

# **CITY OF BELGRADE**

## **DESIGN STANDARDS AND SPECIFICATIONS POLICY**

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# **FOREWORD**

This document is designed to assist design engineers, architects, developers, contractors, or other interested individuals with the preparation of plans and specifications for public infrastructure improvements so that they will meet the requirements of the City of Belgrade (COB). All of the requirements specified herein have been established through the subdivision regulations, municipal ordinance, or City policies.

It is the intent of the COB to revise this document on an as-needed basis as regulations and policies are modified. Written comments on this "Design Standards and Specifications Policy" are encouraged and may be submitted to the City of Belgrade.

If any portion of this document is found to conflict with any existing provisions of the Belgrade Municipal Ordinance (BMO), the provisions of the BMO shall supersede this Guide.

## **Abbreviations Used:**

AASHTO - American Association of State Highway and Transportation Officials

ADA - Americans with Disabilities Act

ASTM - American Society for Testing and Materials

AWWA - American Water Works Association

BCSR - Belgrade City Subdivision Regulations

BMO - Belgrade Municipal Ordinance

COB - City of Belgrade

DEQ - Department of Environmental Quality

ESAL - Equivalent Single Axle Load

FSP - Final Site Plan

MPWSS - Montana Public Works Standard Specifications

MUTCD - Manual of Uniform Traffic Control Devices

PUD - Planned Unit Development

RCP - Reinforced Concrete Pipe

WQB - Water Quality Bureau

# CITY OF BELGRADE

## PLANS AND SPECIFICATIONS REVIEW POLICY

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### **I. Standard Submittal Requirements**

#### **A. Prior to Plan and Specification Submittal:**

For projects such as; Planned Unit Developments (PUD's), Conditional Use Permits (CUP's), Annexations, preliminary plats, and in some cases Final Site Plans (FSP's)), Belgrade City Council approval must be obtained prior to submission of infrastructure plans and specifications.

The following shall be submitted and approved by the City of Belgrade obtained prior to submission of infrastructure plans and specifications:

1. Water and Sewer Utilities Design Report. (Subsequent to receipt and approval of this report, the City will issue a water/sewer capacity letter, if warranted).
2. Pavement Design Report and Traffic Impact Analysis.
3. Storm Water Facilities Design Report (Per DEQ-8).
4. Parks Requirements Information

Submittal of plans and specifications, and all subsequent correspondence and submittals for public infrastructure improvements including, but not limited to; sanitary sewer mains, water mains, storm sewers, street and transportation improvements, shall be made to the City of Belgrade, 91 East Central Street, Belgrade, Montana, 59714.

#### **B. Plan and Specification Submittal:**

The minimum number of complete sets of plans and specifications (24" x 36" sheets only, stamped and signed by a professional Engineer, registered in the State of Montana) to be submitted are as follows:

<u>Type of Project</u>	<u>Number</u>
Water and Sewer Main Extensions	3 Sets
Fire Service Lines	2 Sets
Street Improvements and/or Storm Sewers	3 Sets
Water & Sewer Mains with Streets and/or Storm Sewer Improvements	4 Sets

### **C. Initial Review and Disposition**

The COB shall complete the initial review and provide written comments to the Engineer/Owner within thirty (30) calendar days of receiving the initial submittal. A review meeting may be scheduled with City representatives to discuss review comments if the design Engineer desires. Pre-design and interim meetings with the City staff are always encouraged.

Upon receipt of the plans and specifications and checklist, one complete set will be sent to the Public Works Director and one set to the City Engineer.

Upon review and approval of the Checklist, Plans, and Specifications, the City Engineer will provide the City Manager with a letter of approval and one set of plans and specifications stamped "Approved For: One Year From This Date".

No construction may begin prior to the pre-construction meeting, which must be attended by the applicant's engineer, engineers inspector, the contractor, the City, and other parties that may be affected by the construction, including Public Utility Companies, Montana Department Of Transportation, and Emergency Service Agencies.

Any changes to the approved plans must be reviewed and approved by the City of Belgrade prior to proceeding.

Any required easements must be properly executed.

### **D. Final Review and Disposition**

The COB shall complete each review of revised plans and specifications within fourteen (14) business days of receiving the revisions. All COB review comments must be adequately addressed and resolved before the final plans and specifications are approved.

The City will either approve or disapprove the submitted documents. A review comment letter will be transmitted to the Engineer/Owner at the completion of each review cycle.

Each submittal of revised plans and specifications shall be accompanied by a written response from the Design Engineer that specifically addresses **each** item in the Staff comment letter. In general, "red-lined" copies of the plans and specifications will be provided to the Design Engineer to facilitate revisions of the documents. However, all redlined drawings must be returned with each subsequent re-submittal.

A "Pre-construction Meeting Checklist" will typically be included with the approval letter specifying any additional documentation, which must be submitted prior to scheduling the pre-construction meeting.

For projects subject to Department of Environmental Quality (DEQ) review and approval, a copy of the project approval letter from DEQ must be submitted to the City prior to the preconstruction meeting. In addition, the City Engineer will not consider the plans and specifications for water or sewer projects for approval without written approval from the Public Works Director.

**Please Note: no work on the project shall begin prior to obtaining the following:**

- 1) the COB's and DEQ's written approval of the plans and specifications, and
- 2) completion of a pre-construction meeting conducted by the Owner's Engineer and attended by the Contractor(s) and COB representative(s).

Once all review comments have been adequately addressed and resolved the City shall be supplied with four (4) complete sets (See Section 2 above for exact quantities) of the final plans and specifications, signed and stamped by a Professional Engineer licensed in the State of Montana. Specification manuals shall be bound and contain the most current version of the revised documents. Plan sheets shall be the most current version. The final sets of plans and specifications submitted for City approval will be reviewed to ensure that all requested modifications are included.

Deficiencies in plans and specifications that are discovered during project construction are inherently much more costly to the project schedule and budget than design deficiencies or issues resolved and addressed prior to construction. Deficiencies discovered during construction may require revised plans to be submitted and approved, and could require additional untimely and expensive correction or replacement of non-compliant work installed on the project.

Engineers are strongly encouraged to work closely with the City's Planning, Public Works, and Engineering personnel throughout the pre-design, design and construction phases of a project.

**E. Applicable Standards:**

All infrastructure projects shall comply with the following design standards in order of precedence:

- A. COB Design Standards and Specifications Policy
- B. COB Modifications to Montana Public Works Standard Specifications (MPWSS)
- C. Belgrade City Subdivision Regulations
- D. DEQ Circulars 1, 2, and 8
- E. City Adopted MPWSS and Adopted Addenda

The most recently adopted versions of the City Water and Wastewater Facilities Plans shall govern sewer and water trunk main design and sizing. The COB Transportation Plan shall govern their respective service area issues.

**F. Construction Coordination:**

**Pre-construction Meeting**

Following approval of infrastructure plans and specifications, the Developer's Engineer shall schedule a pre-construction meeting with the City of Belgrade, Contractor(s), and if applicable, other affected utilities or governmental agencies. A "Preconstruction Meeting Checklist" will be included with the letter of approval, which lists any submittals that must be received by the City of Belgrade prior to scheduling a preconstruction meeting.

**Shop/Fabrication Drawings**

Any required shop/fabrication drawings shall be submitted by the Contractor to the Engineer. Upon approval, the Engineer shall submit two sets of the shop/fabrication drawings to the City, a minimum of two days prior to the preconstruction meeting.

**Bonding**

All new public utilities and infrastructure that will be publicly maintained shall be bonded. Prior to initiation of construction, copies of the Contractor's Performance and Payment Bonds, each in an amount equal to 100% of the contract amount, in favor of the Owner, shall be filed with the Owner and the City of Belgrade.

### **Engineer's Status/Responsibility During Construction (Owner's Engineer)**

The Engineer will furnish a qualified Resident Project Representative (RPR) and other field staff to assist the Engineer in observing the performance of the work. The RPR will act as directed by and under the supervision of the Engineer, and will confer with the Engineer regarding the RPR's actions. The RPR shall not authorize any deviation from the approved plans and specifications or substitution of materials or equipment, unless authorized by the Engineer.

#### Qualifications of the Resident Project Representative:

The Resident Project Representative shall have a minimum of two (2) years of full time experience inspecting public infrastructure projects. Inspector shall have sufficient experience and knowledge of the following subject areas: A/C and P/C street paving; street sub-grade excavation, backfill and compaction, trench excavation and backfill; installation and testing of water, wastewater, and storm drain utilities; and curb/gutter installation. In addition, the RPR shall possess a current 'Nuclear Moisture-Density Gauge Operator Training Certificate' from the United States Nuclear Regulatory Commission in order to be qualified to operate a nuclear densometer.

The Resident Project Representative's qualifications and experience are subject to the review and approval of the City of Belgrade. Once an RPR has been assigned to a project, City of Belgrade approval shall be required prior to substitution of a replacement RPR.

It is considered a possible conflict of interest when an engineer or engineering firm has a financial or ownership interest in any associated development or project. In such cases, the engineer/developer must retain an independent engineering firm to provide inspection services for the project.

The Resident Project Representative will act under the direct supervision of a professional engineer licensed in the State of Montana. The RPR will be on-site at all time work is being performed in City right of way or easements, no exceptions. Failure of the RPR to be onsite during construction, shall result in all work installed without inspection to be removed and replaced, at contractor's expense.

The following work requires that a City inspector be present at all times:

- Pre-Construction Meeting
- Testing of Water Mains
- Testing of Sewer Mains (Leakage and TV)
- Pouring of Thrust Blocks
- Street Subgrade Excavation and Preparation
- Street Paving
- Water Main Flushing and Disinfection
- Water Main Bacteriological Testing

Trench Bedding Materials Testing (Gradation, Plasticity, Density, and Moisture)  
Street Sub-grade/Base Materials Testing (Gradation, Plasticity, Density, Moisture)  
Final Walk Through & Acceptance

The RPR shall notify the City at least 48 hours prior to scheduling any of the above work. Failure to provide notice to City and have City inspector present during performance of any of the above work, shall result in rejection of said work and shall require removal and replacement of utilities installed without a City inspector present, at the contractor's risk and expense.

Duties of the Resident Project Representative:

The RPR and/or other field staff of the Engineer will:

- Conduct extensive on-site observations of the work in progress and field checks of materials and equipment to provide protection against defects and deficiencies in the work of the Contractor.
- Perform construction observation, documentation, and required testing of all critical construction work including, but not limited to: all underground or buried work including placement and connection of utility lines and appurtenances, trench backfill and compaction, placement of geo-textile fabric membranes, placement of fill or embankments; placement of curb and gutter and other surface drainage improvements; placement of pavement base and surface courses; and placement of sidewalks.
- Advise the Engineer and Contractor of the commencement of any work requiring Shop Drawings or sample if the submittal has not been approved by the Engineer.
- Report to the Engineer whenever RPR believes that any work is unsatisfactory, faulty, or defective or does not conform to the approved plans and specifications, or has been damaged, or does not meet the requirements of any inspection, test or approval required to be made.
- Advise the Engineer of work that the RPR believes should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection, or approval.
- Verify that all tests are conducted in the presence of appropriate personnel, and observe, record and report to the Engineer appropriate details relative to testing procedures.
- Accompany visiting inspectors representing the City of Belgrade or other public agencies having jurisdiction over the project.
- Maintain **at the job site** orderly files for correspondence, reports of job conferences, Shop Drawings and samples, reproductions of original Contract Documents including all Work Directive Changes, Addenda, Change Orders, Field Orders, additional Drawings issued subsequent to the execution of the contract or beginning of work, Engineer's clarifications and interpretations of the Contract Documents, and other Project related documents.

- Keep a detailed and accurate diary or log book, recording Contractor hours on the job site, weather conditions, prime and subcontractor daily work force, daily log of equipment onsite or standby, data relative to questions of Work Directive Changes, Change Orders, or changed conditions, list of job site visitors, daily activities, decisions, observations in general, and specific observations in more detail as in the case of observing test procedures.
- Furnish Engineer with weekly reports of progress of the work. Copies of the progress report will be forwarded to the City on a weekly basis.
- Furnish Engineer and Contractor a list of observed items requiring completion or correction before Engineer may issue a Certificate of Substantial Completion, assess completion or correction of said items, advising Engineer on their status, and make recommendation to Engineer regarding issuance of a Certificate of Substantial Completion.
- Conduct final inspection of the project in the company of Engineer, Owner, Contractor, and City of Belgrade, and prepare final list of items to be completed or corrected.
- Verify that all items on final list have been completed or corrected and make recommendations to Engineer concerning final acceptance.

Duties of Engineer:

The Engineer will:

- Issue written clarifications or interpretations of the requirements of the Contract Documents (i.e. plans and specifications).
- Disapprove or reject work which Engineer believes to be defective, and require special inspection or testing of the work whether or not the work is fabricated, installed or completed.
- Review Shop Drawings and samples for compliance with the Contract Documents.
- Review proposed changes in work and submit such changes to the City of Belgrade or other public agencies having jurisdiction for review.
- Issue Certificate of Substantial Completion and Certificate of Completion and Acceptance.
- Inform the City of construction progress on a weekly basis (at minimum) with a written report noting progress, revisions to schedule, deficiencies identified, and testing schedules. Please Note: The City must be **notified at least 48 hours prior** to conducting all infrastructure testing so that the City representative may be present to observe the testing. Failure to notify the City of an upcoming test may result in the contractor/engineer having to repeat the test(s), at the sole discretion of the City of Belgrade.

## **G. Testing and Documentation Requirements for Infrastructure Improvements**

To better document the inspection and certification of public infrastructure improvements, the City of Belgrade shall require the following information for all projects approved for construction. This documentation shall be required prior to final acceptance of sanitary sewer, water main, storm drain, Portland cement concrete, and bituminous pavement improvements within City right-of-way or easements.

### **THE FOLLOWING DOCUMENTATION SHALL BE REQUIRED ON ALL PROJECTS APPROVED BY THE CITY OF BELGRADE:**

- A. The Engineer shall submit a letter to the City certifying that the public improvements (i.e. sanitary sewers, water mains, drainage structures and streets) were installed in accordance with the approved plans and specifications and shall be accompanied by Record Drawings for the project.
- B. Dates of acceptable tests for sanitary sewer, which shall include TV inspection, cleaning, exfiltration by air or water, and manhole testing, shall be included in the certification letter. The testing log shall identify who performed the tests, where and how they were performed, test duration, and name of City inspector who witnessed the testing. Final TV inspection for City final acceptance shall occur after all improvements are completed, including street paving. The above information shall be required for all public sewer main and force main extensions.
- C. Dates of acceptable tests and test results for water mains, which shall include bacteriological testing, hydrostatic testing, and leakage testing shall be included in the certification letter. This information shall be required for all public water main extensions.
- D. Benchmark elevations shall be established for all new hydrants on the project. Said elevations shall be certified by either a P.E. or L.S. registered in the state of Montana. Elevations shall also be provided for the top of the water main at 50' intervals. The datum used as the basis for the elevations shall be clearly identified.
- E. Verification that all thrust blocking was installed in accordance with the approved plans and specifications shall be included in the certification letter. If mechanical restraints are used in lieu of thrust blocks, include verification that the restrained length as installed meets or exceeds the manufacturer recommendations.
- F. An accurate record of the location of all sanitary sewer service connections as installed, and the length and slope of all service lines installed must be provided by the Engineer. Elevations at the end of dry service line stub-ins are required. Sanitary sewer service connections shall be tied to manholes.

This information shall be required for all public sewer main extensions and service connections to existing mains.

G. The Engineer shall furnish documentation of tests in accordance with methods prescribed by AASHTO for theoretical maximum density, optimum moisture content, and sieve analysis for the sub-base course, crushed base course, pit run, and native backfill and sub-grade material within the right-of-way. This information shall be required for all public sewer main, water main, storm drain and street extensions.

H. The Engineer shall furnish documentation of in-place field density tests. In-place density tests for trenches and embankments shall, as a minimum, be required for each lift of backfill at 200 foot intervals. Density test results shall be provided to the City on daily basis, and/or as backfill material changes.

In-place density tests for roadways shall be required at intervals not to exceed 50 feet for each lift of backfill. Tests for roadways shall also be provided for sub-grade, sub-base course and/or pit run, and crushed base course materials. All sub-grade, which is to be paved or covered with curb, gutter, or sidewalk, shall be field density tested.

All trench backfill material in improved areas and all embankments shall be compacted for the full depth and shall be compacted to 95% of the theoretical maximum proctor density as determined by ASTM-T-180. This information shall be required for all public sewer main, water main, storm drain, and street extensions.

I. The Engineer shall furnish a dated job-mix formula for hot plant mix bituminous pavement which conforms to the procedures of the Asphalt Institute's MS-2 manual. The job mix formula shall be no older than one year, and shall have the same aggregate, asphalt sources, grades, and gradations as the mix used for the public improvements.

The Engineer shall furnish certified results of a Marshall Test showing the bulk specific gravity determination, stability and flow data, and density and void analysis. The engineer shall furnish a minimum of one "field Marshall Test" per 2000 tons of mixture placed to check for variations from the job-mix formula. In addition, test results of ASTM D 1075 for the effect of water on cohesion of compacted bituminous material shall be provided by the Engineer. This information shall be required for all public street extensions.

J. The Engineer shall furnish asphalt core samples for bituminous pavement in the public right-of-way. Four core samples shall be required for every 1000 tons of mixture placed, with a minimum of three samples for projects that use less than 1000 tons.

The location of the core samples shall be determined on a random basis using a system of random numbers, so that each ton of material has the same probability of being selected. For random locations falling near the pavement joints, obtain the core as close to the location as possible without having any part of the core circumference coming closer than 12 inches to the pavement edge or joint.

The Engineer may take additional core samples at locations where he/she has, based on observations of the paving process and/or the results of nuclear density tests, reasonable belief that the in-place material is unsatisfactory.

The Engineer shall submit the sampling plan to the City upon completion of the paving, prior to taking cores. (An example for one method of determining random sample locations is included in the appendix of these Design Standards). The Engineer shall provide a certified laboratory report from the samples taken as to thickness and actual density. Testing laboratories shall meet the requirements of ASTM D3666 (Evaluating and Qualifying Agencies Testing and Inspecting Bituminous Paving Materials). The engineer shall certify that the core holes have been patched with hot plant mix asphalt. This information shall be required for all public street extensions.

- K. The Engineer shall furnish Portland cement concrete tests for concrete placed in the public right-of-way and concrete incorporated into public infrastructure improvements. One set of tests shall be required for every 50 cubic yards of concrete placed with a minimum of one set of tests per project. The concrete shall be sampled, specimens made, and compliance determined in accordance with the following:

Sampling Fresh Concrete	ASTM C-172
Slump	ASTM C-143 or AASHTO T119
Air Content	ASTM C-231 or C-173 or C-138 or AASHTO T152
Compressive Strength	ASTM C-39 or AASHTO T22
Making and Curing Test Specimens in the Field	ASTM C-31 or AASHTO T23

Sampling and testing shall only be performed by persons that are currently certified as an ACI Concrete Field Testing Technician, Grade 1. The above information shall be required for all public street extensions.

#### **Pre-Paving Inspection:**

Prior to application of the base course to the roadway, the Engineer shall conduct a pre-paving inspection for any projects that have paved or gravel streets as part of the improvements. The Engineer, the Contractor and a representative from the City shall attend the inspection.

## **Acceptance/Correction of Deficient Pavement Improvements:**

Acceptance tests shall be evaluated by the Engineer for conformance with the specifications. Any results that indicate the in-place material does not conform to the specifications shall be immediately reported to the City, along with a recommendation of corrective action to bring the material into compliance with the specifications. The City of Belgrade shall determine what corrective action is necessary in order for the improvements to be accepted by the City of Belgrade. Corrective action may include total removal and replacement of the deficient material, partial removal and replacement, placing additional material, or in lieu of corrective action, payment of a penalty to the City of Belgrade.

### **A. Portland Cement Concrete:**

If an individual strength test (average of two cylinders tested at 28 days) falls below the specified strength by more than 500 psi, the in-place material represented by the failed test shall immediately be randomly cored for acceptance testing. A minimum of three and maximum of six cores shall be taken.

If the acceptance cores average strength tests are deficient by greater than 500 psi, but not greater than 1000 psi, the Contractor shall remove and replace the deficient concrete; or pay the City of Belgrade 0.25 times the unit price bid times the area determined to be deficient in strength.

If the average strength tests are deficient by more than 1000 psi, the area of the concrete determined to be deficient shall be removed and replaced.

### **B. Asphaltic Concrete Pavement:**

The asphaltic concrete pavement shall be tested and evaluated for acceptance on a lot basis, with one lot being 1000 tons of material.

1. Thickness. If the average thickness of the pavement cores is more than  $\frac{1}{4}$ " below the plan thickness, or if any one individual core is more than  $\frac{1}{2}$ " below the plan thickness, corrective action or payment of a penalty will be required.

a. Average Thickness Deficiencies. If the average thickness deficiency is between  $\frac{1}{4}$ " and  $\frac{1}{2}$ ", corrective action such as placement of additional material (i.e. overlay or chip seal), as determined by the City Engineer, will be required.

In lieu of placing additional material, the City of Belgrade may allow the payment of a penalty to the City of Belgrade in the amount of 0.25 times the unit price bid of the asphalt pavement times the amount of pavement determined to be deficient, at the sole discretion of the City of Belgrade.

If the average thickness deficiency is greater than  $\frac{1}{2}$ " , an overlay will be required, along with cold milling of the existing pavement to provide for a minimum overlay thickness of 1.5" .

b. Individual Core Thickness Deficiency. If any one core thickness is determined to be greater than  $\frac{1}{2}$ " below plan thickness, additional cores shall be taken at 10 foot intervals parallel to the centerline in each direction from the affected location until, in each direction, a core is found which is not deficient by more than  $\frac{1}{4}$ " , in order to determine the extent of the deficient pavement.

If the thickness deficiency is more than  $\frac{3}{4}$ " , the area that is deficient shall be removed from pavement edge to pavement edge and replaced to bring the non-complying areas to planned thickness.

If the thickness deficiency is not greater than  $\frac{3}{4}$ " , the deficient area shall be removed and replaced to the planned thickness, or at the City's sole discretion, a penalty will be paid to the City of Belgrade in the amount of 1.5 times the unit price bid times the amount of pavement that is deficient in thickness.

2. Density. The average density of the pavement cores shall equal or exceed 93% of the maximum density as determined by ASTM D2041 (Rice's density). If the average density is less than 93% but more than 90.9%, the pavement that has deficient compaction shall be milled and overlaid, (1.5" minimum depth), or at the City's sole discretion, a penalty in the amount of 0.10 times the unit price bid for the pavement material times the amount of pavement that has deficient compaction shall be paid to the City of Belgrade.

If the average density is 90.9% or less, the pavement area affected will be removed and replaced or overlaid as determined by the City of Belgrade.

If any one core is determined to have a density of less than 86.0%, additional cores shall be taken at 10 foot intervals parallel to the centerline in each direction from the affected location until, in each direction, a core is found which has a density of at least 91%.

The area that is determined to have deficient compaction shall be removed from pavement edge to pavement edge and replaced, or at the City's sole discretion, a penalty will be paid to the City of Belgrade in the amount of 1.5 times the unit price bid times the amount of pavement that is deficient in density.

### C. Unit Prices:

If unit prices for the project are unavailable, unit prices shall be as determined from time to time by the City Engineer for the various items of work.

**Project Close-out and Acceptance:**

Final acceptance of all public utility improvements will occur upon completion and acceptance of all required infrastructure development. Final acceptance will be contemplated upon the completion of the following items: Upon completion of the work, the following documentation shall be submitted to the City Engineer:

- A. An executed "Certificate of Completion and Acceptance", which certifies that all public improvements were installed and completed in accordance the approved plans and specifications.
- B. Submission of final Project Inspection Daily Log and Testing Records.
- C. Submission of Certified Checklist for Testing and Documentation Requirements.
- D. Submission of all final Operation and Maintenance Manuals.
- E. Identification of Completion Dates for Warranty.
- F. Satisfactory Completion of a Comprehensive Walk-Through with City Staff, the Engineer, and the Developer.
- G. Satisfactory Completion of All Items on the Final Punch-List.
- H. Inspection and Repair of any Previously Accepted Utilities. The City Reserves the Right to Require Re-Inspection and Repair of Any Existing Facilities if Damage from Construction Related Activities is Considered Likely.
- I. Submission of Final Record Drawings.

Final acceptance of a completed utility system component can be granted prior to completion of the infrastructure development as a whole, if the City of Belgrade is provided with a financial guarantee (in the form of a bond) that the remaining infrastructure components will be completed within a specific time frame.

The required one year warranty period for the complete project begins on the date of final written acceptance. Any required repairs to utilities approved for interim use will also be warranted for the one-year period following final acceptance.

Within 90-days of project completion, the Engineer shall sign and submit Record Drawings to the City of Belgrade. The drawings shall be full-size and consist of one Mylar reproducible set, two blueprint sets, and one digital copy in an approved format.

**Please Note:** failure to provide all of the necessary closeout documentation to the City within the 90-day period shall result in **delaying approval for future projects** submitted by the Engineer, until such time as the necessary documents are provided.

## II. CONSTRUCTION PLANS AND SPECIFICATIONS REQUIREMENTS

### A. GENERAL REQUIREMENTS

1. Any required design reports must be submitted and approved prior to submittal of plans and specifications.
2. Project plans and specifications will not be accepted until the City of Belgrade has approved the project (e.g.; subdivision, PUD, CUP, preliminary plat).
3. All project infrastructure plans must be submitted at the same time.
4. Where existing infrastructure is being extended, existing material, size, elevation, horizontal alignment, and grade shall be field verified, and all critical utility crossings **shall be field verified**, prior to plan and specification submittal.
5. All full-sized plans shall be on 24-inch by 36-inch plan sheets. All plans submitted for final approval and all as-built drawings shall be full-sized. All plans submitted for review and approval will be stamped, signed, and dated by a professional engineer licensed in the State of Montana.
6. Separate plans shall be submitted for water facilities and sanitary sewer facilities. Plans for storm sewer facilities may be included with plans for street facilities.
7. All plans will have both plan and profile views of the proposed improvements shown on the same sheet. A general location map shall be provided showing the relationship of each page to the overall development.
8. Project datum and benchmarks shall be clearly identified on the plans.
9. English units are required.

B. SPECIFICATIONS REQUIREMENTS

1. The City of Belgrade has adopted "Montana Public Works Standard Specifications" (MPWSS) as the standard specifications for new construction. A separate document, "City of Belgrade Modifications to MPWSS" has been adopted which supplements and supercedes MPWSS. All project manuals must incorporate, by specific reference, the appropriate sections of the MPWSS (latest adopted edition) and the "City of Belgrade Modifications to MPWSS", including any addenda.
2. Additions or changes to the above standard specifications must be done through Special Provisions or similar supplemental sections in the project manual.

C. DRAWING SCALES

The following scales are required. Other scales will be considered on a case by case basis if all information can be clearly shown.

1. Plan View: 1" = 50'
2. Profile View, Horizontal: 1" = 50' (or match plan view scale)  
Profile View, Vertical: 1" = 5'
3. Stationing interval: 100 feet or 50 feet

D. PLAN REQUIREMENTS

The following items will be required on all plans. Existing features should be shown dashed or with a lighter shading than proposed new features. All construction will be tied to the centerline of a City right-of-way, to the centerline of a City easement, to a platted property line, or to section lines.

1. Plan View:

- North Arrow.
- Legend of Symbols.
- Property lines and ownership or subdivision information.
- Street names and easements with width dimensions.
- Project Stationing.
- Limits of existing paved or graveled surfaces.
- Monument boxes.
- Culverts.
- Bench Mark, description and elevation.

- Scale
- Existing and proposed utilities and structures, including:
  - Line size and material;
  - Water lines (main lines and service lines);
  - Water valves, and hydrant locations;
  - Sanitary sewer lines (main lines and service lines);
  - Manhole locations;
  - Storm sewer lines, manholes, and inlets;
  - Gas lines;
  - Electric lines, poles, transformers;
  - Telephone lines, manholes, junction boxes;
  - Cable T.V. lines, junction boxes;
  - Irrigation ditches and structures;
  - Irrigation systems;
  - Fiber optic lines, manholes, junction boxes.

2. Profile View:

- Vertical and horizontal grids to scales.
- Final grade (solid).
- Existing grade (dashed).
- Existing utility lines where crossed.
- Project Stationing
- Utility crossings
- Scale

**E. UTILITY PLAN REQUIREMENTS**

1. The following general notes must appear on all plan sets:

- a. All construction will conform to MPWSS (Latest) Edition, and COB Modifications to MPWSS.
- b. Any existing or new valves which control the COB's water supply shall be operated by COB personnel only.
- c. The Contractor shall notify the COB Water Department a minimum of 24-hours prior to beginning any work.
- d. The Contractor shall field-verify line and grade of existing connections.
- e. The Contractor shall be responsible for locating all underground utilities by notifying One Call at least two business days prior to beginning construction.

2. Plans for water facilities shall show the following:

- Size, type and structural class of proposed new water line(s), including AWWA specifications.
- Bedding class.
- Type of excavation and backfill.
- Existing water lines including size and material.
- Proposed valves, fittings, fire hydrants, and service lines, with stationing.
- Depth of cover from finish grade to proposed water line(s).
- Requirements for pipe deflection, if necessary.
- Type of joint restraint.
- Size of gravity thrust blocks based on calculated design.
- Existing or proposed pressure reducing valves.
- Bench Mark, description and elevation.

3. Plans for sanitary sewer facilities shall show the following:

- Size, type, and structural class of proposed new sewer line(s), including American Society for Testing and Materials (ASTM) specifications.
- Slope of each proposed pipeline segment.
- Bedding class.
- Type of excavation and backfill.
- Existing sewer lines and manholes including size, material, field-verified invert elevations, and field-verified slopes.
- Proposed manholes with stationing and rim and invert elevations.
- Existing and proposed sewer service lines with size and stationing.
- Existing and proposed cleanouts.
- Bench Mark, description and elevation.

4. Plans for storm sewer facilities shall show the following:

- Size, type, and structural class of proposed new storm sewer line(s), including ASTM specifications.
- Slope of each proposed pipeline segment.
- Bedding class.
- Type of excavation and backfill.
- Proposed manholes with stationing and rim and invert elevations.
- Proposed inlets and inlet service lines with stationing and invert elevations.
- Points of stormwater discharge.
- Bench Mark, description and elevation.

## F. ROADWAY PLAN REQUIREMENTS

### 1. Plans for streets or roadways shall show the following:

- Limit of cut or fill.
- Existing and proposed utilities, including manholes and valves.
- Proposed new construction, including paving width and limits, curb and gutter, crosspans, sidewalks, and ADA pedestrian ramps.
- Existing and finished grades, with finished grade slopes.
- Vertical and horizontal curves, with curve data:
  - Horizontal curves - R, Delta, L, PC and PT Stationing
  - Vertical curves - K, L, Station of PT's, PI elevation and station
- Profile of centerline.
- Profiles of left and right curb lines, if they are not the same.
- Any required utility adjustments.
- Existing and proposed signs and pavement markings.
- Existing and proposed storm drainage facilities, including culverts, pipes, inlets, sidewalk chases, ditches and detention/retention ponds, with invert and/or spot elevations.
- Top of curb elevations at P.C.s, P.T.s, and inlets.
- Existing and proposed street monuments.
- Bench Mark, description and elevation.
- Typical roadway section(s), dimensioned and drawn to scale, showing:
  - Right-of-way
  - Back-slopes
  - Sidewalks
  - Curb and gutter
  - Pavement thickness and type
  - Base and sub-base thickness and type

- Compaction requirements
- Transition details from full crown to match lines
- Cross-slopes

### III. DRAINAGE POLICY

#### A. GENERAL DESIGN CRITERIA

A Storm-water Drainage Plan is required for all new developments. The following criteria shall be used in the design of all Drainage Plans:

1. The storm-water drainage plan shall be designed to limit storm-water runoff from the development site to the pre-development runoff rates. The pre-developed rate calculations shall be included as part of the required facility design calculations. Adequate on-site storm-water detention or retention shall be provided for design storm runoff exceeding the pre-development rate.
2. The storm-water storage and treatment facilities shall be designed to remove solids, silt, oils, grease, and other pollutants. Where required, oil/water separators shall be provided in the facility design (i.e.; commercial parking lots, service stations, etc.).
3. Where the storm drainage plan includes storm sewers they shall meet the following minimum requirements:
  - a. Alignment between manholes shall be straight.
  - b. The sewers shall be uniformly sloped to maintain a minimum velocity of 3-fps at the design storm depth of flow, or when flowing full, to prevent sediment deposits.
  - c. Pond inlet and outlet piping shall be protected and designed to prevent erosion (i.e. splash pads, rip rap, etc.).
  - d. Publicly maintained storm sewers located in the public right-of-way shall be constructed of reinforced concrete pipe (RCP) or solid-wall or corrugated PVC pipe, complying and installed in accordance with the current edition of MPWSS as modified by the COB. PVC pipe may only be used for pipe sizes of 36" diameter or less. Other pipe materials may be considered for private storm sewer facilities. Use 12-inch minimum pipe size for inlet structures and 15-inch minimum pipe size within the storm drain system.

- e. Storm sewer facilities shall be designed to handle the storm event specified in Table 3.
- f. Inlets shall have sumps for sediment collection, as shown on COB standard drawings, unless approved in writing by the City of Belgrade.
- g. Culverts shall be reinforced Portland Cement concrete.

B. STORM DRAINAGE PLAN:

1. Storm Drainage Plan:

A Storm Drainage Plan shall be submitted to the City for all new developments requiring subdivision review. The drainage report shall be prepared by a Professional Engineer, licensed in the State of Montana, acting on the behalf of the Developer. Drainage reports shall include all of the required design calculations necessary to support the proposed design.

- a. Drainage reports should incorporate the following information:

Provide a Project Summary.

Provide a detailed drawing showing the existing site conditions and a detailed drawing for the proposed site conditions that show site boundary, basin/sub-basin/bypass area boundaries, wetlands, sensitive area buffers and setbacks, easements, etc. Each drawing shall show the total area and the amount of pervious and impervious area in each basin/sub-basin/bypass area. Show flow paths with slope, flow type, surface type, and run length. A separate figure may be required to show runoff treatment collection area if it is significantly different from the runoff control figure.

The drawing shall show building site(s), open areas, drainage ways, ditches, culverts, bridges, storm sewers, inlets, storage ponds, roads, streets, and any other drainage improvements. The map shall also include identification and square foot coverage of the various ground surfaces (i.e. vegetation, gravel, pavement, structures).

Describe the proposed developed conditions including structures, basins, bypass areas, compensatory areas, flow type and flow paths, pervious/impervious areas, slopes, vegetation/surface and CN numbers, constants used (s,n,k ... ), upstream offsite flow routing, source control BMP's runoff control, runoff treatment, nutrient control, frontage improvements and associated storm improvements, time of concentration, storage volume, release rates, and overflow route capacity. If something is not required, then state that in the report. Provide topographic contours (one-foot intervals) and sufficient spot

elevation data.

Provide a description of the ultimate destination of storm-water runoff from the project and an evaluation of its impact on down-slope drainage facilities and water quality.

Provide design calculations determining runoff quantities and storage requirements. State run-off control and run-off treatment design assumptions. Describe method of analysis.

Appendix: Show any calculations/figures required to support your design including basin summary, time of concentration, weighted CN numbers, percent impervious area, level pool routing summary, state-discharge and state-storage tables, volume correction, and conveyance system capacity calculations.

- b. Provide a storm drainage facilities maintenance plan. The plan shall include:

Identify ownership of all facilities.

Establish a schedule for maintenance activities necessary to keep the system operationally effective.

Identify the responsible party in charge of the specific maintenance duties.

- c. Provide details and specifications (including invert and other pertinent elevation information) for all storm drainage improvements, such as storm sewers, manholes, inlets, discharge structures; and retention/detention pond dimensions and volume, side slope, and top, bottom, and maximum water surface elevations.

## 2. Design Storm:

All storm sewer facilities, including inlets and sidewalk chases, shall be designed to handle a 10-year storm event with no surcharging (maximum water elevation of 0.15' below top of curb). Drainage reports shall include hydraulic grade line calculations including losses from friction and transitions. Approved erosion control shall be designed and installed at all outlets.

Analysis of the following storms shall also be provided. Existing and post-development conditions shall be analyzed to quantify run-off control and run-off treatment needs:

6-month, 24-hour storm (water quality design storm)

2-year, 24-hour storm (stream bank protection)

10-year, 24-hour storm (conveyance)

100-year, 24-hour storm (runoff control)

3. Minimum Impervious Area:

A higher percent impervious area shall be required if the proposed project plans indicate a greater impervious area coverage. Storm-water system designs shall take into account future build-out of the proposed development. For commercial and multi-family residential developments, use actual project values.

C. STORAGE/TREATMENT FACILITIES:

Detention is the storage and gradual release of runoff to a storm sewer system, waterway, or a soil of high porosity. Detention facilities dampen peak runoff rates and provide treatment of runoff flows. For new development, on-site detention with release rates limited to pre-development runoff rates is required. Complete retention facilities may be required where discharge is not feasible or desirable. Retention ponds shall be sized based on a 10-year, 2-hour storm intensity. The developer shall be responsible for obtaining all required EPA and DEQ permits for storm water treatment and/or discharge.

1. Detention Basins:

Detention basins utilize natural or manmade depressions or ponds for storage. Release of water in lined ponds is controlled by specially designed outlet structures (See Appendix D of this Guide). Unlined ponds release water through permeable bottom soils.

2. Basin Sizing:

A minimum basin area of 145-square feet per 1-cfs release rate is required for sediment control. The controlling basin volume is determined by subtracting the total basin release volume from the runoff volume at different storm durations. The release rate is equivalent to the pre-development runoff rate at the piping system design frequency (See Table 3). The runoff rate is determined at the piping system design frequency using development runoff coefficients. Where the potential for major property damage exists due to downstream flooding and the terrain and availability of land permit the construction of a large detention basin, a 100-year design frequency should be used for sizing the pond. Basins located in areas accessible to the public shall have a maximum water depth of 1½-feet and a maximum basin depth of 2½- feet. Deep basins designed only for storm-water detention shall be placed in remote areas and fenced. A sample problem for sizing detention basins is included in the Appendix

of this Policy.

3. Basin Location:

Basins serving multiple lots shall be located in common open space owned by a Homeowners or Property Owners Association. Locating a basin within an easement on a lot will not be permitted unless approved by the governing body. Public park land shall not be used for storm water detention or retention ponds unless approved by the Belgrade City Council.

4. Additional Requirements:

The following additional requirements apply to the design of above ground, earth formed detention basins:

- a. To prevent short circuiting, basin length shall be at least three times the width and inlet velocities shall be dissipated.
- b. Basin slopes shall be 3:1 or flatter.
- c. Vegetative channels shall be utilized wherever possible to remove wastewater contaminants.
- d. Basins in floodplains shall have adequate erosion protection on the embankments.
- e. Overflows shall be provided to prevent overtopping of dike walls.

5. Retention Volumes:

Retention volumes shall be calculated using the following formulas:

$$Q = CIA$$

$$V = 7200Q \text{ (cf)}$$

Where:

- C = Weighted C Factor
- I = 0.41 in/hr
- A = area (acres)
- Q = Runoff (cfs)
- V = Volume (cf)

6. Hydrologic Models:

Run-off control (detention) facilities shall be designed using hydrograph analysis. Conveyance systems may be designed using hydrograph-based computer modeling methods or the Rational Formula. Rational Method computation methods are described herein.

Acceptable computer modeling packages:

Stormshed™

StormCAD™

D. DISCHARGE STRUCTURES:

1. A design detail shall be provided including adequate elevation information. Discharge structures shall be adequately protected from damage. A typical discharge structure is shown in Figure A-2 in the Appendix of this Policy.
2. Orifice or weir calculations shall be provided for controlling the discharge to the pre-development rate.
3. Failsafe features shall be provided including:
  - a. An emergency free-flowing overflow for rates exceeding design storm events.
  - b. Discharge piping shall be a minimum of six (6) inches in diameter for maintenance, and capable of conveying a 25-year storm event.
  - c. Ponds shall be designed so as to avoid long-term standing water in the pond.

E. ESTIMATION OF RUNOFF:

1. GENERAL:

The rational method shall be used to determine peak runoff rates with a slight modification of the method to determine runoff volumes. The basic assumptions that apply to the rational method are:

- a. Rainfall is uniformly distributed over the area for the duration of the storm.

- b. The peak runoff rate occurs when the duration of the storm equals the time of concentration.
- c. The runoff coefficient for a particular watershed is constant for a similar land use.

The method is based on the Rational Formula with the following limitations:

The Rational Formula is used for predicting a conservative peak flow rate to determine the required capacity for conveyance facilities.

The drainage sub-basin area (A) shall not exceed 25 acres for a single calculation. The time of concentration (T<sub>c</sub>) must be computed using the method described below and shall not exceed 100 minutes. It shall be made equal to 6.3 minutes when computed to be less than 6.3 minutes.

The following is the traditional Rational Method equation:

$$Q_R = C \cdot I_R \cdot A$$

Where:

Q<sub>R</sub> = Peak run-off flow rate in cfs for a storm of rainfall intensity "I<sub>R</sub>"

C = Runoff coefficient (ratio of rainfall that becomes run-off)

I<sub>R</sub> = Average rainfall intensity (in./hr.)

A = Drainage area (acres)

## 2. RUNOFF COEFFICIENTS:

The allowable run-off coefficients to be used in this method are shown in Table 1 below. Coefficients from other engineering texts may be considered for specific applications such as concrete, asphalt, roofs, etc.. The values for residential areas were computed as composite values (as illustrated below) based on the estimated percentage of coverage by roads, roof, yards and unimproved areas for each density. For drainage basins containing several land cover types, the following formula may be used to compute a composite runoff coefficient "C<sub>C</sub>".

$$C_C = ((C_1 \times A_1) + (C_2 \times A_2) + \dots + (C_n \times A_n)) / A_t$$

where:

A<sub>t</sub> = total area (acres)

A<sub>1,2,n</sub> = areas of land cover types

C<sub>1,2,n</sub> = runoff coefficients for each area land cover type

**Table 1. Runoff Coefficients - "C" Values for Use in the Rational Method**

Type of Drainage Area	Runoff Coefficient, C*
<b>Business:</b>	
Downtown areas	0.70 – 0.95
Neighborhood areas	0.50 – 0.70
<b>Residential:</b>	
Single-family areas	0.30 – 0.50
Multi-units, detached	0.40 – 0.60
Multi-units, attached	0.60 – 0.75
Suburban	0.25 – 0.40
Apartment dwelling areas	0.50 – 0.70
<b>Industrial:</b>	
Light areas	0.50 – 0.80
Heavy areas	0.60 – 0.90
Parks, cemeteries	0.10 – 0.25
Playgrounds	0.20 – 0.40
Railroad yard areas	0.20 – 0.40
Unimproved areas	0.10 – 0.30
<b>Lawns:</b>	
Sandy soil, flat, 2%	0.05 – 0.10
Sandy soil, average, 2-7%	0.10 – 0.15
Sandy soil, steep, 7%	0.15 – 0.20
Heavy soil, flat, 2%	0.13 – 0.17
Heavy soil, average 2-7%	0.18 – 0.22
Heavy soil, steep, 7%	0.25 – 0.35
<b>Streets:</b>	
Asphaltic	0.70 – 0.95
Concrete	0.80 – 0.95
Brick	0.70 – 0.85
Drives and walks	0.75 – 0.85
Roofs	0.75 – 0.95

**\*Higher values are usually appropriate for steeply sloped areas and longer return periods because infiltration and other losses have a proportionally smaller effect on runoff in these cases.**

### 3. TIME OF CONCENTRATION (Rational Method Only)

A basic assumption of the rational method is that the peak runoff rate occurs when the duration of the storm equals the time of concentration. The time of concentration is the flow time from the most remote point in the drainage to the point in question. It generally consists of overland flow time and channel flow time. Overland flow time may be estimated using the nomo-graph shown in Figure 1.

Note that when the composite run-off coefficient ( $C_C$ ) of a drainage basin exceeds 0.60, it may be important to compute the time of concentration ( $T_C$ ) and peak rate of flow from the impervious area separately. The computed peak rate of flow for the impervious surface alone may exceed that for the entire drainage basin using the total drainage basin  $T_C$ . The higher of the two peak flow rates shall then be used to size the conveyance facility. The  $T_C$  is computed by summation of the travel times(s) ( $T_i$ ) of overland flow across separate flow path segments.

The equation for composite time of concentration is:

$$T_C = T_1 + T_2 + \dots + T_n$$

where:

$T_{1,2,n}$  = consecutive flow path segments of different land cover category or having significant difference in flow path slope

Travel time for each segment is computed using the following equation:

$$T_i = L/60V \text{ (minutes)}$$

**Note:** the travel time ( $T$ ) through an open water body (such as a pond) shall be assumed to be zero with this method.

where:

$L$  = the distance of flow across a given segment (feet)

$V$  = average velocity across the land cover (feet/second)

Average velocity ( $V$ ) is computed using the following equation:

$$V = k_R \sqrt{S_O}$$

where:

$k_R$  = time of concentration velocity factor (feet/second) (see Table 2)

$S_O$  = slope of flow path (feet/feet)

**Table 2 - Kr Values For Travel Time (Tt) Using The Rational Method**

Land Cover Category	K <sub>r</sub>
Forest with heavy ground litter and meadow	2.5
Fallow or minimum tillage cultivation	4.7
Short grass pasture and lawns	7.0
Nearly bare ground	10.1
Grassed waterway	15.0
Paved area (sheet flow) and shallow gutter flow	20.0

Channel flow time in gutters, ditches, or pipes may be determined by estimating velocities with the Manning equation:

$$V = \frac{1.486 R^{2/3} S^{1/2}}{n}$$

V - Mean velocity (ft/sec.)

n - Manning roughness coefficient (typical values in Table 3)

R - Hydraulic radius\* =  $\frac{\text{cross sectional area}}{\text{wetted perimeter}}$

**TABLE 3**

<u>MANNING EQUATION - TYPICAL "n" VALUES</u>	
<u>Channel Type</u>	<u>"n" Factor</u>
Open Grass Lined Channels	0.025
Open Unlined Channels	0.035
Concrete and RCP Pipe	0.013
Corrugated Steel Pipe	0.024
PVC pipe	0.013

4. STORM INTENSITY:

The intensity of the storm is determined from Figure 2 or Figure 3. Duration is assumed to be equal to the time of concentration. The values shown in Table 4 are the City of Belgrade design frequencies.

5. RUNOFF RATES AND VOLUMES:

The rational formula provides a peak runoff rate, which occurs at the time of concentration. The modified rational method approach shall be used to compute runoff volume for storm durations equal to or greater than the time of concentration. This method assumes the maximum runoff rate begins at the time of concentration and continues to the end of the storm. Maximum runoff rates for durations greater than the time of concentration are less than the peak runoff rate because average storm intensity decreases as duration increases. Total runoff volume is computed by multiplying the duration of the storm by the runoff rate.

Alternate methods for determining run-off may be considered, if approved in advance by the City of Belgrade. Alternate methods shall be methods that are commonly accepted by other governing agencies.

**TABLE 4**

RAINFALL FREQUENCY FOR USE IN THE RATIONAL FORMULA

<u>Land Use</u>	<u>Design Rainfall Frequency</u>
Open Land	2-year
Residential	10-year
Commercial or Industrial	10-year

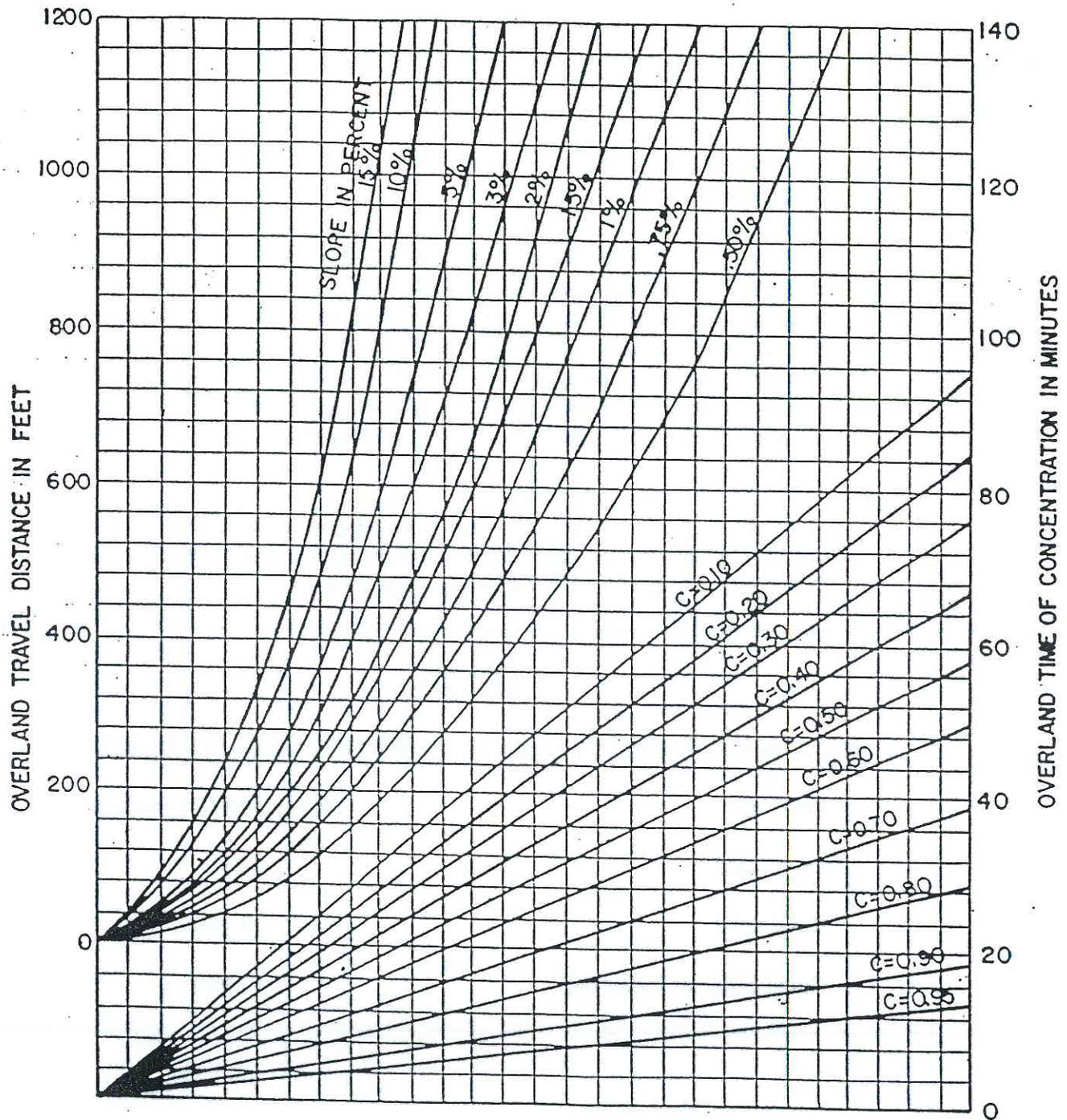


Figure 1 - Time of Concentration (Rational Formula)

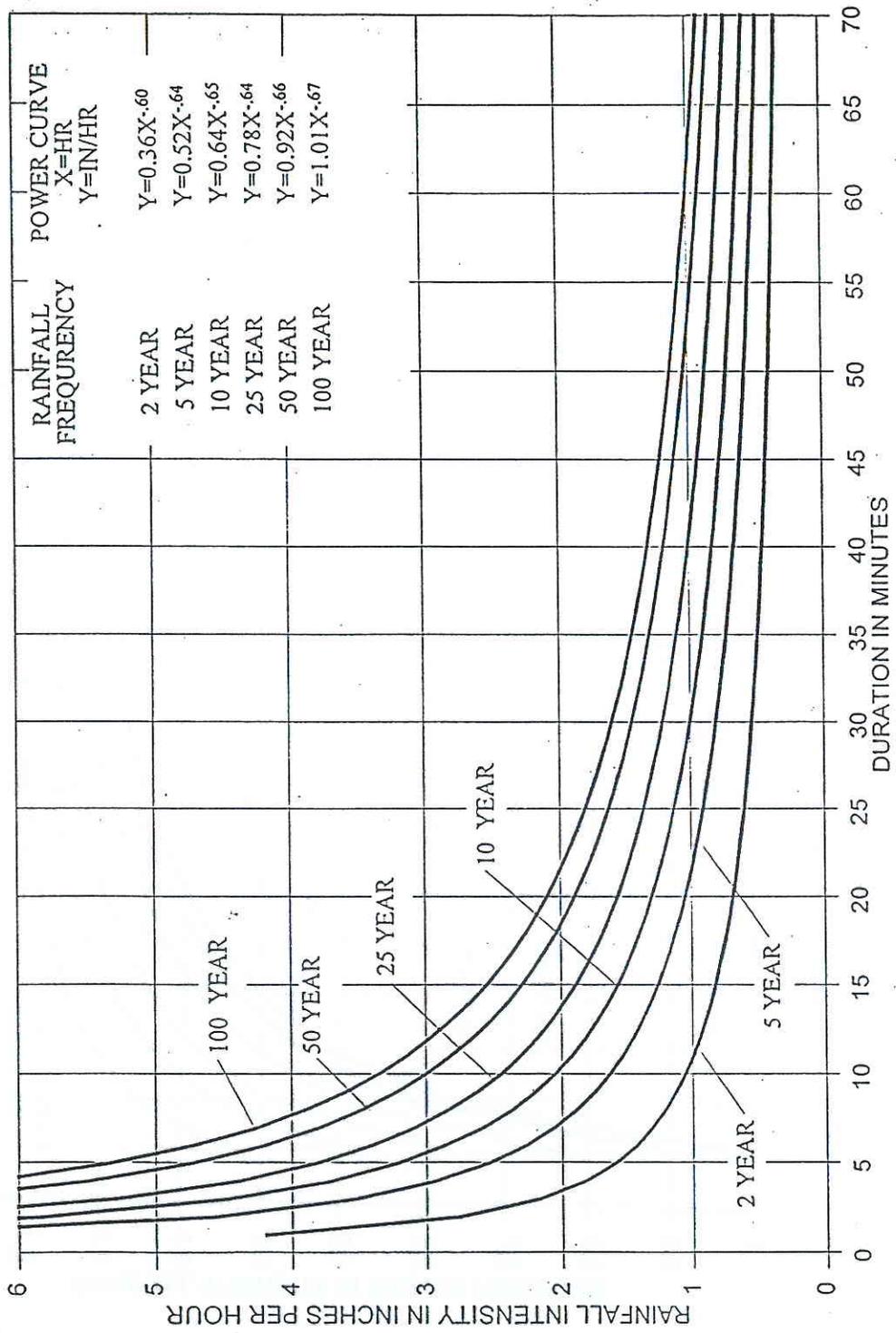


Figure 2 - Rainfall Intensity - Duration in Minutes

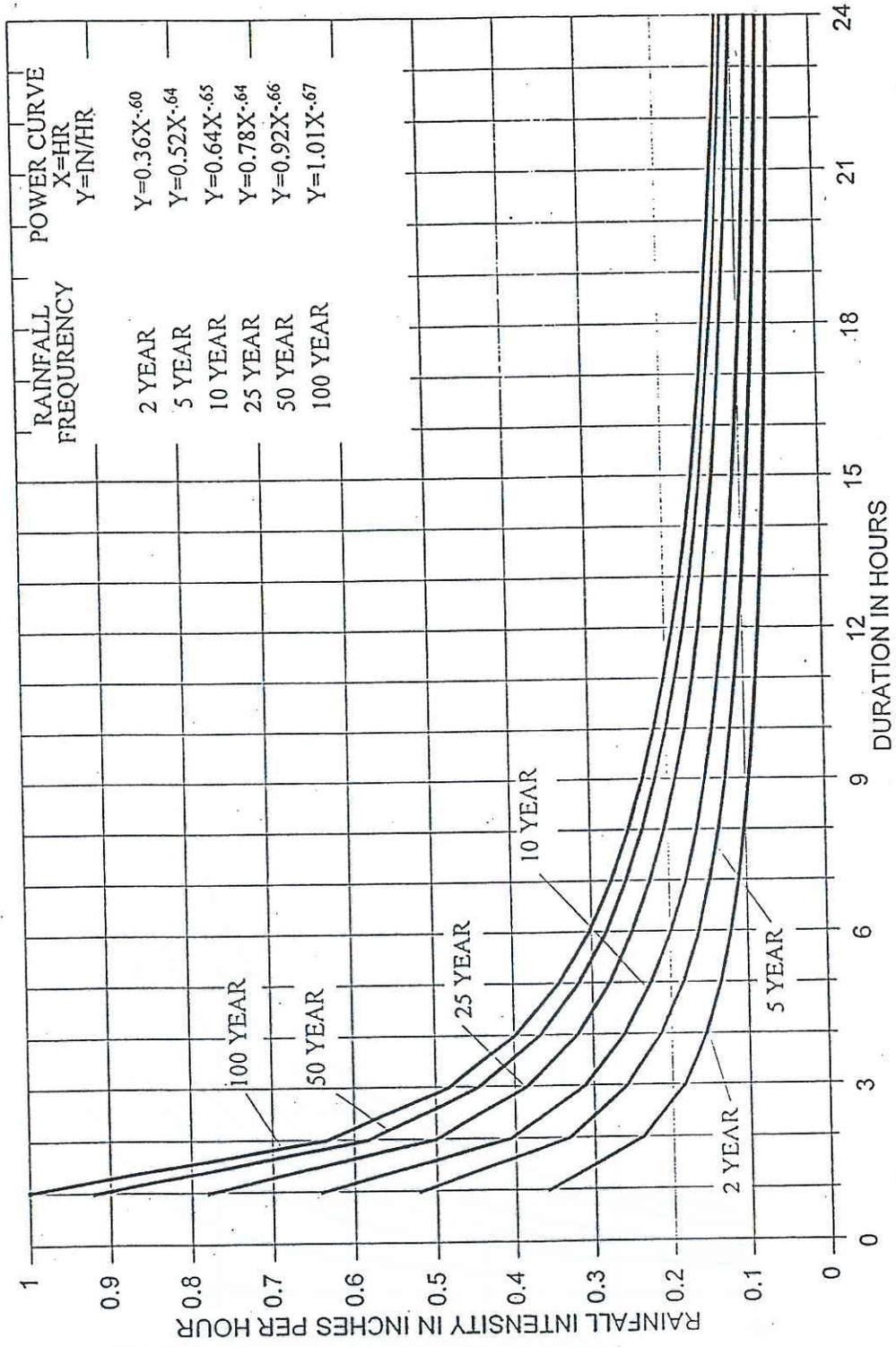


Figure 3 - Rainfall Intensity - Duration in Hours

F. HYDRAULIC ANALYSIS AND DESIGN:

1. Design:

Design the on-site storm-water system (conveyance, runoff control, runoff treatment, and emergency overflow elements) in accordance with Circular DEQ-8 Montana Standards for Subdivision Storm Drainage.

The Engineer shall consider drainage system reliability in terms of layout, specification of materials and methods of installation, and the influence of other activities in the area both during and after construction.

For any anticipated off-site problems resulting from the development or re-development, the Engineer/Developer must demonstrate that the proposed project has been designed to mitigate the anticipated problem.

The Engineer/Developer, with approval by the City, may arrange with the owners of the other off-site properties to install measures to mitigate existing or anticipated problems.

All proposed drainage easements shall be executed by the affected property owners and be recorded prior to approval for construction.

G. CONVEYANCE SYSTEMS:

Off-site storm-water flows passing through the site shall be conveyed by a hydraulically adequate conveyance system designed in accordance with Circular DEQ-8 Montana Standards for Subdivision Storm Drainage and as modified herein.

1. Conveyance System Setbacks:

Conveyance systems shall not be located:

Underneath any structure (e.g. buildings, sheds, decks, rockeries or retaining walls which run parallel to the pipeline, carports, etc.); and

Within the 1: 1 plane from the bottom edge of the pipe or structure to the finished grade at a building or structure; and

Within the 1: 1 plane from the bottom edge of the pipe or structure to the property line at finished grade when an easement is not provided on the adjacent property; and

Within one half of the minimum easement width of a structure; and

Where such facilities interfere with other underground utilities; and

Where allowable design loads would be exceeded.

2. Clearances/Other Utilities:

All clearances listed below are from edge-to-edge of each pipe:

Horizontal clearances from storm main shall be as follows:

Cable TV, Natural Gas, Power, Sewer, Telephone, and Fiber Optics - 5 Feet

Water - 11 Feet

Vertical clearances from storm main shall be as follows:

Cable TV, Natural Gas, Power, Sewer, Telephone, and Fiber Optics - 1 Foot

Water - 1.5 Feet

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.

The Engineer shall send a letter and preliminary plan to all existing utility company's to: 1) inform them of the new construction, and 2) to request utility as-built information for incorporation into plans. At minimum the following utilities should be contacted: cable television, natural gas, power, sanitary sewer, telephone, water, and telecommunications companies.

Submit evidence showing water main crossings account for effects of frost from storm-water piping and that measures have been taken to prevent the freezing of water inside water mains.

Avoid crossing other utilities at highly acute angles. The angle measure between utilities shall be between 45 and 90 degrees.

For crossings of sanitary sewer pipes Montana DEQ Circulars WQB-1 and WQB-2 for water/wastewater systems and Montana Department of Environmental Quality criteria will apply.

3. Open Channel Design Criteria:

Drainage swales shall be located no closer than 10 feet to any structure foundation as measured horizontally from the edge of the swale at the freeboard elevation.

4. Culverts & Bridges:

All culverts & bridges shall conform to Montana Department of Transportation requirements and as modified herein.

5. Storm Drains:

Storm drains shall be provided for all street sections.

6. Private Drainage Systems:

Private drainage systems shall comply with all criteria for storm-water systems set forth in Circular DEQ-8 Montana Standards for Subdivision Storm Drainage.

7. Easement Requirements:

Drainage facilities that are constructed to serve predominantly public property or public right-of-way shall be publicly owned and shall be dedicated to the City. Public conveyance systems shall be constructed within the public right-of-way. When site conditions make this infeasible, public utility easements or dedicated tracts shall be provided. Private drainage facilities shall be constructed outside of the public right-of-way on private property.

8. Water Quality Best Management Practices:

Best Management Practices (BMPs) shall be implemented to protect water quality. BMP(s) to treat the contaminants anticipated from the proposed project shall be required.

Source Control BMPs - The goal of source control BMPs is to keep contaminants associated with a development's activities from entering the storm and surface water system rather than removing contaminants.

Runoff Treatment BMPs - Runoff treatment BMPs intercept and remove contaminants from storm-water runoff and are categorized by the type of contaminants most effectively removed. These categories are:

Conventional Pollutant Treatment - designed to remove particulates and contaminants typically associated with particulates, such as heavy metals. These areas typically include all driving surfaces (streets and roads), uncovered parking areas, driveways, and uncovered storage areas for wastes, materials, equipment, etc.

Oil/Water Separation - designed to remove and contain oil.

Nutrient Treatment - designed to remove suspended and dissolved nutrients.

Oil/water separation (e.g.; a baffle-type (API) or coalescing plate (CP) separator) shall be required if the proposed project involves any of the land uses listed below:

Vehicle fueling/service stations,

fuel storage and distribution facilities,

vehicle maintenance and repair facilities (including those at automobile dealers),

heavy equipment storage and maintenance facilities,

outdoor storage areas for trucks, industrial machinery and equipment, and

all high-turnover, uncovered parking lots (no size limitations) including but not limited to fast food restaurants, convenience markets, supermarkets, shopping centers, discount stores, retail stores, movie theaters, athletic clubs, banks, etc. Typically, office buildings, apartments, light industry, and schools do not have "high-turnover" parking.

H. MATERIALS:

The Contractor shall provide a Manufacturer's Certificate of Compliance for all pipe, fittings, pre-cast concrete products, castings, and manufactured fill materials to be used in the City of Belgrade.

I. METHODS OF CONSTRUCTION & BEST MANAGEMENT PRACTICES:

1. General:

All construction on City right-of-way shall be done in accordance with the procedures and methods set forth in the Standard Specifications as modified herein.

Prior to final inspection, the Contractor shall clean the storm drain system and any off-site drainage systems affected by construction activities by a method approved by the City. Wastewater from such cleaning operations shall not be discharged to the City sanitary sewer system.

Prior to the installation of impervious surfacing all storm-water detention facilities shall be operational. Prior to occupancy of any single phase of a phased development, storm drainage facilities shall be completed and operational to provide conveyance, runoff control, and water quality treatment for the phase for which occupancy is requested.

Tees and other fittings shall be installed as shown on the approved plans. These items shall not be backfilled until both the City and the Engineer have inspected their installation and recorded their exact location.

2. Manholes, Catch Basins, and Inlets:

Manholes, catch basins, and inlets shall be pre-cast concrete unless otherwise approved in writing by the City. All structure ladders, when used, shall be firmly attached using stainless steel hardware and extend to the bottom of the structure.

When connecting to a concrete structure, openings must be core-drilled unless an existing knockout is available. All connections shall be made with watertight rubber boots or other approved watertight connectors.

3. Runoff Control – Infiltration Systems:

Excavation of infiltration systems shall be done with a backhoe or excavator working at "arms length" to avoid the compaction and disturbance of the completed infiltration surface. The facility site shall be cordoned off so that construction traffic does not traverse the area.

An inspection by the civil/geotechnical engineer of record, of the exposed soil shall be made after the infiltration system is excavated to confirm that suitable soils are present. Infiltration systems for runoff control shall not be utilized until construction is complete and disturbed areas have been stabilized, as determined by the City, to prevent sedimentation of the infiltration system. When temporary runoff control facilities are deemed necessary, they shall be provided at contractor risk and expense.

4. Abandoning Facilities:

Abandoning Pipe In Place - The Contractor shall completely fill the pipeline to be abandoned with concrete, controlled density fill, or have it completely removed.

Abandoning Structures - Abandonment of structures shall be completed only after all piped systems have been properly removed and/or abandoned. All structures within a public right-of-way or easement shall be removed.

J. SEDIMENT AND EROSION CONTROL:

1. General:

All projects shall adhere to the State DEQ requirements for sediment and erosion control except as modified herein. The objective of sediment & erosion control is to minimize erosion of disturbed areas during the construction of a project. Additional Erosion and Sediment Control measures may be found in the Field Manual on Sediment and Erosion Control (SEC Field Manual) Best Management Practices for Contractors and Inspectors (Fifield, 2002, ISBN 0-9707687-1-0). The Best Management Practices include the management, techniques, and methods necessary for the control of accelerated erosion and sedimentation damage resulting from construction related activities.

Any person planning to engage in construction/subdivision activities shall submit an erosion and sediment control plan to the City of Belgrade for approval prior to any disturbance of land within the City of Belgrade City Limits.

The erosion and sediment control plan shall contain, as a minimum, the following information:

- a. Name, address, and telephone number of the applicant;
- b. Topographic map showing location of the proposed activity;
- c. Soils information;
- d. Time schedule indicating the anticipated starting and completion dates of the development sequence and the estimated time of exposure for areas of soil disturbance prior to the completion of effective measures for erosion and sediment control.

Land-disturbing activities shall require as a minimum that:

Stripping of vegetation, re-grading and other development activities shall be conducted in such a manner so as to minimize erosion.

Cut and fill operations shall be kept to a minimum.

Development plans must conform to topography and soil type so as to create the lowest practical erosion potential.

Whenever feasible, natural vegetation shall be retained, protected, and supplemented.

The disturbed area and the duration of exposure to erosive elements shall be kept to a minimum and disturbed soils shall be stabilized as quickly as practicable.

Temporary vegetation or mulching shall be employed to protect exposed critical areas during development, and all permanent control measures must be installed as soon as practicable.

To the extent necessary, sediment in run-off water must be trapped by the use of debris basins, sediment basins, silt traps, or other similar measures until the disturbed area has been completely stabilized.

Adequate provisions must be provided to minimize damage from surface water to the cut face of excavations or the sloping surfaces of fills.

Cuts and fills may not endanger adjoining property and shall not encroach upon natural water courses or constructed channels.

2. Erosion and Sediment Control Plan Requirements:

The erosion and sediment control plan shall include the following:

The nature of the construction activity, including a proposed time table for major construction related activities.

Estimates of the total surface area of the site, and all other sites, if project is a phased development that is expected to undergo clearing, excavation, and/or grading.

A site map indicating, as a minimum, all areas of soil disturbance, areas of cut and fill, drainage patterns and approximate slopes anticipated after major grading activities, areas used for the storage of soils or wastes, the location of impervious structures (including buildings, roads, parking lots, etc.), and the location of all erosion control facilities and structures.

The nature of fill material to be used, the existing soils located at the site, and the characteristics of such soils. The location (s) to which the storm sewer system discharges shall be identified.

Temporary control structures shall not be removed until after permanent vegetation and site stabilization has taken place. Graveled access entrance and exit drives and parking areas to reduce the tracking of sediment onto public roadways shall be required.

Visible or measurable erosion which leaves the construction site is prohibited, and is defined as:

Deposits of mud, dirt, sediment or similar material exceeding ½ cubic foot in volume in any area of 100 square feet or less; or

Evidence of concentrated flows of water over bare soils; turbid or sediment laden flows;

NOTE: Under no condition shall sediment be discharged to surface waters or natural wetlands. Under no condition shall the sediment be washed into the storm sewers or drainage-ways.

Contractors shall also address controls for the following pollutants: oils, grease, paints, fuel (gasoline and diesel), concrete truck wash down areas, raw materials for manufacturing concrete (sand, aggregate, and cement), solvents, litter, debris and sanitary waste management.

Please Note: An erosion and sedimentation control plan shall not be required for the following projects:

The construction of single-family residences when they are constructed by or under contract with the owner for his own occupancy;

Activities such as home gardening, individual home landscaping, repairs, and maintenance work;

3. Clearing and Grading Standards Notes:

All Clearing & grading construction shall be completed in accordance with the standards stated herein, the Uniform Building Code, permit conditions, and all other applicable codes, ordinances, and standards.

A copy of the approved plans shall be on-site at all times during construction. The applicant is responsible for obtaining any other required or related permits prior to the beginning of any construction related activities.

All location of existing utilities shall be established by field survey or obtained from available records and shall, therefore, be considered only approximate and not necessarily complete. It is the sole responsibility of the contractor to independently verify the accuracy of all utility locations and to discover and avoid any other utilities not shown which may be affected by the implementation of these plans and specifications.

The area to be cleared and graded shall be staked/flagged by the contractor and inspected and approved by the City of Belgrade prior to beginning any construction related activities at the site.

A reinforced silt fence shall be installed and located as shown on the approved plans or per the City of Belgrade's requirements, along all slope contours and down slope from the building site.

A hard-surface construction access pad shall be required at the sole discretion of the City of Belgrade. The construction access pad shall remain in place until all paving is installed and complete.

Clearing shall be limited to the areas within the approved disturbance limits. Exposed soils shall be covered at the end of each working day when working from October 1<sup>st</sup> through April 30<sup>th</sup>. From May 1<sup>st</sup> through September 30<sup>th</sup>, exposed soils shall be covered at the end of the construction week and also at the threat of rain.

Locations for the mobilization area and stockpiled material area shall be approved in writing by the City of Belgrade at least 1 week in advance of any mobilization or stockpiling.

Final site grading must direct drainage away from all building structures at a minimum 2% slope, as per the latest edition of the *Uniform Building Code*.

The contractor must maintain a sweeper on site during earthwork and immediately remove soil that has been tracked onto paved areas as result of construction.

A public information sign listing the 24-hour emergency phone numbers for the City and the contractor shall be provided by the Contractor/Owner. The applicant shall post the sign at the project site in full view of the public, and it shall remain posted until final sign-off by the City of Belgrade.

Any project that is subject to Rainy Season Restrictions will not be allowed to perform land disturbing activities without prior written approval from the City of Belgrade. The rainy season extends from November 1<sup>st</sup> through April 30<sup>th</sup>.

4. References:

The following references can be used in association with these design standards:

HEC-22 FHWA Urban Drainage Design Manual

Montana Public Works Standards Specifications

Montana Department of Transportation Model Drainage Manual

NOAA Atlas 2, Montana Precipitation Isopluvials

SEC # \_\_\_\_\_

Date Received: \_\_\_\_\_

# SEDIMENT & EROSION CONTROL PLAN

PLEASE PRINT OR TYPE

**PROJECT DESCRIPTION:**

Contact:	Owner Name:
Location:	Address:
Legal Description:	
Purpose and Types of Soil Disturbing Activities (be specific):	
Approximate Number of Acres to be disturbed:	
Sequence of Major Activities:	
1.	6.
2.	7.
3.	8.
4.	9.
5.	10.
Name of Receiving Waters: (lakes, creeks, rivers, or wetlands the site will drain into)	

Attach soils information which provides existing soils types, textures, and erodibility:

**EROSION AND SEDIMENT CONTROLS:**

**Provide detailed explanation of any temporary and/or permanent stabilization measures planned such as seeding, mulching, paving:**

**Provide detailed explanation of any structural practices planned such as dikes, sediment basins, and silt fences:**

**Provide detailed explanation of the storm-water management measures planned for the un-developed areas as well as any areas to be developed:**

**Duration of Activity**

\_\_\_\_\_  
**Applicant Signature:**

\_\_\_\_\_  
**Date:**

#### IV. FLOODPLAIN REGULATIONS

##### A. GENERAL

Floodplain regulations are detailed in the Belgrade City Subdivision Regulations. These regulations are intended to protect the public health, welfare and safety in order that citizens and property owners can remain under the national flood insurance program. All proposed developments shall conform to the requirements of the Belgrade City Subdivision Regulations.

#### V. ROADWAY DESIGN AND TECHNICAL CRITERIA

##### A. GENERAL

This section sets forth the minimum design and technical criteria and specifications to be used in the preparation of all roadway plans. All roadway plans shall be designed in conformance with MPWSS; City of Belgrade Modifications to MPWSS; Americans with Disabilities Act; and City of Belgrade Sidewalk Policy.

**Please Note:** the City of Belgrade does not allow any public utility construction (i.e.; water main or sewer main extensions, street sub-base preparation and paving, etc.) **from November 1<sup>st</sup> through April 1<sup>st</sup>**, without the prior written permission of the City of Belgrade.

##### B. FUNCTIONAL CLASSIFICATION – URBAN ROADS:

###### 1. General:

The purpose of a functional classification system for city streets and 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. 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 arterials, collectors, and local roads are as shown in the Belgrade Area Transportation Plan, Updated June 2001.

Urban roads are classified as outlined below:

Principal Arterial – The basic element of the City's road system. All other functional classifications supplement the principal Arterial road network. Access to a Principal Arterial is generally limited to intersections with other principal arterials or to the interstate system. Direct access is minimal and controlled. The purpose of a principal arterial is to serve the major centers of activity, the highest traffic volume corridors, and the longest trip distances in an urbanized area. This classification of

roads carries a high proportion of the total traffic within an urban area. The major purpose is to provide for the expedient movement of traffic. Posted speed limits on principal arterials typically range from 25 mph to 70 mph and typically carry greater than 10,000 vehicles per day.

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 for 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 multifamily development but, generally, not for single-family residential properties. The purpose of this classification of road is to increase traffic mobility by connecting to both the Principal Arterial system and also providing access to adjacent land uses. Posted speed limits on minor arterials typically range from 25 mph to 55 mph and typically carry 5,000 to 10,000 vehicles per day.

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 carry between 500 and 5,000 vehicles per day.

Local – Comprises all facilities not included in the higher systems. Its primary purpose is to permit direct access to abutting lands and connections to higher systems. Usually through-traffic movements are intentionally discouraged. Posted speed limits on local roads typically range from 25 mph to 35 mph and designed for less than 500 vehicles per day.

### C. SIDEWALKS, CURBS AND GUTTERS AND DRIVEWAYS

1. Roadway typical sections shall be as specified by the Belgrade City Subdivision Regulations (BCSR), and are detailed in Appendix C of this Policy. Roadway typical sections shall conform to conditions of approval for the project. Deviations from these typical sections shall be made on a case-by-case basis and only after a thorough review by the City Engineer.
2. Concrete sidewalks shall be constructed on both sides of all roadways unless otherwise approved by action of City Commission. Sidewalks shall be 6-inches thick across driveways and 4-inches thick elsewhere. Sidewalk design and construction shall be in accordance with the "City of Belgrade Sidewalk Policy".
3. All sidewalks shall have a minimum width of five (5) feet, except the minimum width shall be ten (10) feet in the central business district.

4. Pedestrian ramps shall be installed at all intersections and at certain mid-block locations for all new construction or reconstruction of curb and sidewalk. Pedestrian ramps shall be constructed in accordance with City of Belgrade Standard Drawings and Americans with Disabilities Act (ADA) requirements. Pedestrian ramps shall be shown at all curb returns or called out by a general note on the development plans.
5. Guardrails may be required in certain situations. Guardrails shall be designed and constructed in accordance with AASHTO Standards or as directed by the City Engineer.
6. Drop-curbs for driveways may only be installed with the initial curb construction when the final building locations have been determined. Driveway locations shall conform to the Belgrade City Subdivision Regulations.
7. Integral curb and gutter shall be used on all roadways unless specifically approved in writing by the Belgrade City Council. Refer to Appendix C for typical street and curb sections.

#### D. ROADWAY DRAINAGE:

Drainage systems shall be designed in accordance with these Design Standards and Specifications, Section II, Drainage Policy. Development plans, including roadway drainage report, for the drainage system is required for concurrent review with, and shall be considered part of roadway design.

##### 1. Crosspans:

Crosspans (valley gutters) shall be constructed in accordance with City of Belgrade Standard Drawings. Crosspans are not allowed across collector or arterial roadways, nor are they allowed on roadways with storm sewer systems.

Crosspans may be used parallel with collector or arterial roadways to convey storm runoff across residential roadways. The use of crosspans elsewhere will not be allowed without the written approval of the Belgrade City Council.

##### 2. Inlets:

- a. Inlets shall be located to intercept the major edge-of-roadway flow at the point flow capacity is exceeded by the storm runoff. Inlets should be aligned with lot lines wherever possible.
- b. Inlets shall also be installed to intercept cross-pavement flows at points of transition in super elevation. 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 returns.

- c. All inlets within the public right-of-way, or to be maintained by the City of Belgrade, shall be constructed in accordance with City of Belgrade Standard Drawings.

### 3. Cross Slope:

Except at intersections, or where super-elevation is required, roadways shall have a two (2) percent crown as measured from centerline to the edge of the pavement. Parabolic or curve crowns are not allowed.

Maximum pavement cross slope allowed is five (5) percent 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-feet horizontally for local streets, 100-feet horizontally for collector streets, and 150-feet horizontally for arterial streets.

### 4. 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 of Belgrade.

### 5. Sidewalk Chases:

- a. Storm waters 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.
- b. Chase sections shall not be located within a curb cut or driveway. Chase sections shall be identified by station and elevation.
- c. Sidewalk chase sections are to be constructed in accordance with the City of Belgrade Standard Drawings.

E. HORIZONTAL ALIGNMENT:

1. Turning Radius:

All roadways shall intersect at right angles as nearly as possible. In no case shall the angle of intersection be less than seventy-five degrees (75°).

2. Pavement Edge Return:

Minimum pavement edge returns shall be as shown in Table 5 of these specifications. A larger radius may be used with the approval of the City of Belgrade.

3. Design Speed:

Design speed shall be as shown in Table 6 of these specifications.

4. Horizontal Curves:

The minimum centerline radius for horizontal curves shall be as shown in Table 6 of these specifications. Variances from the requirements of Table 6 may be considered on a case by case basis for local streets only.

5. Intersecting Streets:

Two streets meeting a third street from opposite sides shall meet at the same point, or their centerlines shall be off-set by a minimum of 125 feet.

6. Super-elevation:

Super-elevation may be required for arterial roadways and selected collector roadways. Horizontal curve radius and super-elevation shall be in accordance with the recommendations of AASHTO. Super-elevation shall not be used on local roadways.

7. Spiral Curves:

Spiral curves shall not be used on roadways within the COB (State highways excluded) except by written approval of the City of Belgrade.

8. Railroad Crossing:

All railroad crossings on streets shall be steel reinforced rubber for the full width of the roadway.

9. Barricades:

Whenever roadways terminate due to project phasing, subdivision boundaries, etc., barricades shall be required in accordance with the Manual of Uniform Traffic Control Devices (MUTCD) and City standards.

**Table 5 – Pavement Edge Return Radius at Intersections \***

	<b>Local (ft)</b>	<b>Collector (ft)</b>	<b>Minor Arterial (ft)</b>	<b>Principal Arterial (ft)</b>
<b>Local</b>	15	15	15	15
<b>Collector</b>	15	25	25	25
<b>Minor Arterial</b>	15	25	**	**
<b>Principal Arterial</b>	15	25	**	**

\* Measured from top back of curb

\*\* Shall be per AASHTO standards

STREET TYPE	MAJOR ARTERIAL	MINOR ARTERIAL	COLLECTOR	LOCAL	RURAL
Right-of-way width	110' - 120' <sup>3</sup>	100'	90'	60'	90' - 110' <sup>3</sup>
Centerline radius on curves	1	1	300'	150'	
Tangent length between reverse curves	1	1	100'	50'	
Stopping sight distance	1	1	300'	200'	
Angle at intersection centerline	1	1	>75°	>75°	
Curb radius at intersections	2	2	2	2	
Length of tangent at intersection	1	1	150'	100'	
Back of curb to back of curb	82'	50', 63', 71' <sup>3</sup>	40'	38'-40'	
Length of cul-de-sac <sup>5</sup>	N/A	N/A	N/A	500'	
Outside radius on cul-de-sac right-of-way <sup>5</sup>	5	5	N/A	50'	
Grade – maximum	1	1	7%	10%	
Grade – minimum	1	1	0.5%	0.5%	
Grade within 150 feet of intersecting centerlines	1	1	3%	3%	

<sup>1</sup>All design criteria shall meet AASHTO standards.

<sup>2</sup>See Table IV-1

<sup>3</sup>The specific right-of-way and back of curb to back of curb street width will be determined on a case by case basis through the subdivision review process, and will be based on the specific needs, impacts and context of the development proposal.

<sup>4</sup>The rural street standard does not include curb and gutter. The street width is measured from the edge of pavement to the edge of pavement.

<sup>5</sup>Cul-de-sacs are generally not allowed. The City Engineer may consider and approve the installation of a cul-de-sac only when necessary due to topography, the presence of critical lands, a ccess control, a djacency to parks or open space, or similar site constraints.

**TABLE 5 – Minimum Design Standards for City Streets**

## F. VERTICAL ALIGNMENT:

Design controls for vertical alignment are shown in Table 6.

### 1. Permissible Roadway Grades:

The minimum allowable grade for any roadway or alley is one-quarter (0.25) percent. The maximum allowable grade for any roadway is shown in Table 5 of this Policy. The maximum grade for an alley is subject to the approval of the City of Belgrade.

### 2. Changing Grades:

Continuous grade changes or "roller-coastering" shall not be permitted. The use of grade breaks, in lieu of vertical curves, is not encouraged. Where the algebraic difference in grade (A) exceeds one percent (1.0%), a vertical curve is to be used.

### 3. Vertical Curves:

All vertical curves shall be symmetrical. Design criteria for vertical curves are found in Table 5. The minimum grade within a sag (sump) vertical curve is one-half (0.50) percent. Minimum length of a vertical curve is shown in Table 5. All vertical curves shall be labeled, in the profile, with length of curve (L) and  $K (=L/A)$ .

### 4. Intersections: The following additional criteria shall apply at intersections:

- a. The grade of the "through" street shall take precedence at intersections. At intersections of roadways with the same classification, the more important roadway, as determined by the City of Belgrade, shall have this precedence. Warp side streets to match through streets. The length of transition from normal crown to edge of pavement shall be at least 50 feet.
- b. 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.
- c. Carrying the crown of the side street into the intersecting through street is not permitted.
- d. At an arterial-arterial intersection, a more detailed review of the entire intersection's drive-ability shall be required.

5. Curb returns:

Minimum fall around curb returns, when turning water, shall be three-tenths (0.3) of a foot for a fifteen (15) foot radius; four-tenths (0.4) of a foot for a twenty (20) foot radius; one-half (0.5) of a foot for a twenty-five (25) foot radius.

For all other curb return radii use a grade of 1.25-percent within the return to establish minimum fall when turning water. The maximum fall around a curb return is three (3.0) percent. Show and label high point location, elevation and intersection of flow line in plan view if applicable.

6. 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 one percent (1.0%). 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.

7. 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 three hundred (300) feet or to its intersection with an arterial roadway. This limit shall be extended to six hundred (600) feet when arterial roadways are being designed. 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-foot road base shoulder for the safe conveyance of traffic from his improved section to the existing roadway. The following formula shall be applied to the taper or land 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 85th percentile speed (whichever is greater)

The City of Belgrade should be consulted for any unusual transition conditions. Grade breaks greater than 1-percent are not allowed when matching existing dirt or gravel streets. The cost of offsite pavement transitions shall be borne by the developer.

## G. MEDIAN TREATMENT

Median curbs should be integral curb and gutter (with spill curb) unless otherwise approved. Medians less than eight (8) feet wide should be capped with M-4000 concrete a minimum of three (3) inches thick. Wider medians should be top soiled and seeded with an approved seed mix. The minimum median width is 4 feet. All medians or raised islands should be made clearly visible at night through the use of adequate reflectorization and/or illumination. Flexible delineators shall be placed at the beginning and end of all medians, and at the point of any horizontal alignment change. All median curbs shall be painted yellow.

## H. ROADWAY SPECIFICATIONS:

Following are the requirements of the minimum roadway surfacing standards:

### 1. Surfacing:

The pavement thickness design will 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.

A Pavement Design Report, based upon specific site soil data and design-year traffic loading conditions, prepared by a Professional Engineer, or other qualified professional approved by the City, shall be submitted to the City Engineer for approval prior to plan and specification submittal. The design shall be based on at least a 20-year performance period traffic volume; however, the minimum design lane Equivalent 18,000-lb Single Axle Load (ESAL) used in the pavement design shall not be less than 50,000-ESAL.

The minimum asphalt pavement thickness for any new roadway shall be three (3) inches. A minimum of nine (9) inches 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.

**Please Note: All fine grained material including; sand, silt, clay, or mixtures of these materials, shall be removed from the sub-grade (for the entire right-of-way width), to the depth that pit-run gravel is encountered.**

### 2. Flow-able Fill:

Flow-able fill material shall be used under all street areas when utility trenches are cut through new or existing asphalt. The intent is to protect the integrity of the roadway

riding surface and eliminate the potential for roadway failure due to failure of trench backfill material under a roadway. All roadway plans that have a crossing of a utility transverse to the centerline of the roadway shall have a trench detail placed in the plans calling out for placement of flow-able fill complying with the requirements of Section 02225 – Flow-able Fill, contained in the Montana Public Works Standards Specification (Fifth Edition – March, 2003).

3. Right-of-Way Standards:

Typical road-way sections are shown in Appendix C. Right-of-way width that is required to accommodate full build-out of each type of facility are as follows: a) Principal Arterials = 120 feet, b) Minor Arterials = 110 feet, c) Collectors = 80 feet, and d) 60 feet for Local Roads. Although existing roads within the City of Belgrade may not have the necessary right-of-way width based on these standards, it shall be the policy of the City of Belgrade to attain these desired right-of-way widths on all new roadway and development projects. Right-of-way widths less than those listed above will require Belgrade City Council Approval.

I. BRIDGES:

1. General:

The City of Belgrade requires bridges to be designed in accordance with current Montana Department of Transportation (MDT) standards for “on-system” bridges and the Standard Specifications for Highway Bridges as produced by the American Association of State Highway and Transportation Officials (AASHTO) for “off-system” bridges.

J. UTILITY CORRIDORS:

1. GENERAL:

All new utilities shall be placed underground. Except for sewer and water, underground utilities, if placed within the public street right-of-way, shall be located between the top back of curbs and the sidewalk. Such underground facilities shall be installed after the street has been brought to grade and before it is surfaced, to eliminate the necessity for disturbing such surfacing for the connection of individual services.

Utility lines shall be designed by a licensed professional engineer or by the utility firms in coordination with the Engineer/Owner. All applicable laws, rules and regulations of appropriate regulatory authority having jurisdiction over such facilities shall be observed.

If television, telephone or natural gas is not installed at the time of a development, provisions shall be made for installation of said utilities at a later date, without requiring the cutting of paved roadways.

K. LANDSCAPING REQUIREMENTS:

1. GENERAL:

Landscaping requirements shall comply with the requirements as set forth under the City of Belgrade Landscaping Ordinance (See Ordinance 2004-7). The intent of this ordinance 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. A full copy of City of Belgrade Landscaping Ordinance can be obtained from the City Clerk at Belgrade City Hall, 91 East Central Street, Belgrade, Montana, 59714.

L. TRANSPORTATION IMPACT STUDIES:

1. GENERAL:

Private or public developments which can contribute one hundred (100) or more vehicle trips per days to the City Street System shall have a Traffic Impact Study completed by a professional engineer licensed in the State of Montana. Such study shall indicate the expected increase in traffic movements on the existing roadways serving the development and shall determine the existing conditions on roadways to be impacted by the development.

The Traffic Impact Study should present an objective technical analysis in a straightforward and logical manner that leads the reader through the analytical process to the resulting conclusions and recommendations.

At a minimum, the Report should include the following information:

The study's purpose and objectives.

A description of the site and the study area.

A description of the existing conditions in the area of the site (existing roadway geometries, traffic counts, crash analysis, existing intersection level of Service (LOS), existing roadway capacity analysis).

The anticipated nearby land developments and transportation improvements.

Analysis and discussion of trip generation, distribution and modal splits.

The traffic assignment resulting from the proposed development.

The projection and assignment of future traffic volumes.

An assessment of the traffic impacts attributable to the development, and

Recommendations for site access and transportation improvements.

Sufficient detail should be provided so that the reviewer is able to follow the path and methodology of the study. All assumptions should be documented and all published reference sources identified.

M. TRAFFIC SIGNAL REQUIREMENTS:

1. GENERAL:

The City of Belgrade requires that all traffic signal design and plans to be completed in accordance with current Montana Department of Transportation (MDT) standards as contained in Part II (Electrical) of the MDT Traffic Engineering Manual. The MDT Traffic Engineering Manual identifies the requirements for determining whether a traffic signal shall be required (See Chapter 12), and goes further to identify specific items which must be contained on any traffic signal design plans.

N. SIGNING and PAVEMENT MARKING REQUIREMENTS:

1. Street identification signs shall be installed at all new intersections in accordance with City of Belgrade Modifications to MPWSS. The design Engineer should consider, and the City may require, regulatory traffic control signs and pavement markings in accordance with the MUTCD. Stop signs shall be installed on local streets when they intersect with any collector or arterial streets.
2. All pavement markings shall be either: 1) inlaid thermoplastic, 2) pre-formed plastic tape, or 3) paint with glass beads, for all crosswalks, stop bars, words & symbols, and at all intersections, as approved by the City of Belgrade. All roadway centerlines and outside lane lines which are away from major intersections shall be painted (refer to Section 02581 of the MPWSS).
3. Crosswalk markings should not be used indiscriminately. An engineering study should be performed before they are installed at locations away from traffic signals or stop signs. Mid-block crosswalks are discouraged.
  - a. All marked crosswalks for designated school crossings shall be longitudinal white bars ("City of Belgrade Type B" style). "School Crossing" signs and "School Advance Warning" signs shall be installed at all designated school crossings.
  - b. At signal controlled intersections, marked crosswalks shall be two 8" white lines, 8' apart typically, installed transverse to traffic and in-line with sidewalks, if any ("City of Belgrade Type A" style).

- c. Marked crosswalks at uncontrolled intersections and all mid-block crosswalks shall be "Type B", with "Pedestrian Crossing" signs. "Pedestrian Crossing Advance Warning" signs should be installed.
- d. Parking shall be restricted by the use of signs and curb markings within 50 feet upstream and within 20 feet downstream of all crosswalks.

O. MONUMENTATION:

1. GENERAL:

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

P. STREET LIGHTING REQUIREMENTS:

1. GENERAL:

The design Engineer shall consider the need for roadway lighting in the development of plans for any new or reconstructed roadways. Illumination shall be provided at all street intersections on collector and arterial streets, and for any roadway with a raised median.

All roadway lighting shall be designed in accordance with the "American National Standard Practice for Roadway Lighting" (ANSI/IESNA RP-8-00).

Q. BIKE LANES/PATHS:

1. GENERAL:

All bike lanes/paths shall be designed in accordance with the "Guide for the Development of Bicycle Facilities" (AASHTO, latest edition). Bike lanes shall be marked and signed in accordance with the MUTCD.

R. WORK ZONE TRAFFIC CONTROL:

1. GENERAL:

A Traffic Control Plan must be submitted to the City of Belgrade at least seven (7) business days before construction begins for all work within the public right-of-way. The location and description of all traffic control devices must be shown on the Traffic Control Plan. The plan must be approved by the Police Department, Fire Department and Public Works Department prior to beginning construction. If the required traffic control devices are not in place, the Contractor will not be allowed to begin work on the project. All traffic control devices shall be kept in place and maintained in good visible condition throughout the project. The City of Belgrade reserves the right to reject any traffic control device observed to be in inferior condition. Emergency access to the work area shall be maintained at all times. The Manual on Uniform Traffic Control Devices (Millennium Edition) and the Montana Department of Transportation (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 signal lights which shall be kept illuminated 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.

S. ACCESS MANAGEMENT AND CONTROL:

1. GENERAL:

It shall be the policy of the City of Belgrade to review all projects for access management and control measures during the review phase of a project. The City reserves the right to mandate certain access control features.

T. TRANSPORTATION DESIGN SPECIFICATIONS:

1. GENERAL:

The standards for the design of City of Belgrade roads and bridges shall consist of the following references, in addition to items discussed herein:

Belgrade City Subdivision Regulations;

City of Belgrade Zoning Ordinance;

MDT Structures Manual (Volume I);

Montana Public Works Standard Specifications (Fifth Edition – March, 2003);

Manual on Uniform Traffic Control Devices (Millennium Edition);

Montana Department of Transportation (MDT) Guidelines for Work Zone Safety;

The Americans with Disabilities Act (ADA);

AASHTO Guide for Design of Pavement Structures;

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

Roadside Design Guide (January 1996) published by the American Association of State Highway and Transportation Officials (AASHTO);

MDT Traffic Engineering Manual;

Standard Specifications for Highway Bridges as produced by the American Association of State Highway and Transportation Officials (AASHTO);

Belgrade Area Transportation Plan, June 2001 Update;

2. Construction Plan Requirements for Transportation and Utility Improvements:

The applicant shall submit to the City of Belgrade plans and specifications for street and utility construction. At a minimum, the plans and specifications shall include a vicinity map, a plan and profile, typical sections, roadway cross sections, necessary details for construction, special provisions, reference to applicable Montana Public Works Standard Specifications (MPWSS), and any project specific specifications. The submitted plans shall be stamped and signed by a licensed professional engineer in the State of Montana.

At a minimum the plan view shall include the road alignment at a scale of not less than one (1) inch to fifty (50) feet showing the following information:

Centerline stationing on all intersecting streets, with bearings on centerlines.

Curve data on all horizontal curves.

Right-of-way.

Relevant topography.

Existing and proposed utility locations.

Street names in the new development (if applicable).

Typical roadway section showing placement of utilities.

Existing and proposed drainage and water quality appurtenances.

Sidewalk locations.

Floodplain and wetland boundaries (if applicable).

Signalization and striping/signing.

Sufficient topographic data on and adjacent to the site, and

Any further information as shall be required by the City Engineer.

At a minimum the profile view shall show the relevant original ground lines using the same stationing as in the plan, control elevations, grade line showing the proposed grades, vertical curves, all bench marks, the vertical datum, and such further information as may be reasonably required by the City of Belgrade. For new streets, the relevant original ground lines will show the ground line at centerline at a minimum and also at the edges of the right-of-way if grade differences are significant (or alternatively, surveyed contour lines on the plan view will be acceptable). In addition, top back of curb grades shall be superimposed in the profile view and labeled with the corresponding slope to ensure minimums are either met or exceeded. The profile lines for roads extending to the perimeter of any development shall be extended a minimum three hundred (300) feet beyond the perimeter to include any change in contours that would affect the profile of the extension of the proposed road.

Any required construction notes shall be shown or referenced on the plans.

The cover sheet of all plans shall include a statement identifying that the Montana Public Works Standard Specifications (Fifth Edition, March 2003) will apply to the project. Plan and profile must be shown on the same sheet, with profiles on the bottom half of the sheet. Acceptable sheet size shall be 24 inches by 36 inches. A north arrow shall be shown on each plan view sheet of the plans and adjacent to any other drawing that is not oriented the same as other drawings on the sheet. All detail drawings shall be included in the drawing set. A title block shall appear on each sheet of the plan set and shall be placed in the lower right-hand corner of the sheet, across the bottom edge of the sheet or across the right-hand edge of the sheet. The title block shall include the name of the project, the engineering firm, the sheet title and the owner.

### 3. Transportation Design Specifications:

The typical roadway section shall be as shown 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 Belgrade City Council.

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

Alternate surface treatments may only be used upon approval of the Belgrade City Council. The applicant shall supply the City of Belgrade with specifications for materials and application rates as part of the approval process.

4. Transportation Construction Specifications:

No construction shall begin until plans have been approved by the City of Belgrade.

Temporary and permanent barricades shall conform to the standards described in Section 6F of the Manual on Uniform Traffic Control Devices (MUTCD) Millennium Edition.

Type I or Type II barricades shall be used when traffic flow is maintained through the area being constructed/reconstructed. Type III barricades shall be used when roadways and/or proposed future roadways are closed to traffic. Type III barricades shall extend completely across the roadway 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 Contractor/Owner 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 at the end of a local street that ends abruptly without cul-de-sac bulb or on temporarily stubbed off streets. Each barricade shall be used together with an end-of-road marker and shall be illuminated from dusk till dawn. Barricades on dead-end streets that may be extended in the future will have a sign placed upon them, as approved by the City of Belgrade.

**VI. UTILITY DESIGN CRITERIA**

**A. WATER DISTRIBUTION LINES DESIGN CRITERIA**

1. Design Criteria:

All additions or modifications to the City of Belgrade water system will be designed in accordance with the criteria set forth in this and other sections of this Policy as approved by the City of Belgrade. All additions to the water system will be designed and installed in accordance with the Water Quality Bureau (WQB) Circular No. 1; MPWSS; COB Modifications to MPWSS; COB Water Facility Plan; and COB Fire Service Line Standard.

2. Master Water Plan:

A master water plan shall be submitted for each subdivision or other major development prior to approval of any portion of the water system. An overall plan of the development, including all areas outside of the study area, which would naturally be served through the study area, shall be submitted.

3. Design Report:

A design report prepared by a professional engineer licensed in the State of Montana demonstrating compliance with these requirements shall be submitted to and approved by the City of Belgrade prior to plan and specification submittal for any new development. Design parameters and the critical conditions shall be shown on an overall plan of the study area. An overall plan of the development, including all areas outside of the study area which would naturally be served through the study area shall be included.

4. 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 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 of Belgrade.

5. Conditions for Service Area Expansion:

The following conditions shall be met prior to making application for enlargement of the service area. The property at the time the application is filed shall be:

- 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.

6. Annexation Requirements:

All properties to be included within the service area shall be annexed or an attempt to annexation shall be made first and before any service area enlargement applications may be considered. Further, that whenever possible the property being considered for inclusion in the service areas shall be annexed to the city rather than accepting waivers of the property owner's right to protest annexation of said property to the city. Waivers may be accepted by the city in its sole discretion only in those particular cases where good and sufficient cause is shown and a hardship would result if waivers were not accepted.

A prospective applicant shall first petition the city to annex the property involved prior to submission of a service area enlargement application. The city commission shall then consider such petition. Any waivers must be in legal form as approved by the city attorney; be recorded with the county clerk and recorder of Gallatin County, Montana; run with the land, and shall be signed by owners of the majority of the land area and by a majority of the landowners of the area to be considered by inclusion in the water or wastewater service area. The city manager shall notify in writing the

prospective applicant of the approval or denial of annexation or of the right to file waivers or both.

The city manager shall notify in writing the prospective applicant of the approval or denial of annexation or of the right to file waivers or both. The city manager shall also notify the prospective applicant of the approval or denial of enlargement of the service area. If approved the applicant shall be notified as to when the requirements set forth in this section have been satisfactorily completed and authorize said applicant to proceed with the service area enlargement application.

7. Main Size:

The water distribution system shall be designed to meet the maximum demand plus fire flow and the peak hour demand. The design shall be based on a maximum hour to average day ratio of 3:1 (maximum day to average day ratio of 2.5:1, for an average daily usage of 200-gallons per day per person), plus fire flow demand as determined by ISO (Insurance Services Office) criteria. A "C" Factor of 130 shall be used in modeling system designs. The working residual water pressure shall not be less than 20-psi at any point in the water distribution system under maximum day plus fire flow. The velocity of the water in the system shall not exceed 10-feet per second through a public main line. The minimum diameter for any new main is 8-inch, unless specific approval in writing is obtained from the City of Belgrade for smaller diameters. Larger diameters shall be required in order to maintain the minimum pressure requirements of Montana Circular DEQ-1 "Standards for Water Works"

8. 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 shall not exceed 60 psi.

Fireflows - All mains shall be designed to provide adequate fire flows unless specifically waived by the City of Belgrade Public Works Department. The amount of fire flow required for structures shall be based on the Uniform Fire Code Appendix II-A. Non-structural utilization of an area shall have the fire flow requirements as determined by the City of Belgrade Fire Chief. The minimum fire flow for any structure shall be 1000 gallons per minute, with a minimum of twenty pounds per square inch residual pressure at the hydrant during flow.

9. Water Main Material:

All water main pipe shall be DR 14 Class 200 PVC pressure pipe meeting AWWA C900. All fittings used shall be made of ductile iron. Acrylonitrile butadiene (NBR) gaskets are required for water main installations in areas of hydrocarbon contamination.

Fittings – All water main fittings, including tees, crosses, caps, plugs, reducers and elbows equal to or greater than 22½° shall be restrained using standard mechanical joints with concrete thrust blocks. All mechanical joint restraints shall be “Megalug”, Uniflange or equal. All mechanical joint restraint shall be provided in addition to meeting thrust block requirements in accordance with MPW.

10. Installation:

**Please Note:** In order to isolate sections of the existing water system to allow for new construction, it may be necessary to operate existing system valves. The City Water Department shall be notified when existing valves must be operated and shall undertake those operations.

The minimum cover for all water mains from top of pipe to final finished grade shall be six and one-half (6½) feet unless otherwise approved by the Public Works Director/City Engineer.

All water main piping, fittings, valves, etc. shall be encased in polyethylene wrap with a minimum thickness of 8 mils. All encasement shall be in accordance with AWWA C-105 Standards.

11. Main Extensions:

All main extensions shall be looped, where possible. All dead end mains shall end with a fire hydrant or a 2" blow-off. Larger diameter mains shall end with a fire hydrant. Permanent dead-end mains shall not exceed 500-feet long. Temporary dead-end mains scheduled for future extension may end with a temporary blow-off in lieu of a fire hydrant.

Any extension of an existing City water main must be extended through the entire frontage length of the property to be served. Main extensions shall include all valves, hydrants and appurtenances deemed necessary by the City. The Director of Public Works may require that public mains be connected, extended or looped in addition to the proposed extension to provide an adequate and functional water supply.

12. Sewer Line Crossings:

A minimum of 18-inches vertical separation is required when a water main crosses above or below a sanitary sewer, measured outside to outside of pipe. Please refer to MPWSS Drawing 02713-2 for further information on sewer line crossings.

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

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

Unless specifically authorized by the Montana Department of Environmental Quality and the City of Belgrade Public Works Department, a minimum of 11-feet horizontal separation is required when a water main and sanitary sewer are installed in parallel.

13. Tapping City Water:

The City of Belgrade Water Department shall witness all water main taps. Preparations for exposing the water main and preparing the water main for tapping, as well as scheduling for the City to witness the tap are all responsibilities of the contractor. Water main taps shall only be made by a plumber licensed in the State of Montana. The City of Belgrade Water Department can be contacted at (406) 388-3760. 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. For AWWA C900, DR 14 Class 200 PVC pipe, all taps shall be made using a Ford style FS303 or Mueller style 540 series stainless steel saddles.

14. Water Service Lines:

a. Materials: A water line is designated as either a service line or water main based on its use, not its size. Generally, a line serving a single building or facility is considered a service line; a line serving more than one building, or intended to serve more than one building or facility is generally designated a water main. The standard sizes of service lines are 3/4-, 1-, 1½-, 2-, 4-, 6-, or 8-inch. The minimum size of a fire service line is 1-inch. Plans and specifications prepared by a Professional Engineer licensed in the State of Montana shall be submitted for 4-inch and larger service lines.

Service pipe shall be type "K" copper meeting ASTM B88-62 for sizes less than 4-inch. Stainless steel inserts are required for all compression-type fittings. 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 two-tenths percent (0.2%) lead and pipes and fittings containing more than eight percent (8%) lead is prohibited in the installation and repair of residential or nonresidential plumbing connected to a public water supply system.

All service line stubs shall be sized to adequately serve the maximum anticipated demand for the property being served. All service connections shall be uniform size from the service line tap to the building structure or structures unless otherwise approved or required by the City of Belgrade. The City of Belgrade shall reserve the right to require a larger service connection to any building, structure or development if the water requirements when calculated by the fixture unit method, as specified in the Uniform Plumbing Code, cause the service line velocity to exceed ten (10) feet per second. Each service line and meter shall supply a specific building.

b. Installation: The service line stubs shall be installed in accordance with the COB Standard Drawings for service lines with a minimum of six and one-half (6½') feet of cover from the top of service pipe to final finished grade. All water service lines shall be encased in 8 mil polyethylene a minimum distance of 3-feet from the

main.

The service line stubs shall be installed at the center of each lot unless otherwise approved by the City of Belgrade. All water service lines must be so arranged that the supply to each separate house or premises may be controlled by a separate shutoff valve and valve box placed (6 inches outside the property line) within the right of way near the property to be served. One singular, identifiable entity will be responsible for all the water used through each service.

All water service line connections to the water main must be made by a licensed plumber.

No service line shall be extended into a building until an "Application for Service" has been completed and a Plumbing Permit has been obtained from the City of Belgrade.

15. Curb Stops and Boxes:

All curb stops shall be installed in accordance with MPWSS Drawing 02719-1. All curb stops shall have a bronze plug, tee head key with a Minneapolis top thread, 90 degrees open to close operation, and a copper compression nut on both connections.

All curb boxes shall be extension-type having a minimum box length, fully retracted, of 6-feet. All curb boxes shall consist of a Minneapolis pattern and shall be manufactured by either Mueller or Ford.

16. Meters:

All meters shall remain the property of the city and may be removed at the discretion of the City of Belgrade Public Works Director. Water meters shall be purchased from the City by the water user and shall be installed by the water user under the City's direction. The manner of installation of said meters shall be approved by the City of Belgrade prior to installation.

All water meter installations require installation of a SENSUS compatible "radio read" transmitter module, which will be paid for by the property Owner, and shall register water usage in thousands of gallons. Meters will be installed inside the building, by the building owner, on all service lines except for fire service lines. Meter pits may be required, on a case-by case basis, at property owner expense, at the sole discretion of the City of Belgrade.

17. Backflow Prevention Device:

Backflow prevention devices shall be installed on each fire and domestic service line, unless otherwise approved in writing by the City of Belgrade.

18. Valves:

All water valves installed in the City of Belgrade shall meet or exceed the

requirements of ANSI/AWWA C550 and shall be certified to ANSI/NSF 61. All interior and exterior valve surfaces shall be Fusion Epoxy Coated. The epoxy coating shall meet or exceed the requirements of ANSI/AWWA C550. All valves shall have a Non-Rising Stem (NRS) design, with a 2 inch square wrench nut, and shall open in the counter-clockwise direction.

Valves locations shall be determined and installed in accordance with the following, unless otherwise approved or required by the City of Belgrade:

- a. All connections to an existing water main will begin with a new valve.
- b. Valves shall be located at not more than 500-foot intervals in commercial districts and at not more than one block or 800-foot intervals in other districts.
- c. Every leg of a main intersection shall have a valve.
- d. Valves shall be placed so that main shut-downs can be accomplished with only one fire hydrant being out of service at a time.
- e. All Gate Valves shall conform to AWWA C-509 Standards and shall open COUNTER-CLOCKWISE.
- f. All Butterfly Valves shall conform to AWWA C-504 Standards and shall open COUNTER-CLOCKWISE.

19. Hydrants:

All hydrants installed in the City of Belgrade shall be Mueller Super Centurion 250, Model A-423, which meet the requirements of ANSI/AWWA C-502 Standards and physically consists of two hose nozzles, one pumper nozzle, and a 5 ¼ inch main valve opening.

Hydrants shall be located at each street intersection and at intermediate points so that hydrants are spaced no further apart than one standard City block, which is 400 feet. The Fire Chief reserves the right to require additional fire hydrants if the demand of the structure(s) requires more flow than the minimum spacing provides, depending on the area being served. Mid-block hydrants shall be installed in line with property lot lines.

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

All hydrants shall be designed for 7-foot bury depth. All hydrant safety flanges shall be set at 1.5 inches to 3 inches above the finished grade. The hydrant auxiliary valve shall be located in the street.

**Please Note: All proposed hydrant locations shall be reviewed and approved by the City of Belgrade Fire Department prior to installation.**

20. Water Vaults:

All underground vaults and manholes associated with the City's water system shall be constructed of pre-cast concrete sections meeting ASTM C-478 or ASTM C-858. All water vault manhole covers shall have the word "water" cast into the top surface.

21. Air Relief:

Air relief shall be provided at all high points in the line where air can accumulate by means of hydrants, services, or air relief valves.

22. Pressure Reducing Valves:

Pressure reducing valves shall be installed when the anticipated average-day line pressure exceeds 60 psi.

23. Thrust Restraint:

All thrust restraint shall be designed to withstand the test pressure or the working pressure plus surge allowance, whichever is larger. Adequate factors of safety shall be employed in the design.

**B. SANITARY SEWER SYSTEM DESIGN CRITERIA**

1. Design Criteria:

All additions or modifications to the COB sanitary sewer system will be designed in accordance with the criteria set forth in this and other sections of this Guide as approved by the City of Belgrade. All additions to the sewer system will be designed and installed in accordance with WQB Circular No. 2; MPWSS; COB Modifications to MPWSS; the Uniform Plumbing Code; and the COB Wastewater System Needs Analysis.

2. Design Report:

A design report prepared by a professional engineer licensed in the State of Montana demonstrating compliance with these requirements shall be submitted to and approved by the City of Belgrade prior to plan and specification submittal. Design parameters and the critical conditions shall be shown on an overall plan of the study area. An overall plan of the development, including all areas outside of the study area

which would naturally be served through the study area shall be included.

3. Wastewater 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. The following conditions shall be met prior to making application for enlargement of the service area:

The property at the time the application is filed shall: 1) be contiguous to the boundary of the existing service area; 2) be entirely within the city's full service, urban planning area; and 3) be entirely within the city's existing facilities planning area.

4. Annexation Requirements:

All properties to be included within the service area shall be annexed or an attempt to annexation shall be made first and before any service area enlargement applications may be considered. Further, that whenever possible the property being considered for inclusion in the service areas shall be annexed to the city rather than accepting waivers of the property owner's right to protest annexation of said property to the city. Waivers may be accepted by the city in its sole discretion only in those particular cases where good and sufficient cause is shown and a hardship would result if waivers were not accepted.

A prospective applicant shall first petition the city to annex the property involved prior to submission of a service area enlargement application. The city commission shall then consider such petition. Any waivers must be in legal form as approved by the city attorney; be recorded with the county clerk and recorder of Gallatin County, Montana; run with the land, and shall be signed by owners of the majority of the land area and by a majority of the landowners of the area to be considered by inclusion in the wastewater service area.

The city manager shall notify in writing the prospective applicant of the approval or denial of annexation or of the right to file waivers or both. The city manager shall also notify the prospective applicant of the approval or denial of enlargement of the service area. If approved the applicant shall be notified as to when the requirements set forth in this section have been satisfactorily completed and authorize said applicant to proceed with the service area enlargement application.

5. Slope:

Gravity sewer mains shall be installed with slope adequate to maintain flow velocities of at least 2.0 feet per second 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 shall be considered adequate.

6. Capacity:

Public sanitary sewers and appurtenances shall be designed to accommodate peak hourly flows, including an allowance for infiltration, while flowing no more than 1/2 full. The allowance for infiltration shall be 50 gallons per acre of coverage area, per day. The effects of the proposed development's sewer loading on existing downstream sewer lines shall be analyzed.

7. Materials:

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

PVC meeting ASTM D 3034, SDR 35 (8" to 15")

PVC meeting ASTM D 679, SDR 26 or ASTM D F794 (18" and larger)

Concrete meeting ASTM C14, C76 or C655

Other pipe materials specifically approved by the City of Belgrade

Pressure Piping – Pressure sewer piping (force mains) shall consist of PVC Pressure Pipe, ASTM 2241, Class 200 SDR 21.

8. Installation:

All public sanitary sewers shall be installed with a straight alignment between manholes. All 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 so as to preclude the entrance of surface water into said facilities.

All 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 City of Belgrade Public Works Department if approved in writing and suitable pipe insulating provisions have been made.

9. Extension:

Any extension of an existing City sanitary sewer main must be extended through the entire frontage length of the property to be served. Sewer main extensions shall include all manholes, clean-outs and appurtenances deemed necessary by the City.

10. Water Line Crossings:

Crossings - A minimum of 18-inches 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 Drawing 02713-2 for further information on water line crossings.

Less than 18-inches vertical separation may be allowed when the gravity sewer at the crossing is made from a single 20-foot length of AWWA pressure pipe and the crossing is approximately 90°. However, specific written authorization from the Montana Department of Environmental Quality and the City of Belgrade Public Works shall be required. No exception of the minimum 18-inch vertical separation requirement is permitted when the sewage pipe is a force main.

Unless specifically authorized in writing by the Montana Department of Environmental Quality and the City of Belgrade Public Works Department, a minimum of 11-foot horizontal separation is required when a sanitary sewer main and water main are installed parallel. There is no minimum requirement for vertical separation.

11. Average Daily Flow Rate:

New sanitary sewer lines to serve residential areas shall be designed to accommodate an average daily flow rate of 90-gallons per capita per day. An infiltration rate of 50-gallons/acre/day shall be added to all flow calculations when designing new sewers. Residential zoning densities for new developments shall be calculated based on the actual number of residences to be served by the development. The minimum flow shall be based on the density shown in Table 7, as a minimum.

12. Non-residential Flow Rates:

New sanitary sewer lines to serve non-residential areas shall be designed to accommodate the average daily flows as shown in Table 8 of this Policy.

13. Peaking Factor:

A Manning's friction factor of 0.013 shall be used in designing new sewers. A peaking factor shall be calculated for each pipe segment based on the following formula;

$$\frac{Q_{\max}}{Q_{\text{Ave}}} = \frac{18 + P^{1/2}}{4 + P^{1/2}} \quad (P = \text{Population/thousands})$$

**TABLE 7****RESIDENTIAL ZONING DENSITIES**

ZONE	DESCRIPTION	POPULATION DENSITY (People/Acre)
R-1	Residential - Single Family	16.0
R-2	Residential - Single Family - Medium Density	16.0
R-2-D	Residential - One & Two Family	16.0
R-2-M	Residential - Single Family & Manufactured Home	16.0
R-3	Residential - Medium Density District	26.0
R-4	Residential - Apartment District	51.0
RS	Residential - Suburban District	12.0
RS-M	Residential - Suburban District - Manufactured Home	25.4
AS	Agricultural - Suburban District	18.4

**TABLE 8****BUSINESS AND MANUFACTURING FLOW RATES**

ZONE CLASSIFICATION	DESCRIPTION	FLOW (Gallons/Day/Person)	*EQUIVALENT POP. (People/Acre)
M - 1	Commercial - Light Manufacturing	140	5.0
M - 2	Manufacturing & Industrial District	140	5.0
B - 1	Neighborhood Business District	140	10.0
B - 2	Highway Business District	140	10.0
B - 3	Central Business District	140	10.0
BP	Business Park	n/a	n/a
BP - 10	Business Park	n/a	n/a
PL - 1	Public Lands & Institutions	n/a	n/a

\*To be used for peaking factor computation. Based on 140 gal/capita/day.

14. Manhole Spacing:

The maximum distance between manholes shall be as follows:

<u>SANITARY SEWER PIPE SIZE</u>	<u>MAXIMUM DISTANCE</u>
8" to 15"	400'
18" to 30"	500'
larger than 30"	600'

15. Barrel Size:

The alignment and number of pipes into the manhole will determine the barrel size for the size of pipe used. All 48-inch manholes will have eccentric cone top sections if total manhole height is greater than six feet. All other manholes will have flat tops. All drop manholes shall be "inside drop" with a minimum barrel diameter of 60-inch. The internal diameter of the manhole barrel shall be as follows:

<u>SANITARY SEWER PIPE SIZE</u>	<u>BARREL SIZE</u>
12" or less	48"
15" to 27"	60"
30" to 48"	72"

Manholes larger than seventy-two (72) inches are allowed only with prior written approval by the City of Belgrade.

16. Manhole Channels:

All manholes shall have full-depth channels. When a smaller main is being connected to a larger main at a manhole, the manhole inverts shall be set so that the 8/10 depth of flow of each main is equal in elevation. The minimum drop across a manhole (invert-in to invert-out) is two-tenths of a foot (0.2') (cut-in manholes excluded).

17. Sanitary Sewer Mains:

The minimum diameter of a sewer main is 8-inches. Main lines shall be sized for design flow, not available slope. PVC pipe shall be used for all gravity flow main lines unless other materials are specifically approved.

18. Sanitary Sewer Services:

a. Materials:

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

PVC meeting ASTM D 3034, SDR 35 – 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, meeting ASTM 2241, Class 200, SDR 21.

b. Installation:

All sanitary sewer service lines must be so arranged that the discharge from each separately owned house or premises is a separate service line and 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. One service line may service multiple units that are separately owned provided the common service line is owned, operated and under the control of a single person or entity who is responsible for the maintenance of the service line, including the connection with the main.

All sewer service lines shall be installed in accordance with MPWSS Drawing 02724-1 with a minimum of four (4') feet of cover from the top of service pipe to final finished grade.

c. Slope and Diameter:

The minimum diameter of a service is 4-inch. Services shall connect to the main with in-line, gasketed wyes. The service line stub, from the main to the property line or easement line, shall be installed with a maximum slope of 1/2-inch per foot. The minimum slope of a 4-inch service line stub is 1/4-inch per foot. The minimum slope of a 6-inch service line stub is 1/8-inch per foot. Sewer service line stubs will typically be installed 15-feet from the downstream lot line. Services are to be installed perpendicular to the main.

19. 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. All applications for service connection to the city's wastewater system must be made at the City Hall

Building, 91 East Central Street, Belgrade, Montana 59714. 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 to be discharged into the system.

20. Metering When Not On City Water:

For City sewer users who do not use the city water system or whose water consumption or wastewater discharge is not otherwise metered, the City of Belgrade shall require the installation of a suitable metering device in order to determine an equitable charge for sewer services.

21. Access Roads:

A 12'-wide all-weather gravel access road, with a turn-around, (if required), shall be constructed to provide access to all sanitary sewer manholes not located within a paved public street, private street, or a parking lot.

C. STORM DRAINAGE SYSTEMS

1. Materials: RCP (reinforced concrete pipe) or PVC pipe may be used, however PVC pipe may only be used for pipes sized 36" diameter and smaller. PVC pipe shall have a minimum stiffness of 46 PSI. Structural strength shall withstand HS-20 design load.
2. Minimum Sizes: Storm sewer mains shall not be less than 15-inch diameter. Privately owned storm sewers may be smaller, but shall still be designed in accordance with section C.5 below.
3. Manhole Spacing and Size:

<u>Storm Sewer Pipe Diameter or Vertical Rise</u>	<u>Maximum Manhole Spacing (Ft.)</u>
15" - 36"	400
42" - 60"	500
66" and Larger	750

<u>Storm Sewer Pipe Diameter</u>	<u>Barrel Size* ( Ft.)</u>
15" - 18"	4
20" - 28"	5
30" - 48"	6

\* Multiple pipe penetrations may require larger manhole barrels

4. Storm Inlets

- a. Publicly owned storm inlets shall comply with the applicable standard drawing in the COB Modifications to MPWSS. Where inadequate overflow paths are provided, inlets must be oversized 50-percent to accommodate plugging.
- b. The size of outlet pipes from storm water inlets shall be based upon the design capacity of the inlet, but shall not be less than 12-inches in diameter. The outlet pipes shall connect to the storm sewer main with a manhole.
- c. Computations for storm sewer design and storm inlet designs shall be submitted prior to plan and specification submittal. Adequate details of inlets, manholes and other appurtenances shall be included in the overall drainage plan submitted for approval.
- d. Combination manhole/inlets may be used where approved as detailed in the City of Belgrade Modifications to MPWSS.

5. Hydraulic Design

All storm sewer facilities, including inlets and sidewalk chases, shall be designed to handle a 10-year storm event with no surcharging (maximum water elevation of 0.15' below top of curb). Drainage reports shall include hydraulic grade line calculations including losses from friction and transitions. Approved erosion control shall be designed and installed at all outlets.

6. Alignment

- a. Manholes are required wherever there is change in size, direction, elevation, grade or at sewer main junctions.
- b. The minimum vertical clearance between a potable water main and a storm sewer main is 18 inches. The minimum horizontal clearance between a potable water main and a storm sewer main is 11-feet.
- c. Horizontal alignment between manholes shall be straight.

7. Culverts

- a. A culvert is considered to be any structure which connects two open channels. The culvert is to be designed to convey the 25-

year frequency flow of the tributary drainage basin. The headwater depth will be limited by upstream conditions, but in no case shall exceed 1.5 times the culvert diameter. Excessive ponding above culvert entrances will not be acceptable if damage appears likely to surrounding property or to the roadway.

- b. Culverts shall be designed with an emergency overflow path. The emergency overflow capacity shall be 100-percent of the whole culvert for the major storm for culverts with area less than twenty square feet and for culverts with area greater than or equal twenty square feet, the overflow capacity shall be 100-percent of the capacity provided by the first twenty square feet plus 20-percent of the capacity provided for the additional area as established by the formula:

$$\% \text{ overflow} = (110\%) \frac{20 + (A - 20) \cdot 20}{A}, \text{ where "A" is the area of the culvert opening.}$$

## 8. Culvert Hydraulics

- a. Inlet and outlet structures: The culvert including inlet and outlet structures shall convey water, sediment and debris at all stages of flow.
- b. End Treatment: Flared end sections or headwalls with wing-walls are required. Inlets are to be designed to minimize head losses. Approved erosion control is to be provided at all culvert outlets and inlets. Trash racks shall be provided, at the upstream end, for all culverts.
- c. Slopes: Culvert slopes shall prevent silting, yet avoid excessive velocities. Generally, the minimum culvert slope is 0.50-percent. Minimum barrel velocity is 3-fps and maximum is 12-fps.
- d. Hydraulic Analysis: Inlet and outlet control conditions shall be analyzed. Calculations shall be submitted with the design report.
- e. Minimum Size: Culverts crossing a roadway shall not be smaller than 24-inch equivalent diameter. Driveway approach culverts shall not be smaller than 15-inch equivalent diameter. Culvert length shall be adequate to provide back slopes of 4:1 or less from pipe inverts to finished street section, including existing or future sidewalks.

- f. Materials: Culverts shall be RCP.
- g. Culvert Loading: All culverts shall be designed to withstand HS-20 loading in accordance with American Association of State Highway and Transportation Officials (AASHTO) "Standard Specifications for Highway Bridges" and with the pipe manufacturers recommendations.

D. ALIGNMENT, DEPTH, AND EASEMENTS:

1. General:

Water mains, sanitary sewers, and storm sewers within the proposed development shall be arranged to allow the suitable development of any adjoining un-developed land, and shall be constructed to the boundary lines of the tract being developed, unless prevented by topography or other physical conditions, in which case a variance must be approved by the City of Belgrade.

2. Water Mains:

- a. Water mains located in public street right-of-way shall be placed nineteen (19) feet off the right-of-way center line for streets 28 feet in width or greater.
- b. A minimum depth of cover of six and one-half (6 ½) feet below final grade will be maintained over all water mains.
- c. When water pipes cross sanitary or storm sewer lines, the water line must have an eighteen (18) inch minimum vertical separation, with all water pipe joints no closer than eleven (11) feet horizontal from the sewer pipe centerline, and the crossing will be perpendicular to the sewer line. A minimum of eleven (11) feet horizontal separation shall be maintained between any water main and any sanitary or storm sewer main.

3. Sanitary Sewer Mains:

- a. Sanitary sewer mains located in public street right-of-way shall be placed along the centerline of the street.
- b. Sewer mains shall have a minimum depth of cover of four (4) feet below final grade. All sewer mains and services with less than five (5) feet of cover will be adequately insulated.

- c. Where streets are curvilinear, manholes should be located in the center of the street, however, non-centerline locations that are not in vehicle wheel paths will be considered on a case-by-case basis, if it will reduce the total number of manholes required.

4. Storm Sewer Mains

- a. Storm sewer mains located in public street right-of-way shall typically be located on the opposite side of the street from the water main. Storm sewers may be located beneath curb and gutter if combination inlet/manholes are used.
- b. Storm sewer mains shall have a minimum depth of cover of two (2) feet below final grade, provided that the pipe material shall withstand the design load. Storm sewers shall be placed to maintain a minimum horizontal clearance of five (5) feet and a vertical clearance of six (6) inches from any sanitary sewer main.
- c. Manholes shall not be located in vehicle wheel paths.

5. Easements:

- a. A "utility easement" granted to the public is required for all public utility mains not located within public street right-of-way. An easement shall be a minimum of thirty (30) feet wide for one or two utility mains. An additional ten (10) feet is required for each additional main that occupies the easement. Wider easements may be required at the discretion of the City of Belgrade for large utility lines. Easements must be recorded on the plat.
- b. At no time will the utility line in question be less than nine (9) feet from the edge of the easement or less than eleven (11) feet from a parallel utility line. Utility easements will also be required for all meter pits and fire hydrants maintained by the City of Belgrade.
- c. No permanent structures shall be placed within a utility easement unless an encroachment permit has been obtained. Trees or other significant landscaping features shall not be placed within eleven (11) feet of any utility main.

## **LIST OF APPENDICIES:**

**Appendix A - City of Belgrade Fire Service Line Standard**

**Appendix B - Certificate of Completion and Acceptance**

**Appendix C - Standard Roadway Typical Sections**

**Appendix D - Typical Storm Drain Inlet Structure & Concrete Outlet Structure**

**Appendix E - Sample Detention Basin Sizing Problem**

**Appendix F - Pre-construction Meeting Checklist**

**Appendix G - Plan and Specification Checklist**

**Appendix H - Checklist for Testing and Documentation Requirements for  
Infrastructure Improvements**

**Appendix I - Random Sampling Example**

**Appendix A:**  
**City of Belgrade Fire Service Line Standard**

**CITY OF BELGRADE  
FIRE SERVICE LINE STANDARD  
MARCH 15, 2004**

1. For all fire service lines (regardless of size) a City of Belgrade water service application must be completed prior to beginning work on the fire service line. Applications may be obtained from the City of Belgrade located at 91 East Central Street, Belgrade, Montana 59714.
2. Plans for all fire service lines will be reviewed by the City of Belgrade and the City of Belgrade Fire Department. The review and subsequent approval or denial will be for that portion of the proposed fire service line that starts at the point of connection to the City of Belgrade distribution system up to and including the backflow prevention device and the flow detection device. Upon satisfactory completion of the review process, the plans will be forwarded to the Public Works Director with a recommendation for approval. The City Engineer will review the plans and either approve or deny the project.

*Please note: Installation of the fire service will not begin until the plans have been approved by the City of Belgrade and a City of Belgrade water service application has been completed.* For maintenance of the fire service line after City of Belgrade final acceptance refer to Item 16 of this Standard. The Owner shall be completely responsible for assuring the fire service line is adequately sized to provide the flows necessary for the fire protection system being serviced by the proposed fire service line.

3. Plans for all proposed fire service lines shall be drawn to scale on 24" x 36" plan sheet(s) and shall include all essential details such as:
  - a. Size and location of all water supplies.
  - b. Size and location of all piping indicating, where possible, the class, type and depth of existing pipe, the class and type of new pipe to be installed, and the depth to which it will be buried.

For proposed fire service lines 4" in diameter and larger the plans must include a profile drawing of the proposed fire service line from the point of connection at the existing main up to and including the system riser. The profile drawing must show the finished grade, depth of cover for the line, and if applicable, all other utilities which the fire service line will cross or be adjacent to.

- c. Size, type and location of valves.
- d. Classification of the system (See Attachment A).

- e. Sprinkler and standpipe riser to be supplied by the system.
  - f. Location of fire department connections.
4. All fire service lines not installed by the City of Belgrade Water Department shall be designed, inspected and certified by a Professional Engineer licensed in the State of Montana.
  5. Fire service lines 4" in diameter and larger shall be installed, tested, and disinfected by a single Contractor from the point of connection at the City water main (or existing stub) to the first control valve (OS&Y) inside of the building. (Note Item 16 of this Standard for maintenance of the fire line.)
  6. For all fire service lines 2" in diameter and smaller where no stub exists, a licensed contractor shall install the line from the main up to and including the first control valve (OS&Y) and double check valve inside the building. A plumber, licensed in the State of Montana, shall tap the main at the owner's expense and inspect the line under line pressure before it is backfilled. A curb stop and box shall be installed at a point 6 inches inside the property line, unless otherwise directed by the Public Works director.

Installation of the fire service line will not begin until the plans for the project have received City of Belgrade approval and a City of Belgrade water service application has been completed.

7. The City of Belgrade will only accept fire service lines which are 1", 1 1/2", 2", 4", 6", or 8" in diameter.
8. When tapping tees are used for the fire service line connection to the main, the Contractor shall install the tapping tee and valve and a plumber, licensed in the State of Montana, shall make the actual tap to the main at the Owner's expense.

The fire service line connection to the City water main without the use of a tapping tee will be made by the Contractor installing the appropriate sized tee in the water main. The City of Belgrade will operate all valves for the shut down of the line to install the tee and must be provided with a minimum of 24 hours advance notice before work is scheduled to begin. The Contractor shall notify all affected water customers of the water shut down a minimum of 24 hours before the work begins.

Temporary water service shall be provided (at Contractor/Owner expense) to all affected water customers if the shut down period is anticipated to exceed four hours. The City of Belgrade reserves the right to determine the likely extent of the main shut down based on the proposed work and Contractor experience, and require the installation of temporary water services by the Contractor.

9. Material and installation of fire service lines shall comply with the following standards:
  - a. Montana Public Works Standard Specifications, Fifth Edition, March 2003.
  - b. City of Belgrade Modifications to the Montana Public Works Standard Specifications.
  - c. City of Belgrade Standard Drawings 02660-13 and 02660-14.
  - d. City of Belgrade Fire Service Line Standard.
  - e. NFPA 24, Installation of Private Fire Service Mains and Their Appurtenances, (latest edition).
  
10. The City of Belgrade's requirements for the installation of double check valve assemblies and reduced pressure backflow prevention assemblies are as follows:
  1. The first fitting inside of the building shall be a UL listed flanged Kennedy or Mueller OS&Y valve the same size as the fire service line, for lines 4" and larger. For lines 2" and smaller, the first fitting inside the building shall be a NIBCO T-104-0 OS&Y valve.
  
  2. All double check valve assemblies and reduced pressure backflow prevention assemblies shall be:
    - a. UL or FM listed
  
    - b. Approved by the University of Southern California Foundation for Cross Connection Control and Hydraulic Research (USCFCCCHR) for operation in the proposed position (vertical or horizontal) as shown on the approved plans.
  
    - c. Installed as shown on the approved plans.
  
  3. A flow detection device shall be installed immediately following the double check valve assembly or the reduced pressure backflow prevention assembly (alarm check valve, flow/sensor alarm, meter, etc.) as shown on the approved plans.
  
  4. A double detector check valve assembly may be used with a standard City of Belgrade meter (for Class I, II and III systems only). The meter loop of the double detector check valve shall have a double check valve assembly installed which meets the same installation criteria specified above in requirement number "2".

5. Horizontal installations must be a minimum of 2 feet above the finished floor.
6. The fire service riser must be a minimum of 2 feet from any outside wall.
7. The incoming fire service line shall be a minimum of 6.5 feet and a maximum of 7.5 feet below the finished grade.
8. All fire service lines appurtenances shall have a 175 (p.s.i.), minimum pressure rating.
9. All fire service lines 4" and larger shall be PVC DR 14 or ductile iron pipe.
10. Line Sizing: The double check valve assembly or reduced pressure backflow prevention assembly shall be equal in size to both the incoming pipe diameter (upstream) and outgoing pipe diameter (downstream). For example, a 4" fire service line should have a 4" double check valve assembly.
  - a. The incoming pipe diameter (upstream) shall be the same size (nominal size) as the double check valve assembly for a minimum of ten (10) pipe diameters upstream of (in front of) the double check valve assembly or reduced pressure backflow prevention assembly.
  - b. The outgoing pipe diameter (downstream) shall be the same size (nominal size) as the double check valve assembly or reduced pressure backflow prevention assembly for a minimum of three (3) pipe diameters downstream of (in back of) the double check valve assembly.

c. EXAMPLE:

Incoming (upstream) fire service line	=	4"
Double check valve assembly or Reduced pressure backflow prevention Assembly	=	2"
Outgoing (downstream) line size	=	4"

The incoming line upstream must be reduced to a 2" line size a minimum of 20" (10 x 2") prior to the installation of the double check valve assembly or reduced pressure backflow prevention assembly, and the downstream line must be reduced to 2" for a distance of 6" (3 x 2") before it is upsized to the downstream line size of 4".

11. Prior the City of Belgrade's initial acceptance of the new fire service line (4" in diameter and larger) the line must be disinfected in accordance with Montana Public Works Specifications and City of Belgrade requirements. Flushing and pressure testing of the line shall be done in accordance with NFPA 24. Two (2) copies of the bacteriological tests results are to be submitted to the City of Belgrade for approval.
12. Prior the City of Belgrade's initial acceptance of the new fire service line (4" in diameter and larger) the "Contractor's Material and Test Certificate for Underground Piping" (See Attachment B) must be completed and two (2) copies submitted to the City of Belgrade.
13. Prior to the City of Belgrade's initial acceptance and activation of the fire service line (i.e., putting the line into service) a final inspection will be conducted by the City of Belgrade, to confirm that the installation is in accordance with the approved application and the approved plans. A Certificate of Inspection (see Attachment C) will be completed by the City of Belgrade upon completion of the final inspection, with copies sent to the Owner and the Contractor. Installations that are in conformance with the approved plans for the project and have passed all required tests, (see sections 11 and 12), will be initially accepted by the City of Belgrade as noted on the Certificate of Inspection. Installations that are not in conformance with the approved plans for the project will not be initially accepted by the City of Belgrade and the line will not be activated (i.e., placed in service) until the installation is in conformance with the approved plans and all required tests have been taken and passed.
14. The required one-year warranty period for the fire service line begins on the date of initial acceptance as noted on the Certificate of Inspection completed by the City of Belgrade Water Department.
15. Upon the City's initial acceptance, (See Section 13), of the fire service line, the following must be submitted by the Project/Design Engineer to the City of Belgrade within thirty (30) days:
  - a. Two (2) sets of accurate blue line as-built drawings signed by the Engineer.
  - b. A letter of certification from the project Engineer stating that the fire service line was installed in accordance with the approved plans and specifications.

The City of Belgrade's final acceptance of the fire service line will be based on the letter of certification, as-built drawings, and correction of any deficiencies noted during the one-year warranty period.

16. Following the expiration of the one-year warranty period, the City of Belgrade will maintain, at its expense, the fire service line from the main up to the curb stop or curb valve, or to the property line or easement line, whichever is greater.

Any maintenance or repairs to the fire service line or its appurtenances beyond the point of City of Belgrade responsibility specified above shall be by a licensed contractor at the Owner's expense. The building owner shall also be responsible for maintenance, repairs, and testing of all fire service line piping and appurtenances beyond the first control valve (OS&Y) inside the building.

17. The building owner may operate the first control valve (OS&Y) inside of the building when necessary for maintenance or repairs. When the first control valve (OS&Y) inside of the building is shut off for any reason, the City of Belgrade Fire Department must be notified immediately and informed of the shut down date, time and duration.

**Please Note: The building owner is completely responsible to ensure that the OS&Y valve remains open at all times, (except for maintenance or repairs), for the proper operation of the buildings fire protection system.**

18. Use of the fire service line shall be restricted to fire fighting use, emergency use and routine testing and flushing. Combined use lines (i.e., domestic and fire) are not acceptable. Separate service lines must be installed for individual domestic and fire services.
19. Bonding Requirements. The Owner shall require the Contractor to furnish Performance and Payment Bonds in favor of the Owner in an amount equal to one-hundred percent (100%) of the Agreement amount.

The bonds shall be signed by a surety company authorized to do business in the State of Montana, and acceptable as a surety to the Owner and countersigned by a Montana Resident Agent. The bonds shall be filed with the Owner and the City of Belgrade and shall include a copy of Power of Attorney certified to include the date of the bonds.

20. Insurance Requirements. The Owner shall require the Contractor to secure and maintain such insurance from and insurance company (or companies) authorized to write insurance in the State of Montana, with a minimum "A.M. Best Rating" of B+, VI, as will protect himself, his subcontractors, the Owner, and the City of Belgrade and their respective agents and employees from claims for bodily injury, death, or property damage which may arise from operations and completed operations under the Agreement. The types and limits of coverage shall comply with the current edition of "Montana Public Works Standard Specifications". The Owner shall not authorize, nor shall the Contractor commence work under the Agreement until such insurance has been obtained and certificates of insurance, with binders, or certified copies of the insurance policy, have been filed with the Owner and the City of Belgrade.

All insurance coverages shall remain in effect throughout the life of the Agreement, except that the Contractor shall maintain the Commercial General Liability coverage for a period of at least one year following the substantial completion date for property damage resulting from occurrences during the Agreement period.

Each insurance policy shall contain a clause providing that it will not be cancelled by the insurance company without 30 days written notice to the Owner, and the City of Belgrade, of intention to cancel.

21. Warranty Period. If, within one year after initial acceptance of the work by the City of Belgrade, any of the work is found to be defective or not in accordance with the Contract Documents, and upon written notice from the City of Belgrade, the Owner shall cause the Contractor to correct any work within seven (7) calendar days of said written notice. Should the Owner or Contractor fail to correct the discrepant work within the time designated in the notice, the City of Belgrade may correct the work at the expense and risk of the Owner/Contractor.

# ATTACHMENT A

## Backflow Prevention and System Classification

The City of Belgrade requires that the plans for the proposed fire service line include a description of the system including the "Class" of the system and the backflow prevention to be installed with the system. This Attachment provides standards for determining the Class of the proposed system and the required backflow protection to accompany the specific system. The standards in this Attachment are based on recommendations in American Water Works Association Manual M14, *Recommended Practice for Backflow Prevention and Cross-Connection Control*, and City of Belgrade requirements.

### Classification for Backflow Protection

Class 1. Direct connections from public water mains only; no pumps, tanks, or reservoirs; no physical connection from other water supplies; no antifreeze or other additives of any kind; all sprinkler drains discharging to atmosphere, dry wells or other safe outlets.

Class 2. Same as Class 1 except that booster pumps may be installed in the building after the first interior control valve (OS&Y).

Class 3. Direct connection from public water supply mains, plus one or more of the following: elevated storage tanks, fire pumps taking suction from aboveground covered reservoir or tanks; and pressure tanks. (All storage facilities are filled or connected to public water only, the water in the tanks is to be maintained in a potable condition. Otherwise, Class 3 systems are the same as Class 1.)

Class 4. Directly supplied from public mains, similar to Class 1 and Class 2, with an auxiliary water supply dedicated to fire department use and available to the premises, such as an auxiliary supply located within 1700 feet of the hydrant connection.

Class 5. Directly supplied from public mains and interconnected with auxiliary supplies, such as pumps taking suction from reservoirs exposed to contamination, or rivers and ponds; driven wells; mills or other industrial water systems; or where antifreeze or other additives are used.

Class 6. Combined industrial and fire protection systems supplied from the public water mains only, with or without gravity storage or pump suction tanks.

## Required Protection

All systems regardless of Class require a means of flow detection, which must be approved by the City of Belgrade.

Class 1. Minimum backflow protection requirement for a Class 1 system is an approved testable double check valve assembly (a double check valve device for lines 2" in diameter and smaller to prevent water from flowing backwards into the public potable water system. The double check valve assembly should be the same size as the fire service line to the building and installed immediately following the first interior OS&Y control valve as shown on the approved plans. (Refer to City of Belgrade Standard Drawing 02660-13 for specific requirements.)

*Exception: Special conditions may exist on the site of Class 1 fire systems such that actual or potential contamination hazards are presented to the domestic water supply. Under these conditions an approved reduced pressure backflow prevention assembly or an appropriately sized air gap, may be required by the City of Belgrade.*

Class 2. Minimum backflow protection requirement for a Class 2 system is an approved testable double check valve assembly (a double check valve device for lines 2" in diameter and smaller to prevent water from flowing backwards into the public potable water system. The double check valve assembly should be the same size as the fire service line to the building and installed immediately following the first interior OS&Y control valve as shown on the approved plans. (Refer to City of Belgrade Standard Drawing 02660-13 for specific requirements.)

*Exception: Special conditions may exist on the site of Class 2 fire systems such that actual or potential contamination hazards are presented to the domestic water supply. Under these conditions an approved reduced pressure backflow prevention assembly or an appropriately sized air gap, may be required by the City of Belgrade.*

Class 3. Minimum backflow protection requirement for a Class 3 system is an approved testable double check valve assembly to prevent water from backflowing into the public potable water system. The double check valve assembly should be the same size as the fire service line to the building and installed immediately following the first interior OS&Y control valve as shown on the approved plan. (Refer to city of Belgrade Standard Drawing 02660-13 for specific requirements.)

*Exception: Special conditions may exist on the site of Class 3 fire systems such that actual or potential contamination hazards are presented to the domestic water supply. Under these conditions an approved reduced pressure backflow prevention assembly or an appropriately sized air gap, may be warranted and/or required by the City of Belgrade.*

Class 4. The type of backflow protection for Class 4 systems will depend on the quality of the auxiliary supply. The type of backflow protection will be one of the following approved by the City of Belgrade: air gap or reduced-pressure backflow-prevention assembly. Reduced-pressure backflow-prevention assemblies should be the same size as the fire service line to the building and installed immediately following the first interior OS&Y control valve as shown on the approved plans. (Refer to city of Belgrade Standard Drawing 02660-14.)

Class 5. The type of backflow protection for Class 5 systems will be either a reduced-pressure backflow-prevention assembly or an air gap. Reduced-pressure backflow-prevention assemblies should be the same size as the fire service line to the building and installed immediately following the first interior OS&Y control valve as shown on the approved plans. (Refer to City of Belgrade Standard Drawing 02660-14 for specific requirements.)

Class 6. Class 6 system protection would depend on the requirements of both industry and fire protection and could only be determined by a survey of the premises.

## **ATTACHMENT B**

Contractor's Material and Test Certificate for Underground Piping

Contractor's Material and Test Certificate for Underground Piping

CONTRACTOR'S MATERIAL & TEST CERTIFICATE FOR **U**NDERGROUND PIPING

**PROCEDURE**

Upon completion of work, inspection and tests shall be made by the contractor's representative and witnessed by an owner's representative. All defects shall be corrected and system left in service before contractor's personnel finally leave the job.

A certificate shall be filled out and signed by both representatives. Copies shall be prepared for approving authorities, owners and contractor. It is understood the owner's representative's signature in no way prejudices any claim against contractor for faulty material, poor workmanship, or failure to comply with approving authority's requirements or local ordinances.

PROPERTY NAME	DATE
PROPERTY ADDRESS	

	ACCEPTED BY APPROVING AUTHORITY(S) NAMES	
<b>PLANS</b>	ADDRESS	
	INSTALLATION CONFORMS TO ACCEPTED PLANS	<input type="checkbox"/> YES <input type="checkbox"/> NO
	EQUIPMENT USED IS APPROVED	<input type="checkbox"/> YES <input type="checkbox"/> NO
	IF NO, STATE DEVIATIONS	
<b>INSTRUCTIONS</b>	HAS PERSON IN CHARGE OF FIRE EQUIPMENT BEEN INSTRUCTED AS TO LOCATION OF CONTROL VALVES AND CARE AND MAINTENANCE OF THIS NEW EQUIPMENT	
		<input type="checkbox"/> YES <input type="checkbox"/> NO
	IF NO, EXPLAIN	
	HAVE COPIES OF APPROPRIATE INSTRUCTIONS AND CARE AND MAINTENANCE CHARTS BEEN LEFT ON PREMISES	
		<input type="checkbox"/> YES <input type="checkbox"/> NO
	IF NO, EXPLAIN	
<b>LOCATION</b>	SUPPLIES BLDGS.	
	PIPE TYPES AND CLASS	TYPE JOINT
<b>UNDERGROUND PIPES AND JOINTS</b>	PIPE CONFORMS TO _____ STANDARD	
		<input type="checkbox"/> YES <input type="checkbox"/> NO
	FITTINGS CONFORM TO _____ STANDARD	
		<input type="checkbox"/> YES <input type="checkbox"/> NO
	IF NO, EXPLAIN	
	JOINTS NEEDING ANCHORAGE CLAMPED, STRAPPED, OR BLOCKED IN	
		<input type="checkbox"/> YES <input type="checkbox"/> NO
	ACCORDANCE WITH _____ STANDARD	
	IF NO, EXPLAIN	
<b>TEST DESCRIPTION</b>	<p><b>FLUSHING.</b> Flow the required rate until water is clear as indicated by no collection of foreign material in burlap bags at outlets such as hydrants and blow-offs. Flush at flows not less than 400 GPM (1514 L/min) for 4-inch pipe, 600 GPM (2271 L/min) for 5-inch pipe, 750 GPM (2839 L/min) for 6-inch pipe, 1000 GPM (3785 L/min) for 8-inch pipe, 1500 GPM (5678 L/min) for 10-inch pipe and 2000 GPM (7570 L/min) for 12-inch pipe. When supply cannot produce stipulated flow rates, obtain maximum available.</p> <p><b>HYDROSTATIC.</b> Hydrostatic tests shall be made at not less than 200 psi (13.8 bars) for two hours or 50 psi (3.4 bars) above static pressure in excess of 150 psi (10.3 bars) for two hours.</p> <p><b>LEAKAGE.</b> New pipe laid with rubber gasketed joints shall, if the workmanship is satisfactory, have little or no leakage at the joints. The amount of leakage at the joints shall not exceed 2 qts. per hr. (1.89 L/h) per 100 joints irrespective of pipe diameter. The leakage shall be distributed over all joints. If such leakage occurs at a few joints the installation shall be considered unsatisfactory and necessary repairs made. The amount of allowable leakage specified above may be increased by 1 fl oz per in. valve diameter per hour (30 mL/25 mm/h) for each metal seated valve isolating the test section. If dry barrel hydrants are tested with the main valve open, so the hydrants are under pressure, an additional 5 oz per minute (150 mL/min) leakage is permitted for each hydrant.</p>	
	NEW UNDERGROUND PIPING FLUSHED ACCORDING TO _____ STANDARD	
		<input type="checkbox"/> YES <input type="checkbox"/> NO
	BY (COMPANY) _____	
	IF NO, EXPLAIN	
<b>FLUSHING TESTS</b>	HOW FLUSHING FLOW WAS OBTAINED	THROUGH WHAT TYPE OPENING
	<input type="checkbox"/> PUBLIC WATER <input type="checkbox"/> TANK OR RESERVOIR <input type="checkbox"/> FIRE PUMP	<input type="checkbox"/> HYDRANT BUTT. <input type="checkbox"/> OPEN PIPE
	LEAD-INS FLUSHED ACCORDING TO _____ STANDARD	
		<input type="checkbox"/> YES <input type="checkbox"/> NO
	BY (COMPANY) _____	
	IF NO, EXPLAIN	
	HOW FLUSHING FLOW WAS OBTAINED	THROUGH WHAT TYPE OPENING
	<input type="checkbox"/> PUBLIC WATER <input type="checkbox"/> TANK OR RESERVOIR <input type="checkbox"/> FIRE PUMP	<input type="checkbox"/> Y CONN. TO FLANGE & SPIGOT <input type="checkbox"/> OPEN PIPE

PRIVATE FIRE SERVICE MAINS AND THEIR APPURTENANCES

HYDROSTATIC TEST	ALL NEW UNDERGROUND PIPING HYDROSTATICALLY TESTED AT _____ PSI FOR _____ HOURS		JOINTS COVERED <input type="checkbox"/> YES <input type="checkbox"/> NO	
LEAKAGE TEST	TOTAL AMOUNT OF LEAKAGE MEASURED _____ GALS. _____ HOURS			
	ALLOWABLE LEAKAGE _____ GALS. _____ HOURS			
HYDRANTS	NUMBER INSTALLED	TYPE AND MAKE	ALL OPERATE SATISFACTORILY <input type="checkbox"/> YES <input type="checkbox"/> NO	
CONTROL VALVES	WATER CONTROL VALVES LEFT WIDE OPEN IF NO, STATE REASON		<input type="checkbox"/> YES <input type="checkbox"/> NO	
	HOSE THREADS OF FIRE DEPARTMENT CONNECTIONS AND HYDRANTS INTERCHANGEABLE WITH THOSE OF FIRE DEPARTMENT ANSWERING ALARM		<input type="checkbox"/> YES <input type="checkbox"/> NO	
REMARKS	DATE LEFT IN SERVICE _____ _____ _____			
	NAME OF INSTALLING CONTRACTOR _____			
SIGNATURES	TESTS WITNESSED BY			
	FOR PROPERTY OWNER (SIGNED)	TITLE	DATE	
	FOR INSTALLING CONTRACTOR (SIGNED)	TITLE	DATE	
ADDITIONAL EXPLANATION AND NOTES				

# **ATTACHMENT C**

## Certificate of Inspection



The fire service line was activated (placed into service) during this inspection: YES NO

(If "NO" indicate below the reason and teh date it is to be activated.)

The first interior valve (OS&Y) was left in the OPEN CLOSED position at the completion of this inspection.

**OWNER NOTE:** When the first control valve (OS&Y) inside of the building is shut off for any reason, the Fire Department must be notified immediately and informed of the shut down date, time, and duration.

Comments:

cc: Owner  
Contractor  
City Engineer's Office

**CERTIFICATE OF  
COMPLETION AND ACCEPTANCE**

OWNER: \_\_\_\_\_  
PROJECT TITLE: \_\_\_\_\_  
DATE OF ACCEPTANCE: \_\_\_\_\_ PROJECT NO. \_\_\_\_\_  
PROJECT DESCRIPTION: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

PROJECT LOCATION: \_\_\_\_\_  
CONTRACTOR: \_\_\_\_\_  
ENGINEER: \_\_\_\_\_  
Substantial Completion Date: \_\_\_\_\_ One-year warranty expiration date: \_\_\_\_\_

The Work performed under the Contract for the above Project has been inspected by a representative of the Owner, Contractor, & City \_\_\_\_\_ and has been found to substantially comply with the approved Contract Documents and is hereby declared complete. Acceptance by the Owner and City \_\_\_\_\_ and recommendation thereto by the Engineer does not affect the "Contractor's Continuing Obligation" as described in Article 14.15 of the Standard General Conditions of the Construction Contract, or the Owner's contractual obligations.

**ENGINEER'S RECOMMENDATION**

On the basis of observation of the Work during construction, final inspection and review of project testing, final application for payment and accompanying documents, the Engineer is satisfied and hereby certifies that the Work has been completed in accordance with the approved Contract Documents. This acceptance shall not relieve the Contractor of his obligations under the Contract Documents.

\_\_\_\_\_  
Engineer

By: \_\_\_\_\_  
Printed Name: \_\_\_\_\_  
P.E.# \_\_\_\_\_ Date \_\_\_\_\_

**CONTRACTOR'S CONCURRENCE WITH ENGINEER'S RECOMMENDATION**

\_\_\_\_\_  
Contractor

By: \_\_\_\_\_  
Printed Name: \_\_\_\_\_  
Title: \_\_\_\_\_  
Date: \_\_\_\_\_

## OWNER'S ACCEPTANCE AND GRANT OF POSSESSION

On the basis of independent observations and inspections and the recommendations of the Engineer, the Owner accepts the Project as complete. This acceptance does not relieve the Contractor of continuing obligations as described above. The Contractor is reminded this Project is under warranty beginning \_\_\_\_\_ and that bonds shall remain in effect for one year after the Date of Acceptance specified above. The Owner hereby grants possession of all public infrastructure improvements completed by this Project to the City \_\_\_\_\_ and warrants against defects in these improvements for a period of one year from the Date of Acceptance specified above.

\_\_\_\_\_  
Owner

By: \_\_\_\_\_  
Printed Name: \_\_\_\_\_  
Title: \_\_\_\_\_  
Date: \_\_\_\_\_

### Acceptance

The City \_\_\_\_\_ hereby accepts possession of all public infrastructure improvements, subject to the above indicated warranty. This acceptance does not relieve the Owner or Contractor of his continuing obligations for this work as described above or otherwise required through Improvement Agreements, conditions of plat approval, or his other contractual commitments.

\_\_\_\_\_  
City

By: \_\_\_\_\_  
Title: \_\_\_\_\_  
Date: \_\_\_\_\_

**Appendix B:**

**Certificate of Completion and Acceptance**

**CERTIFICATE OF  
COMPLETION AND ACCEPTANCE**

OWNER: \_\_\_\_\_  
PROJECT TITLE: \_\_\_\_\_  
DATE OF ACCEPTANCE: \_\_\_\_\_ PROJECT NO. \_\_\_\_\_  
PROJECT DESCRIPTION: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

PROJECT LOCATION: \_\_\_\_\_  
CONTRACTOR: \_\_\_\_\_  
ENGINEER: \_\_\_\_\_  
Substantial Completion Date: \_\_\_\_\_ One-year warranty expiration date: \_\_\_\_\_

The Work performed under the Contract for the above Project has been inspected by a representative of the Owner, Contractor, City of Belgrade, and Engineer and has been found to substantially comply with the approved Contract Documents and is hereby declared complete. Acceptance by the Owner and City of Belgrade and recommendation thereto by the Engineer does not affect the "Contractor's Continuing Obligation" as described in Article 14.15 of the Standard General Conditions of the Construction Contract, or the Owner's contractual obligations.

**ENGINEER'S RECOMMENDATION**

On the basis of observation of the Work during construction, final inspection and review of project testing, final application for payment and accompanying documents, the Engineer is satisfied and hereby certifies that the Work has been completed in accordance with the approved Contract Documents. This acceptance shall not relieve the Contractor of his obligations under the Contract Documents.

\_\_\_\_\_  
Engineer

By: \_\_\_\_\_  
Printed Name: \_\_\_\_\_  
P.E.# \_\_\_\_\_ Date \_\_\_\_\_

**CONTRACTOR'S CONCURRENCE WITH ENGINEER'S RECOMMENDATION**

\_\_\_\_\_  
Contractor

By: \_\_\_\_\_  
Printed Name: \_\_\_\_\_  
Title: \_\_\_\_\_  
Date: \_\_\_\_\_

**OWNER'S ACCEPTANCE AND GRANT OF POSSESSION**

On the basis of independent observations and inspections and the recommendations of the Engineer, the Owner accepts the Project as complete. This acceptance does not relieve the Contractor of continuing obligations as described above. The Contractor is reminded this Project is under warranty beginning \_\_\_\_\_ and that bonds shall remain in effect for one year after the Date of Acceptance specified above. The Owner hereby grants possession of all public infrastructure improvements completed by this Project to the City of Belgrade and warrants against defects in these improvements for a period of one year from the Date of Acceptance specified above.

\_\_\_\_\_  
Owner

By: \_\_\_\_\_  
Printed Name: \_\_\_\_\_  
Title: \_\_\_\_\_  
Date: \_\_\_\_\_

City of Belgrade's Acceptance

The City of Belgrade hereby accepts possession of all public infrastructure improvements, subject to the above indicated warranty. This acceptance does not relieve the Owner or Contractor of his continuing obligations for this work as described above or otherwise required through Improvement Agreements, conditions of plat approval, or his other contractual commitments.

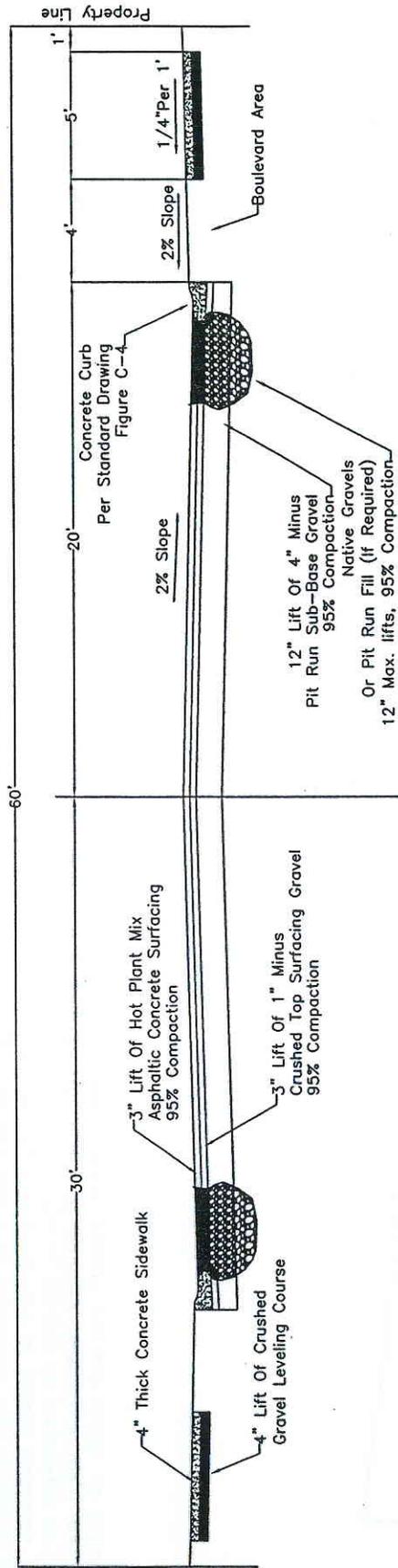
City of Belgrade \_\_\_\_\_

By: \_\_\_\_\_  
Title: \_\_\_\_\_  
Date: \_\_\_\_\_

**Appendix C:**

**Standard Roadway Typical Sections With and Without Curb & Gutter, ADA Handicap Ramp Detail, & Standard Curb and Gutter Detail**

# TYPICAL STREET SECTION CURB AND GUTTER



**NOTES:**

1. Remove all topsoil and fine grained material down to native pit run gravels for full 40' width of roadway. Compact to a minimum of 95% of maximum dry density as determined by AASHTO T-180.
2. Backfill to sub-grade with a minimum 12" lift of 4" minus pit run gravels, compacted to 95%.
3. Place 3" lift of 1" minus crushed surfacing gravels, compacted to 95%.
4. Place 3" lift of hot mix asphalt finished surfacing, compacted to 95%.

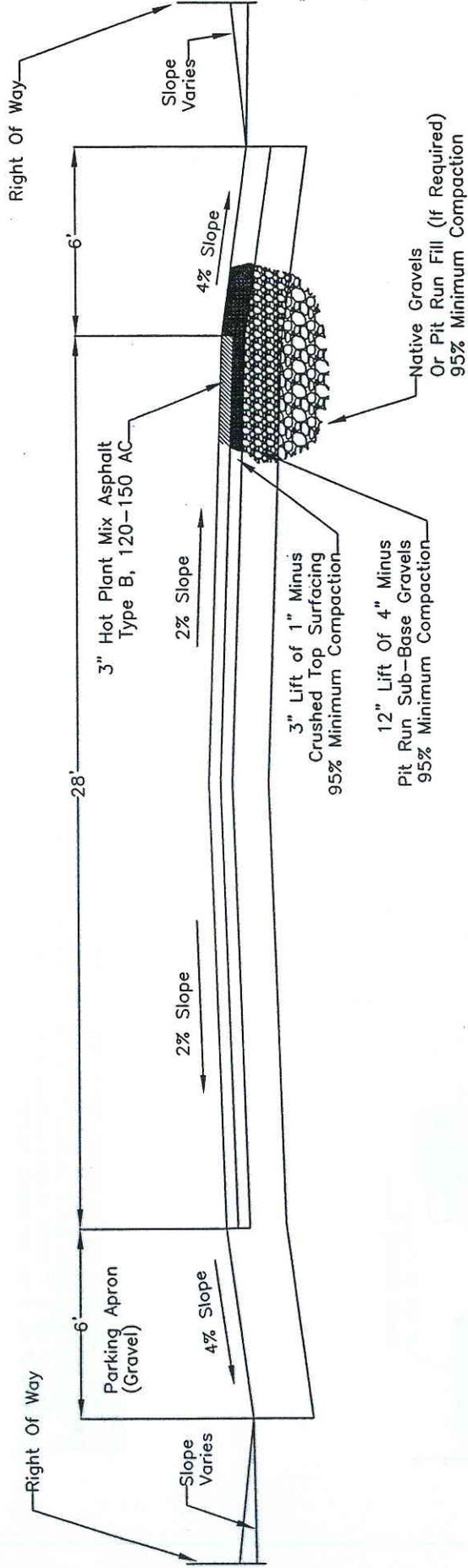
CITY OF BELGRADE  
STANDARD DRAWING

SCALE:  
NONE

TYPICAL STREET SECTION  
CURB AND GUTTER

Figure C-2  
AUG. 1994  
Revised Mar. 2004

# TYPICAL STREET SECTION NO CURB



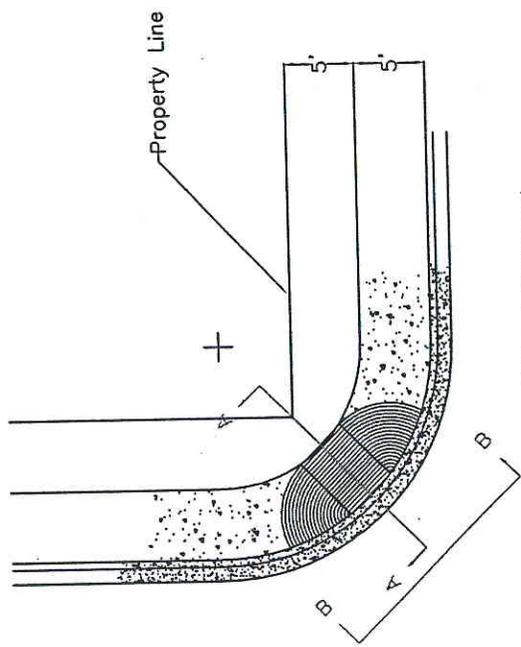
- NOTES:
1. Remove all topsoil and fine grained material down to native pit run gravels for full 40' width of roadway. Compact to a minimum of 95% of maximum Dry Density, as determined by AASHTO T-180.
  2. If necessary backfill to sub-grade elevation with 4" minus pit run gravel, with 8" maximum lifts, compacted to a minimum of 95%.
  3. Place 3" lift of 1" minus surfacing materials, compacted to a minimum of 95%.
  4. Place 3" lift of hot mix asphalt finished surfacing, compacted to 95%.

FIGURE C-1  
AUG. 1994  
Revised Mar. 2004

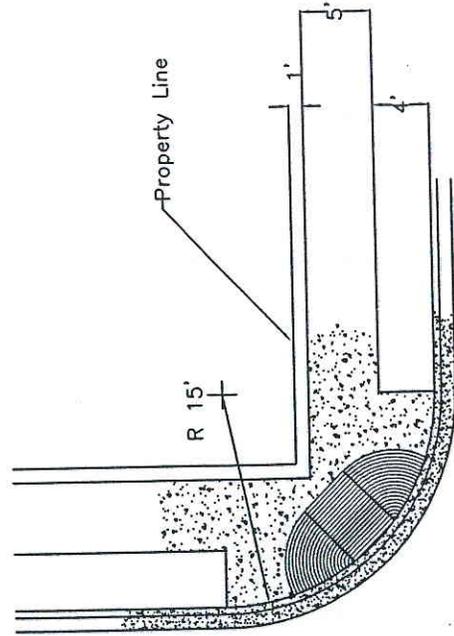
TYPICAL STREET SECTION  
NO CURB

SCALE:  
NONE

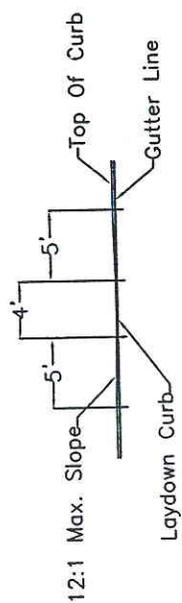
CITY OF BELGRADE  
STANDARD DRAWING



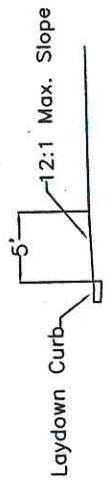
Without Boulevard



With Boulevard



Section B-B



Section A-A

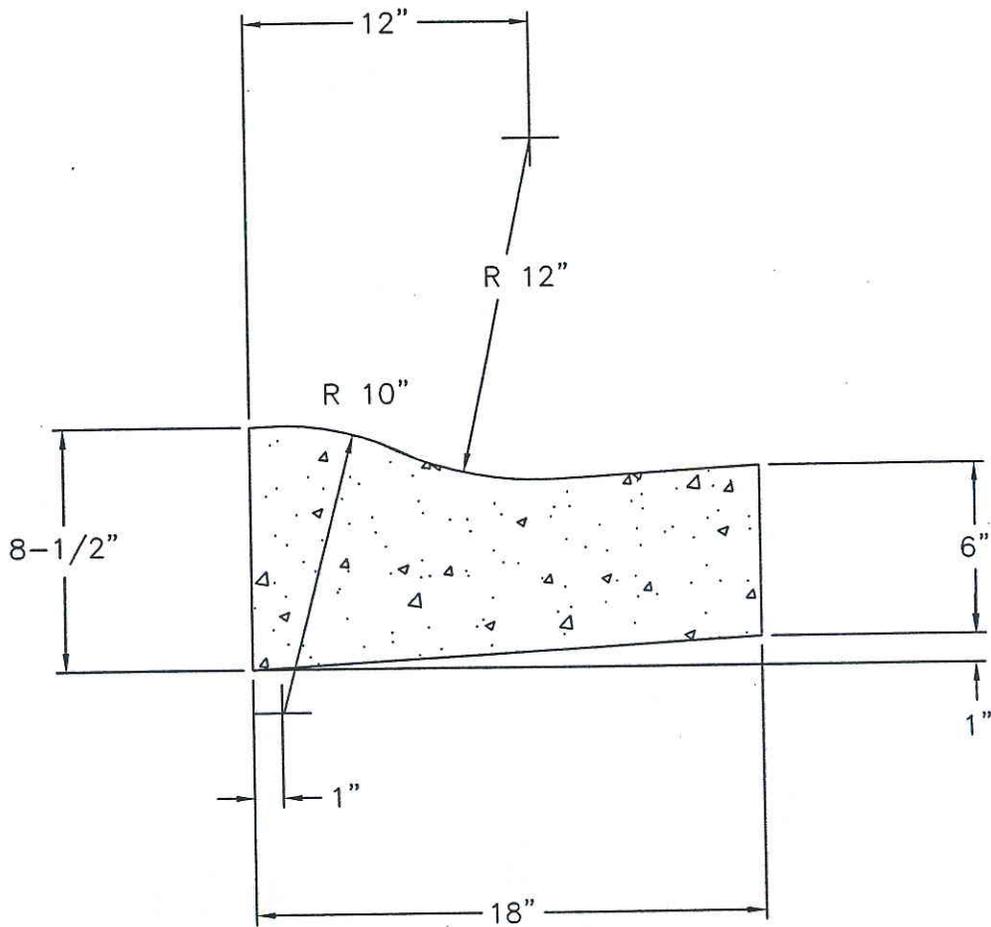
- NOTES:
1. Surface texture of the ramp shall be that obtained by a course brooming transverse to the slope of the ramp.
  2. Care shall be taken to assure a uniform grade on the ramp free of sags and short grade changes.
  3. The normal gutter line profile shall be maintained through the area of the ramp.
  4. No slope shall exceed 12:1 on the ramp or sidewalk.

Figure C-3  
Mar. 2004

HANDICAP RAMP

SCALE:  
NONE

CITY OF BELGRADE  
STANDARD DRAWING



CITY OF BELGRADE  
STANDARD DRAWING

SCALE:  
NONE

STANDARD CURB & GUTTER

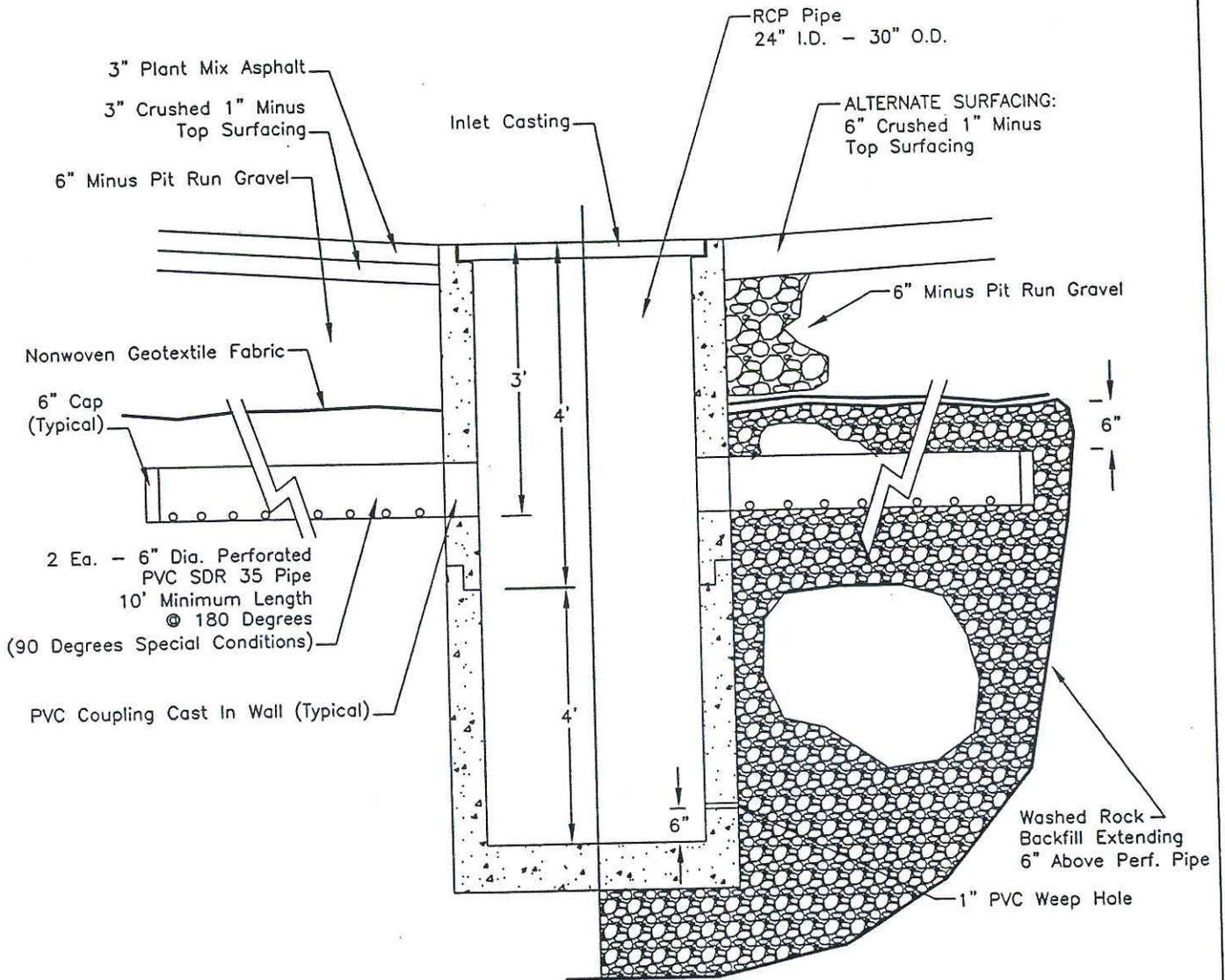
FIGURE C-4  
MAR. 2004

## Appendix D:

### Typical Storm Drain Inlet Structure & Concrete Outlet Structure Standard Details

Faint, illegible text, likely bleed-through from the reverse side of the page.

REVISIONS	DATE	BY	REVISIONS
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**NOTES:**

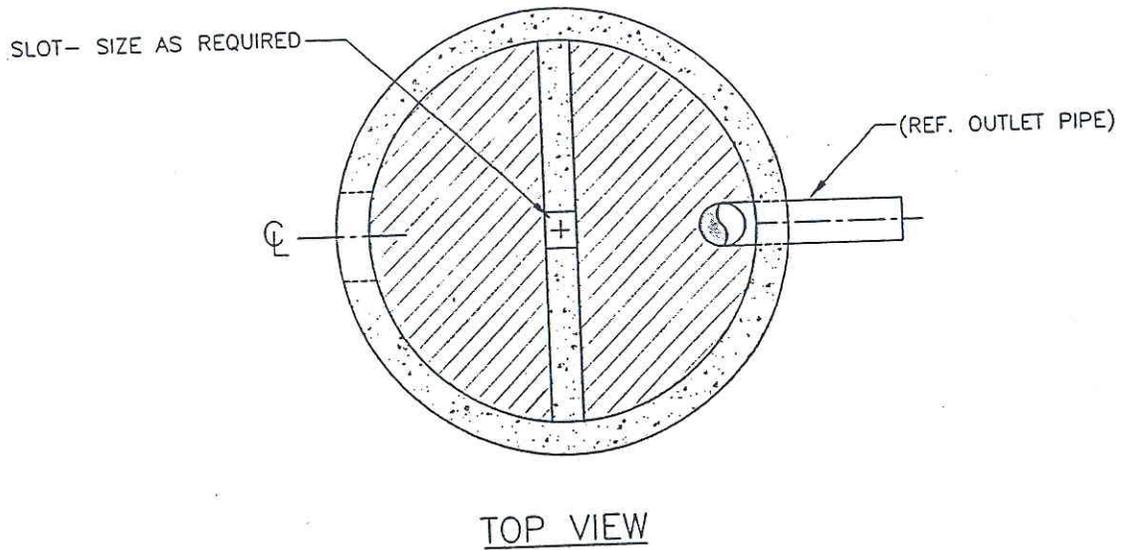
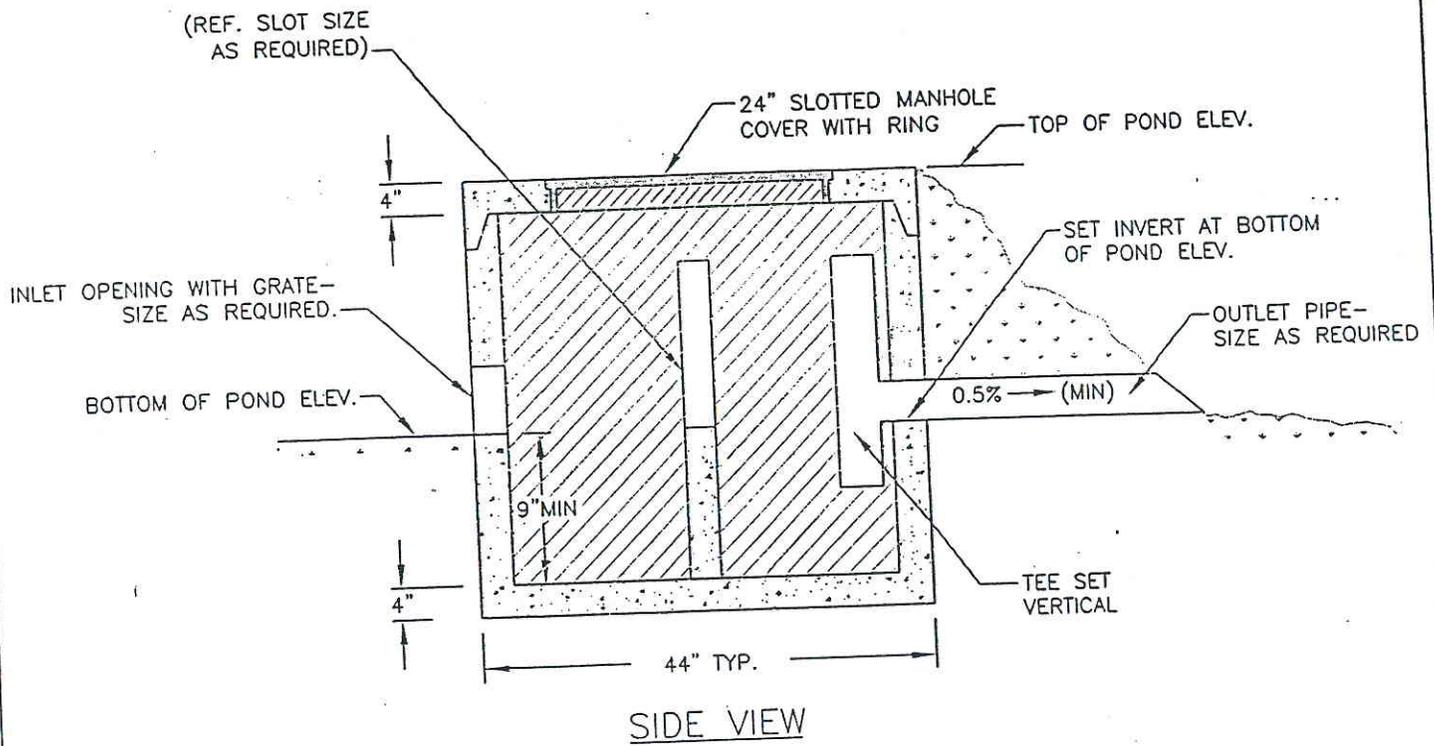
1. Concrete base shall be monolithically cast with bottom section.
2. Place washed rock to a depth of 1' below inlet base, backfill entire structure with washed rock to a depth of 6" above perforated pipe.
3. Backfill above geotextile fabric shall be pit run gravel with a maximum partial size of 6". Backfill shall be compacted in 8" lifts to 95% of Max. dry density AASHTO T-180 followed by a 3" layer of 1" minus crushed top surface leveling course and a 3" thickness of hot plant mix asphalt.
4. If inlet is placed in an unpaved area, the alternate surfacing section of 6" of 1" minus crushed top surfacing shall be required.
5. 6" perforated pipe may be placed at 90 degree angle if 180 degree is not possible.

CITY OF BELGRADE  
STANDARD DRAWING

SCALE:  
NONE

STANDARD  
STORM DRAIN INLET

Figure D-1  
Mar. 2004



UNIVERSITY OF BOZEMAN  
DESIGN STANDARDS

SCALE:  
NONE

TYPICAL CONCRETE  
OUTLET STRUCTURE FOR  
STORMWATER DETENTION PONDS

FIG. D-2  
MAY 2001

**Appendix E:**

**Sample Detention Basin Sizing Problem**



Inlet Flow Rate (MGD)	Detention Time (Hours)	Basin Volume (MG)	Basin Dimensions (Length x Width x Depth)
-----------------------------	---------------------------	----------------------	--

SIZING DETENTION BASINS – SAMPLE PROBLEM  
(Rational Method)

Given: Existing Land Use:	Agricultural
Proposed Land Use:	Industrial
Drainage Area:	5 Acres
Slope:	1%
Overland Travel Distance to Channel:	120 feet
Channel Time:	4 minutes
Max. Basin Water Depth Allowable:	1 foot

Problem:  
Size a detention basin to control runoff to pre-development levels and to remove sediment (40 micron particle).

Solution:

Existing Situation

Land Use:	Agricultural
Area:	5 Acres
C =	0.20 (Table I-1)
Time of Concentration:	16 minutes (Figure I-1) + 4 minutes = 20 minutes
Design Storm Frequency:	10 year (Table I-3) (Based on Future use Design Frequency)
Intensity at Tc:	1.3071 in/hr (Figure I-3)
Peak Runoff Rate:	$(0.20)(1.3071)(5) = 1.31$ cfs

Future Situation

Land Use:	Industrial
Area:	5 Acres
C =	0.80 (Table I-1)
Time of Concentration:	6 minutes (Figure I-1) + 4 minutes = 10 minutes
Design Storm Frequency:	10 year (Table I-3)

Detention Basin Sizing

Design Release Rate:	1.31 cfs
----------------------	----------

## MINIMUM VOLUME

Storm Duration (Minutes) (cf)	Intensity (in/hr)	Future Runoff Rate ( $Q = CiA$ ) (cfs)	Runoff Volume (cf)	Release Volume (cf)	Required Storage
25	1.1306	4.52	6780	1965	4815
27	1.0755	4.30	6966	2122	4844
29	1.0266	4.11	7175	2279	4872
31	0.9831	3.93	7310	2437	4873
33	0.9439	3.78	7484	2594	4890*
35	0.9085	3.63	7623	2751	4872

\* Minimum Volume Required - 4890 cf

- Note: 1. If controlling volume falls at a storm duration less than the future time of concentration, use the volume at the time of concentration.  
 2. Based on Minimum Volume and using 1 foot depth, Surface Area = 4890 sf.

## MINIMUM AREA

Assumptions:

1. Non-flocculant particles.
2. Settling velocity of 40 micron particles = 0.0069 ft/sec.

Design Release Rate: 1.31 cfs

Minimum Area Required:  $1.31 \text{ cfs} \div 0.0069 \text{ ft/sec} = 190 \text{ sf}$

(Since  $4890 > 190 \text{ sf}$ , use 4890 sf)

## BASIN SIZING

Water Depth: 1 foot  
 Surface Area: 4890 sf  
 Volume: 4890 cf  
 Length: 123 ft.  
 Width: 40 ft.

**Appendix F:**

**Pre-construction Meeting Checklist**

Item	Responsible Party	Status
1. Review project schedule and milestones	Project Manager	Completed
2. Discuss site access and logistics	Site Manager	In Progress
3. Review safety protocols and PPE requirements	Safety Officer	Not Started
4. Confirm communication channels and meeting frequency	Project Manager	Completed
5. Review environmental impact and mitigation measures	Environmental Officer	In Progress



**Appendix G:**  
**Plan and Specification Checklist**

# CITY OF BELGRADE

## PLAN AND SPECIFICATION CHECKLIST

Project Name: \_\_\_\_\_

Engineer: \_\_\_\_\_

Inspector: \_\_\_\_\_

### Reports Received:

- A.  Water & Sewer Utilities Design Report
- B.  Pavement Design Report & Traffic Impact Analysis
- C.  Stormwater Facilities Design Report
- D.  Parks Requirements Information Report

---

### CHECKLIST SUBMITTAL INSTRUCTIONS:

Construction may not begin until approval of the checklist is granted by the City of Belgrade and a preconstruction meeting is held. City of Belgrade approval will be issued in a letter to the design engineer submitting the plans and specifications.

All sections of the certified checklist must be completed. *The answer yes may be checked when all the requirements of the section being addressed are satisfied.* Where a yes answer cannot be given, a deviation must be requested or the applicant must explain why that section of the standard is not applicable. All deviation requests must be justified by the design engineer and supported with appropriate documentation.

All infrastructure checklists must be signed and stamped by the professional engineer responsible for the design of the project. In addition, four sets of plans and specifications signed and stamped by a professional engineer must be included.

The plans and specifications for the above referenced project are in compliance with the following sections of the City of Belgrade Design Standards and Specifications Policy.

II. CONSTRUCTION PLANS AND SPECIFICATIONS REQUIREMENTS			
A.		GENERAL REQUIREMENTS	
	1.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	2.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	3.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	4.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	5.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	6.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	7.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	8.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	9.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
B.		SPECIFICATION REQUIREMENTS	
	1.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	2.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
C.		DRAWING SCALES	
	1.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	2.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	3.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
D.		PLAN REQUIREMENTS	

	1.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	2.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
<b>E.</b>	<b>UTILITY PLAN REQUIREMENTS</b>		
	1.a	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	1.b	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	1.c	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	1.d	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	1.e	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	2.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	3.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	4.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
<b>F.</b>	<b>ROADWAY PLAN REQUIREMENTS</b>		
	1.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
<b>III</b>	<b>DRAINAGE POLICY</b>		
<b>A.</b>	<b>GENERAL DESIGN CRITERIA</b>		
	1.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	2.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	3.a	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	3.b	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	3.c	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	3.d	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:

		<input type="checkbox"/> NA	Explain:
	3.e	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	3.f	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	3.g	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
<b>B. STORM DRAINAGE PLAN</b>			
	1.a	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	1.b	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	1.c	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	2.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	3.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
<b>C. STORAGE/TREATMENT FACILITIES</b>			
	1.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	2.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	3.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	4.a	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	4.b	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	4.c	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	4.d	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	4.e	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	5.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:

		6.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
	<b>D.</b>	<b>DISCHARGE STRUCTURES</b>		
		1.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		2.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		3.a	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		3.b	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		3.c	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
	<b>E.</b>	<b>ESTIMATION OF RUNOFF</b>		
		1.a	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		1.b	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		1.c	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		2.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		3.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		4.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		5.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
	<b>F.</b>	<b>HYDRAULIC ANALYSIS &amp; DESIGN</b>		
		1.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
	<b>G.</b>	<b>CONVEYANCE SYSTEMS</b>		
		1.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		2.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:

		<input type="checkbox"/> NA	Explain:
	3.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	4.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	5.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	6.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	7.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	8.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
<b>H.</b>	<b>MATERIALS</b>		
	1.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
<b>I.</b>	<b>METHODS OF CONSTRUCTIONS &amp; BEST MANAGEMENT PRACTICES</b>		
	1.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	2.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	3.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	4.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
<b>J.</b>	<b>SEDIMENT &amp; EROSION CONTROL</b>		
	1.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	2.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	3.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	4.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
<b>IV.</b>	<b>FLOODPLAIN REGULATIONS</b>		
	<b>A.</b>	<b>GENERAL</b>	

<b>V.</b>	<b>ROADWAY DESIGN AND TECHNICAL CRITERIA</b>		
<b>A.</b>	<b>GENERAL</b>		
<b>B.</b>	<b>FUNCTIONAL CLASSIFICATION - URBAN ROADS</b>		
	1.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
<b>C.</b>	<b>SIDEWALKS, CURBS, GUTTERS, and DRIVEWAYS</b>		
	1.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	2.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	3.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	4.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	5.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	6.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	7.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
<b>D.</b>	<b>ROADWAY DRAINAGE</b>		
	1.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	2.a	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	2.b	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	2.c	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	3.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	4.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	5.a	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	5.b	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:

		<input type="checkbox"/> NA	Explain:
	5.c	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
<b>E.</b>	<b>HORIZONTAL ALIGNMENT</b>		
	1.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	2.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	3.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	4.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	5.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	6.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	7.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	8.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	9.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
<b>F.</b>	<b>VERTICAL ALIGNMENT</b>		
	1.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	2.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	3.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	4.a	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	4.b	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	4.c	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	4.d	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:

	5.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	6.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	7.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
<b>G.</b>	<b>MEDIAN TREATMENT</b>		
	1.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
<b>H.</b>	<b>ROADWAY SPECIFICATIONS</b>		
	1.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	2.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	3.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
<b>I.</b>	<b>BRIDGES</b>		
	1.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
<b>J.</b>	<b>UTILITY CORRIDORS</b>		
	1.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
<b>K.</b>	<b>LANDSCAPING REQUIREMENTS</b>		
	1.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
<b>L.</b>	<b>TRANSPORTATION IMPACT STUDIES</b>		
	1.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
<b>M.</b>	<b>TRAFFIC SIGNAL REQUIREMENTS</b>		
	1.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
<b>N.</b>	<b>SIGNS &amp; PAVEMENT MARKING REQUIREMENTS</b>		
	1.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	2.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	3.a	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:

		<input type="checkbox"/> NA	Explain:
	3.b	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	3.c	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	3.d	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	<b>O.</b>	<b>MONUMENTATION</b>	
	1.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	<b>P.</b>	<b>LIGHTING</b>	
	1.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	<b>Q.</b>	<b>BIKE LANES/PATHS</b>	
	1.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	<b>R.</b>	<b>WORK ZONE TRAFFIC CONTROL</b>	
	1.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	<b>S.</b>	<b>ACCESS MANAGEMENT CONTROL</b>	
	1.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	<b>T.</b>	<b>TRANSPORTATION DESIGN SPECIFICATONS</b>	
	1.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	2.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	3.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	4.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	<b>V.I</b>	<b>UTILITY DESIGN CRITERIA</b>	
	<b>A.</b>	<b>WATER DISTRIBUTION LINES</b>	
	1.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	2.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:

		3.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		4.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		5.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		6	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		7.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		8.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		9.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		10.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		11.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		12.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		13.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		14. a	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		14. b	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		15.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		16.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		17.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		18. a	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:

	18. b	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	18. c	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	18. d	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	18. e	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	18. f	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	19.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	20.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	21.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	22.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	23	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
<b>B.</b>	<b>SANITARY SEWER SYSTEM DESIGN CRITERIA</b>		
	1.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	2.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	3.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	4.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	5.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	6.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:

	7.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	8.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	9.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	10.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	11.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	12.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	13.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	14.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	15.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	16.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	17.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	18. a	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	18. b	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	18. c	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	19.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	20.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	21.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
<b>C.</b>	<b>STORM DRAINAGE SYSTEMS</b>		

		1.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		2.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		3.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		4.a	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		4.b	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		4.c	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		4.d	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		5.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		6.a	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		6.b	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		6.c	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		7.a	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		7.b	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		8.a	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		8.b	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		8.c	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		8.d	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		8.e	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
			<input type="checkbox"/> NA	Explain:
		8.f	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:

		<input type="checkbox"/> NA	Explain:
	8.g	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
<b>D. ALIGNMENT, DEPTH, and EASEMENTS</b>			
	1.	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	2.a	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	2.b	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	2.c	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	3.a	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	3.b	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	3.c	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	4.a	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	4.b	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	4.c	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	5.a	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	5.b	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:
	5.c	<input type="checkbox"/> Yes	<input type="checkbox"/> Deviation Requested:
		<input type="checkbox"/> NA	Explain:

Certified By: \_\_\_\_\_  
 (Signature of Professional Engineer)

Date: \_\_\_\_\_

Montana P.E. Number: \_\_\_\_\_

**Appendix H:**

**Checklist for Testing and Documentation Requirements for Infrastructure Improvements**

## CHECKLIST FOR TESTING & DOCUMENTATION REQUIREMENTS FOR INFRASTRUCTURE IMPROVEMENTS

All sections of the checklist must be completed. *The answer yes may be checked when all the requirements of the section being addressed are satisfied.* Where a yes answer cannot be given, a deviation must be requested or the applicant must explain why that section of the standard is not applicable. All deviation requests must be justified by the design engineer and supported with appropriate documentation. All infrastructure checklists must be signed and stamped by a professional engineer licensed in the state of Montana.

- A.     Yes    Deviation Requested  
       N/A   Explain
  
- B.     Yes    Deviation Requested  
       N/A   Explain
  
- C.     Yes    Deviation Requested  
       N/A   Explain
  
- D.     Yes    Deviation Requested  
       N/A   Explain
  
- E.     Yes    Deviation Requested  
       N/A   Explain
  
- F.     Yes    Deviation Requested  
       N/A   Explain
  
- G.     Yes    Deviation Requested  
       N/A   Explain
  
- H.     Yes    Deviation Requested  
       N/A   Explain
  
- I.     Yes    Deviation Requested  
       N/A   Explain
  
- J.     Yes    Deviation Requested  
       N/A   Explain
  
- K.     Yes    Deviation Requested  
       N/A   Explain

Certified By: \_\_\_\_\_  
(Signature of Professional Engineer)

Date: \_\_\_\_\_

Montana P.E. Number: \_\_\_\_\_

**Appendix I:**  
**Random Sampling Example**

## SAMPLING MATERIALS BY RANDOM NUMBER SAMPLING

1. SCOPE - This method provides a procedure, in the form of several examples, for selecting samples on an approximately random basis using a system of random numbers. To accomplish this selection, choose the random sample so that each unit of material (i.e., cubic yard, square yard, ton, etc.) has the same probability of being selected. Divide each material sampled into lots, and establish a frequency of sampling.

### 2. PROCEDURE -

2.1. Random numbers can be generated by some calculators by planting a seed number such as date, time of day, etc., expressed as a decimal between 0 and 1. Included in this method are two tables of random numbers for use. Enter the table in a random method, such as a blind placement of a pencil. After choosing the first random number in this manner, choose consecutive numbers, following a column (or row), until the entire table has been used. At that time, repeat the initial process of random entry into the table of numbers. This method will reduce the possibility of using a value from the table more than once.

2.2. Following are examples related to particular phases of highway construction:

#### 2.2.1. EXAMPLE NO. 1

In this example, select station numbers for density coring of a 0.75-in. nominal-maximum mixture. Specifications require four density cores for each 1000 tons of mixture placed. The subplot size is 1000 tons with a frequency of four cores per subplot. The subplot of mixture in question will be placed on a 12-ft.-wide lane that is 4545 ft. long. The lift thickness of the 0.75-in. nominal-maximum mixture is 3.0 in. The job starts at Station No. 0+00.

Since four density cores are required for the entire 4545-ft. length, obtain one core for each 1136.25 ft. of pavement. Use the following steps to determine the station number and offset for each density core:

2.2.1.1. Refer to the random number table (see p. 5 for example).

2.2.1.2. Enter the table at any point. Select four consecutive numbers from the random number table. Use these numbers for finding the station number of the core site in each 1136.25-ft. section.

Multiply each random number by 1136.25 to determine the station number at which to obtain the density core. After determining the

location of the first core, for each of the remaining cores, add increments of 1136.25 ft., increasing with each core, to provide locations throughout the entire subplot length.

SAMPLE NO.	RANDOM NUMBER CALCULATION	STATION NUMBER
1	$0.420 \times 1136.25 = 477.23 + 0.00 = 477$	4 + 77
2	$0.859 \times 1136.25 = 976.04 + 1136.25^* = 2112$	21 + 12
3	$0.011 \times 1136.25 = 12.50 + 2272.50 = 2285$	22 + 85
4	$0.762 \times 1136.25 = 865.82 + 3408.75 = 4275$	42 + 75

\*1136.25-ft. increments, as determined by the subplot length, provide resultant numbers throughout the entire subplot length.

According to Subsection 402.03.02 of the *Standard Specifications*, obtain cores no closer than three inches from the pavement edge or joint. To select the transverse distance from the pavement edge (left or right), select four additional consecutive numbers from the random number table (see p. 5 for example), and multiply each random number by 11.5 (12-ft. lane width minus the 0.25-ft. offset from each side). For this example, calculate the distance from 0.25 ft. inside of the right edge of the pavement.

SAMPLE NO.	RANDOM NO. CALCULATION	OFFSET FROM RIGHT EDGE
1	$0.062 \times 11.5 + 0.25 =$	1.0 ft.
2	$0.100 \times 11.5 + 0.25 =$	1.4 ft.
3	$0.409 \times 11.5 + 0.25 =$	5.0 ft.
4	$0.784 \times 11.5 + 0.25 =$	9.3 ft.

Therefore, from the calculations above, conform to the coring schedule given below for this subplot:

SAMPLE NO.	STATION NUMBER	OFFSET FROM RIGHT EDGE
1	4 + 77	1.0 ft.
2	21 + 12	1.4 ft.
3	22 + 85	5.0 ft.
4	42 + 75	9.3 ft.

With respect to this example, in other cases, the paving length and width will vary, but use the same procedure for obtaining random locations.

2.2.2. EXAMPLE NO. 2

In this example, select trucks to sample for running air content, slump, and concrete cylinders on Class AA Concrete for a bridge deck pour.

The pour will consist of 250 cubic yards of concrete. The trucks will be hauling 10 cubic yards each. The testing frequency is one test for each 50 cubic yards; therefore, perform five tests. There will be at least five tests required. Use the following steps to select the trucks to sample:

2.2.2.1. Refer to the random number table (see p. 5 for example).

2.2.2.2. Select five consecutive numbers from the random number table. Use these numbers to determine which trucks to sample. Multiply each number by 50 (a lot size of 50 cubic yards), and divide the answer by 10 (cubic yards per truck) to determine which trucks to sample.

SAMPLE NUMBER	RANDOM NUMBER	CALCULATED VOLUME (cubic yards)	TRUCK SAMPLED
1	0.007	$x 50 = 0.35 + 0 = 0.35 \div 10 = 0.04^*$	1st
2	0.922	$x 50 = 46.1 + 50^{**} = 96.1 \div 10 = 9.6$	10th
3	0.729	$x 50 = 36.5 + 100 = 136.5 \div 10 = 13.7$	14th
4	0.949	$x 50 = 47.5 + 150 = 197.5 \div 10 = 19.8$	20th
5	0.606	$x 50 = 30.3 + 200 = 230.3 \div 10 = 23.03$	24th

\*When this answer contains a decimal, always round upward to the next highest whole number to determine the truck number.

\*\*Add increments of 50 cubic yards (lot size), increasing with each sample, in order to provide sampling throughout the full 250 cubic yards.

2.2.3. EXAMPLE NO. 3

In this example, select the accumulated tonnage of Crushed Stone Base for gradation testing. The frequency for gradation testing of aggregate bases is one test per 2000 tons of material. Plan quantities show 10,000 tons of Crushed Stone Base exist on this project. This quantity will require five gradation tests.

Again, select five consecutive random numbers from the random number table (see p. 5 for example). Use these numbers to determine the accumulated tonnage at which to select the sample.

Multiply each number by 2000 to determine the accumulated tonnage for sampling. Add increments of 2000 tons (lot size), increasing with each sample, in order to provide sampling throughout the full 10,000 tons.

SAMPLE NUMBER	RANDOM NUMBER CALCULATION	ACCUMULATED TONNAGE
1	$0.658 \times 2000 = 1316 + 0 =$	1316
2	$0.747 \times 2000 = 1494 + 2000 =$	3494
3	$0.270 \times 2000 = 540 + 4000 =$	4540
4	$0.715 \times 2000 = 1430 + 6000 =$	7430
5	$0.418 \times 2000 = 836 + 8000 =$	8836

Obtain samples as near the above-listed accumulated tonnages as possible.

- 2.3. The system of selecting random samples can be related to periods of time, number of pieces, tons, etc. The key to randomness, using this method, relies heavily on the manner of entering the table. Do not use the same set of numbers repeatedly.

TABLE 1  
RANDOM NUMBERS

.600	.504	.248	.230	.996	.462	.422	.054	.224	.121
.116	.227	.802	.349	.241	.956	.079	.632	.126	.677
.098	.726	.507	.607	.963	.410	.572	.777	.237	.851
.147	.867	.802	.416	.370	.377	.775	.256	.348	.148
.644	.067	.001	.158	.702	.148	.667	.217	.421	.149
.310	.531	.520	.560	.888	<i>E.287</i>	.567	.251	.593	.571
.493	.235	.886	.178	.490	<i>X.007</i>	.640	.343	.894	.079
.788	.272	.484	.487	.277	<i>A.922</i>	.435	.716	.924	.304
.652	.523	.317	.601	.705	<i>M.729</i>	.669	.435	.984	.239
.816	.045	.423	.943	.227	<i>#.949</i>	.395	.931	.887	.242
.086	.585	.177	.851	.513	<i>2.606</i>	.911	.253	.669	.328
.689	.755	.027	.183	.024	<i>E.653</i>	.041	.512	.518	.910
.117	.029	.309	.017	.926	<i>X.747</i>	.584	.570	.212	.504
.700	.989	.980	.532	<i>E.640</i>	<i>A.270</i>	.610	.257	.996	.978
.321	.431	.370	.814	<i>X.420</i>	<i>M.715</i>	.548	.148	.953	.450
.515	.775	.759	.438	<i>A.859</i>	<i>#.413</i>	.689	.924	.350	.724
.543	.575	.633	.097	<i>M.011</i>	<i>3.170</i>	.357	.429	.899	.087
.629	.502	.503	.036	<i>#.762</i>	.280	.605	.518	.275	.017
.221	.882	.206	.415	<i>I.776</i>	.548	.520	.417	.253	.808
.751	.446	.189	.776	.465	.936	.970	.467	.371	.077
.553	.160	.464	.309	.298	.304	.613	.512	.816	.270
.384	.778	.284	.435	.246	.319	.078	.695	.152	.637
.969	.740	.102	.093	.055	.155	.225	.782	.226	.250
.085	.125	.750	.900	.991	.887	.993	.183	.096	.542
.667	.355	.784	.803	<i>E.072</i>	.206	.508	.385	.691	.127
.076	.968	.527	.749	<i>X.062</i>	.075	.526	.292	.176	.310
.788	.943	.091	.141	<i>A.100</i>	.040	.750	.870	.249	.345
.165	.422	.601	.095	<i>M.409</i>	.897	.963	.271	.770	.100
.472	.201	.558	.725	<i>#.734</i>	.025	.943	.040	.984	.011
.668	.708	.776	.490	<i>I.270</i>	.868	.658	.954	.916	.955

TABLE 1  
RANDOM NUMBERS

.600	.504	.248	.230	.996	.462	.422	.054	.224	.121
.116	.227	.802	.349	.241	.956	.079	.632	.126	.677
.098	.726	.507	.607	.963	.410	.572	.777	.237	.851
.147	.867	.802	.416	.370	.377	.775	.256	.348	.148
.644	.067	.001	.158	.702	.148	.667	.217	.421	.149
.310	.531	.520	.560	.888	.287	.567	.251	.593	.571
.493	.235	.886	.178	.490	.007	.640	.343	.894	.079
.788	.272	.484	.487	.277	.922	.435	.716	.924	.304
.652	.523	.317	.601	.705	.729	.669	.435	.984	.239
.816	.045	.423	.943	.227	.949	.395	.931	.887	.242
.086	.585	.177	.851	.513	.606	.911	.253	.669	.328
.689	.755	.027	.183	.024	.658	.041	.512	.518	.910
.117	.029	.309	.017	.926	.747	.584	.570	.212	.504
.700	.989	.980	.532	.640	.270	.610	.257	.996	.978
.321	.431	.370	.814	.420	.715	.548	.148	.953	.450
.515	.775	.759	.438	.859	.418	.689	.924	.350	.724
.543	.575	.633	.097	.011	.170	.357	.429	.899	.087
.629	.502	.503	.036	.762	.280	.605	.518	.275	.017
.221	.882	.206	.415	.776	.548	.520	.417	.253	.808
.751	.446	.189	.776	.465	.936	.970	.467	.371	.077
.553	.160	.464	.309	.298	.304	.613	.512	.816	.270
.384	.778	.284	.435	.246	.319	.078	.695	.152	.637
.969	.740	.102	.093	.055	.155	.225	.782	.226	.250
.085	.125	.750	.900	.991	.887	.993	.183	.096	.542
.667	.355	.784	.803	.072	.206	.508	.385	.691	.127
.076	.968	.527	.749	.062	.075	.526	.292	.176	.310
.788	.943	.091	.141	.100	.040	.750	.870	.249	.345
.165	.422	.601	.095	.409	.897	.963	.271	.770	.100
.472	.201	.558	.725	.784	.025	.943	.040	.984	.011
.668	.708	.776	.490	.270	.868	.658	.954	.916	.955

TABLE 2  
RANDOM NUMBERS

.605	.973	.319	.294	.236	.572	.216	.973	.931	.870
.720	.497	.679	.634	.299	.578	.743	.835	.062	.200
.918	.295	.295	.777	.854	.281	.867	.864	.374	.748
.294	.396	.441	.321	.655	.191	.205	.899	.807	.186
.089	.927	.802	.530	.937	.257	.530	.005	.539	.999
.591	.409	.668	.967	.993	.920	.812	.018	.578	.618
.494	.808	.410	.097	.633	.149	.547	.895	.829	.953
.021	.699	.597	.286	.982	.953	.913	.422	.291	.979
.926	.085	.758	.624	.491	.694	.496	.490	.949	.457
.351	.709	.461	.093	.498	.377	.639	.801	.388	.334
.329	.857	.949	.550	.095	.906	.596	.462	.891	.758
.126	.525	.834	.677	.045	.699	.568	.147	.902	.664
.572	.101	.066	.147	.069	.006	.979	.259	.765	.460
.728	.374	.402	.679	.601	.492	.002	.512	.529	.089
.524	.346	.698	.133	.013	.907	.992	.453	.883	.684
.176	.870	.306	.179	.071	.854	.086	.414	.973	.785
.031	.437	.512	.107	.842	.507	.458	.018	.881	.506
.826	.110	.065	.878	.182	.460	.442	.504	.075	.027
.945	.640	.283	.330	.163	.496	.767	.543	.921	.923
.948	.890	.677	.328	.075	.752	.207	.692	.268	.204
.232	.639	.425	.434	.795	.329	.941	.026	.867	.035
.896	.502	.074	.092	.203	.625	.541	.505	.835	.021
.643	.838	.357	.294	.592	.440	.676	.186	.304	.212
.552	.892	.843	.851	.685	.847	.963	.189	.604	.634
.623	.955	.024	.718	.534	.978	.962	.208	.645	.811
.988	.648	.182	.983	.128	.784	.606	.138	.208	.337
.326	.500	.874	.958	.826	.523	.462	.823	.955	.773
.130	.545	.756	.164	.418	.817	.707	.882	.984	.903
.907	.419	.705	.597	.655	.566	.546	.738	.614	.373
.859	.365	.476	.351	.154	.458	.645	.303	.631	.832