

# **MINIMUM DESIGN STANDARDS**

**For**

**The**

**CITY OF KINGSPORT**



**CITY OF KINGSPORT  
MINIMUM  
DESIGN STANDARDS  
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## **1. Introduction**

### **1-1 Purpose**

The intent of this document is to provide the design professional with guidelines and requirements for designing projects within the bounds of the City of Kingsport.

The requirements contained in this document are in addition and supplementary to all applicable Federal and State laws and regulations, and ordinances of the City of Kingsport, including the codes adopted therein.

### **1-2 Definitions**

**ARCHITECT** – An individual licensed and registered by the State of Tennessee to practice architecture in the State of Tennessee.

**CITY ENGINEER** - The City Engineer of the City of Kingsport, an assistant or other representative duly authorized by the City Engineer.

**CONTRACTOR** - The successful Bidder to whom a contract has been awarded and who has executed the contract documents.

**EASEMENT** - A property right to use or control real property of another.

**ENGINEER** – An individual licensed and registered by the State of Tennessee to practice engineering in the State of Tennessee.

**INSPECTOR** - The Construction Inspector, or other representative duly authorized by the City Engineer.

**INVERT** - The lowest point in the internal cross section of a pipe or other culvert.

**PLANS** - The approved plans, profiles, standard details, supplemental plans, and working drawings, which show the location, dimensions, and details of the work to be done.

**RIGHT-OF-WAY** - A portion of land being used or in the future dedicated to use as a street, road, thoroughfare or crosswalk, pipeway, drainage canal, and/or similar use and designated by means of a right-of-way line.

**SPECIFICATIONS** - The general term comprising all the directions, provisions, and requirements contained or referred to in the document entitled "City of Kingsport Construction Specifications", of latest issue.

**SUBGRADE** - That portion of the roadbed prepared as a foundation for

the pavement structure.

TRAFFIC ENGINEER - The individual with supervisory responsibility over the Traffic Engineering Division of the City of Kingsport.

1-3 Abbreviations

|        |                                                                    |
|--------|--------------------------------------------------------------------|
| AASHTO | American Association of State Highway and Transportation Officials |
| A.B.S. | Acrylonitrile Butadiene Styrene                                    |
| A.D.A. | Americans with Disabilities Act                                    |
| ADT    | Average Daily Traffic                                              |
| A.F.F. | Above Finish Floor                                                 |
| ANSI   | American National Standards Institute                              |
| ASTM   | American Society of Testing and Materials                          |
| AWWA   | American Water Works Association                                   |
| F      | Fahrenheit                                                         |
| ft.    | foot                                                               |
| gpd    | gallons per day                                                    |
| gpm    | gallons per minute                                                 |
| ID     | Internal Diameter                                                  |
| lbs.   | pounds                                                             |
| MSL    | Mean Sea Level                                                     |
| MUTCD  | Manual on Uniform Traffic Control Devices                          |
| N.E.C. | National Electric Code                                             |
| NFiPA  | National Fire Protection Association                               |
| OD     | Outside Diameter                                                   |
| OSHA   | Occupational Safety and Health Association                         |

|        |                                                                       |
|--------|-----------------------------------------------------------------------|
| P.C.   | Point of Curvature                                                    |
| PE     | Professional Engineer                                                 |
| PLS    | Professional Land Surveyor                                            |
| ppm    | parts per million                                                     |
| psi    | pounds per square inch                                                |
| P.T.   | Point of Tangency                                                     |
| PVC    | Polyvinyl Chloride                                                    |
| P.V.C. | Point of Curvature on Vertical Curve                                  |
| P.V.T. | Point of Tangency on Vertical Curve                                   |
| Qmax   | maximum discharge                                                     |
| Qmin   | minimum discharge                                                     |
| RH     | Relative Humidity                                                     |
| SCS    | Soil Conservation Service                                             |
| sec.   | second                                                                |
| s.f.   | square feet                                                           |
| SU     | Single Unit Truck (with 20 feet wheelbase and 30 foot overall length) |
| TDEC   | Tennessee Division of Environment and Conservation                    |
| TDOT   | Tennessee Division of Transportation                                  |
| TOSHA  | Tennessee Occupational Safety and Health Administration               |
| UL     | Underwriters' Laboratories, Inc.                                      |
| V      | Volts                                                                 |
| VAC    | Voltage - Alternating Current                                         |

## **2. General Provisions**

### **2-1 General**

All construction on public infrastructure, all infrastructure that will be public and all infrastructure that is likely to become public shall conform to the requirements and dimensions on the approved construction plans, latest revisions of the City of Kingsport Construction Specifications, the Code of Ordinances of the City of Kingsport, The Kingsport Planning Region Subdivision Regulations, applicable Federal and State regulations, or any other requirements as contained herein. The design of streets, water systems, storm drainage systems, and grading plans shall be signed and sealed by a Professional Engineer, Professional Land Surveyor, Architect or Landscape Architect currently registered with the State of Tennessee. All standards and regulations shall be maintained unless good engineering practices determine otherwise. These modifications will be determined by the City of Kingsport Public Works Department staff/management.

### **2-2 Inspections**

The Contractor shall provide the necessary personnel and equipment required as a part of the inspection process. The presence of the City Engineer or Inspector at the work site shall in no way lessen the Contractor's responsibility for conformity with the plans and specifications. Should the City Engineer or Inspector accept materials, or work that does not conform with plans and specifications, whether from lack of discovery or for any other reason, it shall in no way prevent later rejection or corrections to the unsatisfactory materials or work when discovered. The Contractor shall have no claim for losses suffered from any necessary removals or repairs resulting from the unsatisfactory work.

Any work which has been covered without the Inspector's approval, shall, at the Inspector's request, be uncovered and be made available for inspection at the Contractor's expense. Work performed before or after City staff's normal work hours or during the weekend or City Holidays shall be approved in advance by the City Engineer or their designee and shall comply with the City Code and shall include only such tasks that do not require observation by an Inspector.

### **2-3 Maintenance of Traffic**

#### **2-3.1 General**

When construction occurs in a traffic zone, traffic control devices shall be erected, maintained, relocated, and removed in accordance with the plans, specifications, and MUTCD. This requirement shall apply for all construction occurring on public streets, and right of way including construction or repairs by utility companies. The MUTCD referred to in this provision shall be the current edition of

the Manual on Uniform Traffic Control Devices for Streets and Highways. The current edition shall be the edition current at the time of construction.

Traffic control devices shall include but not be limited to signs, drums, barricades, cones, delineators, flashing arrow panels, temporary guardrail, temporary concrete median barrier, vehicle-mounted temporary impact attenuators, pavement marking, raised reflective pavement markers, flaggers and pilot vehicles.

The Contractor/Developer shall be responsible for notification to all emergency service agencies shall occur prior to beginning construction. These agencies consist of the Kingsport Fire Division and the Kingsport Police Division Communications Division.

#### 2-3.2 Materials

Unless otherwise required, materials used in the fabrication and installation of construction traffic control devices shall be in accordance with the applicable provisions of the MUTCD.

#### 2-3.3 Installation and Maintenance

Existing public streets or highways shall be kept open to traffic at all times by the Contractor unless permission to close the street or sidewalk or mobility path, or portions thereof, is granted by the City Traffic Engineer, the Fire Chief, the Police Division, the Public Works Division, TDOT's Division Traffic Engineer, and/or a designated representative, a minimum of 72 hours prior to any closing or partial closing.

Work on any project shall not start until all traffic control devices required for the particular work activity are properly installed. Traffic control devices shall be properly maintained, relocated as necessary, cleaned and operated during the time they are in use. During periods when use of the devices is not warranted, they shall be removed from the work area, covered, or otherwise positioned so that they do not convey their message to the traveling public.

The location, legends, sheeting, dimension, number of supports, and horizontal and vertical placement of warning signs, barricades, and other traffic control devices shall be as required by the approved plans or the MUTCD. Weeds, brush, trees, construction materials, equipment, etc. shall not be allowed to obscure any traffic control device in use.

Competent and properly trained, attired and equipped flaggers, using "stop" and "slow" paddles shall be provided when two-way

traffic cannot be maintained or as determined by the City Traffic Engineer or Construction Inspector.

The Contractor shall assume full responsibility for the continuous and expeditious maintenance or replacement of all construction warning signs, barricades, and other traffic control devices. The Contractor shall continuously review and maintain all traffic control measures to assure that adequate provisions have been made for the safety of the public and workers. Failure to maintain all traffic control devices in a satisfactory condition shall be cause for suspension of construction operations until proper traffic control is re-established.

## 2-4 Permits

During the course of designing, and prior to construction of a utility or street project, all necessary permits from the City, State, or Federal Government shall be obtained. City issued permits are described herein. Coordinate with all other required permits with applicable local, state, or federal agencies.

### 2-4.1 Grading Permit

A Grading Permit is required whenever the denuded area on a project is to be 2,500 square feet or greater. A Grading Permit may be issued after plans are approved and prior to any grading or site work. The Grading Permit is issued by the Building Division. If the proposed project disturbs 10,000 square feet or greater, an Erosion Prevention and Sediment Control Plan for the project shall be turned into the City at the time of site plan submittal. In certain situations, a Grading Permit may not be required on City, County, State or Federal construction projects.

### 2-4.2 Driveway Permit

A driveway entrance permit is required prior to the construction or modification of all driveways or connections within the right of way of a City maintained street. The driveway shall be indicated on the site plan and shall conform to City Standards and Subdivision Regulations. The permit application shall be obtained from the City's Traffic Division.

### 2-4.3 Blasting Permit

A Blasting Permit is required any time there is to be transportation, use or storage of explosive materials. This permit is required a minimum of 24 hours in advance of any blasting operations and shall be obtained from the State of Tennessee.

2-4.4 Right of Way Disturbance Permit

A Right of Way Disturbance Permit shall be obtained from the Public Works Division for all utility cuts, sidewalk modification, utility pole locations/installations/borings, trenching, roadway widening, curb and gutter, and storm drainage connections to the City storm drainage system. All repairs proposed for construction shall be in conformance with the City of Kingsport Construction Specifications.

2-4.5 Demolition Permit

A Demolition Permit shall be obtained from the Building Division for any and all demolition of commercial or residential buildings.

2-5 Acceptance Procedures

All improvements intended for public maintenance are eligible for acceptance by the City of Kingsport following the procedures outlined below:

- 2-5.1 After the installation of improvements in accordance with approved plans and City of Kingsport Construction Specifications, the Owner/Developer or designee shall contact the Engineering Division and schedule a completion inspection.
- 2-5.2 The Engineering Division will accept the improvements or respond with a punch list within 30 days of the request.
- 2-5.3 The Owner/Developer or designee shall complete all items indicated on the punch list, and any additional items noted, within 60 days or the punch list will be void. The Owner/Developer or designee shall then request another completion (final) inspection.
- 2-5.4 Upon the acceptable completion of all punch list items and payment of any outstanding fees, the Owner/Developer or designee will receive an acceptance letter from the City of Kingsport Engineering Division. This acceptance begins a warranty for materials and workmanship for 1 year from the date of acceptance.
- 2-5.5 Upon completion of, or just prior to the end of, the warranty period, the Owner/Developer or designee shall request a final inspection from the Engineering Division.
- 2-5.6 The Engineering Division will respond with final acceptance or a punch list on workmanship or materials within 30 days of the request.
- 2-5.7 The Owner/Developer or designee shall complete all items indicated on the punch list, and any additional items noted within

60 days or the punch list will be void. The Owner/Developer or designee shall then request another final inspection.

2-6 License Requirements

All contractors performing any construction activity involving the City of Kingsport shall be licensed to practice contracting in the State of Tennessee. The contractor shall be classified in the appropriate area of license for the type construction to be performed and shall not perform construction activity which exceeds the limitations of the designated contractor's license.

2-7 Retaining Walls

All retaining walls with a height of 4 feet or greater shall be designed by a professional engineer and shall be signed and sealed. The design of retaining walls within the public right of way shall be submitted to the Engineering Division for approval prior to construction.

Any retaining wall meeting the height criteria listed herein and located on private property shall be submitted to the City's Building Division and shall comply with the current adopted City Building Code. All necessary permits (e.g. building permit) shall be obtained prior to any construction associated with the retaining wall.

2-8 Bridges

All vehicular and pedestrian bridges shall be designed by a Professional Engineer and shall be properly signed and sealed. The design shall be submitted to the Engineering Division for approval prior to construction. All necessary permits (e.g. those required by the U.S. Army Corps of Engineers) shall be obtained prior to construction.

Vehicular bridges shall be designed to meet or exceed all local, state, and federal highway loading requirements.

2-9 Disciplines Not Covered

These Standards are not intended to be all-inclusive, and should not be used in lieu of applicable State and Federal guidelines. When a conflict arises between City, State, or Federal guidelines, the more stringent shall govern.

Disciplines not covered under this Standard include, but are not limited to, Structural Engineering, Building Codes, Architectural Design, Electrical, HVAC, Life Safety, Fire Safety, and other applicable laws or requirements as determined by the City of Kingsport.

### **3. Streets**

#### **3-1 General**

All work and materials shall conform to the latest edition of the City of Kingsport Construction Specifications, Kingsport Planning Region Minimum Subdivision Regulations, latest City adopted revision of the International Building Code, any applicable State and Federal regulations, and/or the Tennessee Division of Transportation Standard Specifications for Road and Bridge Construction, as determined by the City Engineer.

#### **3-2 Earth Work Requirements**

##### **3-2.1 Grading the Right-of-Way**

The entire width of the right-of-way shall be graded to conform with a cross-section that will have a maximum of +/-5% and a minimum of +/-2% slope extending from the back side of roadway to the right-of-way limit.

##### **3-2.2 Side Slopes and Embankments**

The maximum cut and fill slope permitted shall be 50% or two horizontal units to one vertical unit (2:1). Any terrain with a slope greater than 2:1 shall be designed by a professional engineer and approved by the City Engineer. The City Engineer withholds the right to require a geotechnical report for any slope that could endanger the welfare of the general public.

Fill embankments shall be formed of suitable material placed in successive layers not to exceed more than 6 inches in depth for the full width of the roadway cross-section, and 12 inches in the slope and embankment area. No stumps, trees, brush, rubbish or other unsuitable materials or substances shall be placed in the embankment. Each successive layer shall be thoroughly compacted by a sheepsfoot tamping roller, 10-ton minimum power roller, pneumatic-tired roller, or other standard method approved by the City Engineer.

Spreading and compacting of material shall be performed in accordance with the pertinent section of the Tennessee Division of Transportation Standard Specifications for Road and Bridge Construction, of latest issue.

##### **3-2.3 Roadway Subgrade**

The subgrade shall be prepared in reasonably close conformity with the lines and grades as shown on the approved plans and as staked correctly in the field. The subgrade shall be proof-rolled with a loaded tandem axle dump truck (to the approval of the City

Engineer or his designee), and soft areas which show will be undercut and brought to the lines and grades by spreading and compacting suitable material in sufficient quantity. Compaction of the subgrade shall conform to the pertinent section of the Tennessee Division of Transportation Standard Specifications for Road and Bridge Construction, of latest issue.

Excavation and undercutting shall be completed per the requirements of the latest revision of the Tennessee Division of Transportation Standard Specifications for Road and Bridge Construction, Section 203.

The Contractor shall construct the final road geometry, elevations, and typical section as shown on the approved Plans. Unless otherwise approved by the City Engineer, the final grade between the back of curbs and the right-of-way shall slope  $\frac{1}{4}$ -inch vertical per 1 foot horizontal toward the top of the curb.

The Contractor shall be responsible for having a registered Geotechnical Engineer provide appropriate compaction testing of the excavation and undercut. Compaction testing shall be taken at a frequency determined by the Geotechnical Engineer, but the City Engineer reserves the right to require tests to be taken in questionable areas. The Geotechnical Engineer shall provide the City with compaction testing results and certify that all excavations were constructed per TDOT and City of Kingsport requirements. The Geotechnical Engineer shall be a licensed engineer and place his seal and signature on the certification. The certification shall be received by the City Engineer prior to construction of any pavement sections, curbs, gutters or other structures on the excavations.

Prior to placement of any pavement base material, the elevation of the subgrade shall be checked by the owner's engineer or surveyor, and the engineer or surveyor shall certify that the lines and grades of the approved plans have been constructed.

#### 3-2.4 Trenching

Trenches for storm water pipe, water lines, sanitary sewer lines, natural gas lines, electric power and telecommunications lines that are within the limits of an improved surface shall be back-filled with crushed stone (pug). The crushed stone material shall be placed in layers not to exceed 6 inches in depth, and each successive layer shall be tamped with a mechanical tamper specifically designed for the direct purpose of compacting material in confined space, such as trenches.

### 3-3 Design Speed and Sight Distance

#### 3-3.1 For Residential Streets

The design speed sight distances for streets serving predominantly residential areas shall comply with the design standards set forth in Article 4 of the Subdivision Regulations.

#### 3-3.2 For Non-Residential Streets

The design speed for non-residential streets will be determined by considering factors such as the proposed or intended land use along the street, the level of safety and convenience proposed or desired for the street, and the vehicle classification, volume and pedestrian mix likely to use the street. The sight distances for stopping, passing, and intersections will meet or exceed the limits specified in the latest edition of the American Association of State Highway and Transportation Officials', A Policy on Geometric Design of Highways and Streets, the Green Book.

### 3-4 Alignment

#### 3-4.1 Horizontal Alignment

The minimum radii for residential and non-residential streets shall comply with the American Association of State Highway and Transportation Officials', A Policy on Geometric Design of Highways and Streets, the Green Book. Residential streets may conform to the low speed minimum design criteria.

#### 3-4.2 Vertical Alignment

Minimum Vertical Curve Length: All changes in grade shall be connected by vertical curves of minimum length as established by the design speed and required sight distance. The relationship between the K value and the length of a vertical curve shall be based on the minimum K values for vertical alignment as established in the American Association of State Highway and Transportation Officials', A Policy on Geometric Design of Highways and Streets, the Green Book.

#### 3-4.3 Street Grades

Street grades on collector and arterial streets shall not exceed 12 percent. Grades on other streets may exceed 12 percent but not 15 percent. The minimum grade shall not be less than 0.5 percent.

### 3-5 Pavement Design

A minimum pavement section is established by these standards for local, Collector, and light industrial streets. To determine if the minimum pavement section can be utilized, a series of soil tests shall be conducted

and submitted. Each construction plan shall be submitted with a sufficient amount of soil data and a pavement design based on application of the measured soil data.

3-5.1 Minimum Number of Soil Samples

The minimum required soil data shall include at least one test for each discrete classification of subgrade to be enumerated within the roadway construction lines. The location of each test shall be indicated on the site plan or present layout sheet.

3-5.2 Minimum Required Soil Tests

Each soil test shall include a Standard Proctor Test (ASTM D 698); Atterberg Limit Test (ASTM D 423 and D424); Unified Soil Classification; and a California Bearing Ratio Test (ASTM D 1883). The test results shall be submitted as supplemental data with the site plan or construction plans and shall indicate the date, time, place of testing, and the person or firm supervising the test.

3-5.3 Minimum Pavement Section

The minimum pavement section shall be as follows:

A. For Collector, Non – Residential, Alleys, Lanes, Local, Residential, and Marginal Access Streets:

1. Asphalt Concrete Surface Layer and Asphalt Concrete Binder Layer over a Mineral Aggregate Base:

As defined in the Subdivision Regulations for each applicable street designation cross section and pavement schedule.

2. Full Depth Asphalt concrete:  
1-1/4 inches of surface mix  
1-1/2 inches of binder mix  
1-3/4 inches of asphalt treated base mix  
2-1/2 inches of asphalt treated drainage mix
3. Portland Cement Concrete:  
7 inches of portland cement concrete  
2 inches of mineral aggregate base material

3-6 Curb and Gutter Section

With the exception of the residential rural street described in the Subdivision Regulations, all streets shall have as a part of their pavement section a portland cement concrete combined curb and gutter. Three types of combined curb and gutter may be used: a vertical faced (standard), a mountable type, and rollover curb. See Section 3-9.4 for discussion of median curbs. Details of the dimensions of these curbs are shown in the Construction Specifications. Non-anchored/stand alone extruded curb shall not be permitted.

3-7 Stormwater Manholes or Catch Basins

Stormwater manholes or catch basins will be TDOT standard structures as shown in the TDOT Standard Roadway and Structure Drawings manual of latest revision.

3-8 Sidewalks / Mobility (Shared Use) Paths, and Bicycle Paths

3-8.1 Sidewalks and Mobility Paths

Sidewalks shall be provided as specified in the Subdivision Regulations and in Table 1 of this document. Sidewalks shall be a minimum of 5 feet wide and 4 inches thick - concrete, and mobility paths shall be a minimum of 8 feet wide and 4 inches thick (concrete) or 2 inches thick (asphalt). In areas of high volume pedestrian traffic, additional width may be required.

The City Engineer will determine whether concrete or asphalt will be used for mobility path material.

Where concrete is used, both shall be constructed of no less than 4,000 psi portland cement concrete. The subgrade shall be adequately graded and shall be compacted with a mechanical tamper specifically designed for the direct purpose of compacting subgrade material. The subgrade density shall conform to the compaction requirements of the TDOT Standard Specifications for Road and Bridge Construction, of latest issue. Refer to the Construction Specifications for more detail on how to finish and joint the concrete. The sidewalk area of driveway aprons shall have a minimum thickness of 6 inches. The thickness of the asphalt apron area shall be 4 inches.

3-8.2 Bicycle Paths

Bicycle paths shall be a minimum of 10 feet wide and may be constructed of asphalt concrete or portland cement concrete, with pavement section thicknesses as follows:

- A. Asphalt Concrete and Mineral Aggregate Base:  
2 inches of asphalt concrete surface mix (4 inches in driveway apron) with 4 inches of mineral aggregate base.
- B. Portland Cement Concrete on subgrade:  
4 inches of 4,000 psi portland cement concrete (6 inches in driveway apron) with 2 inches of mineral aggregate base.

The subgrade for both of these pavements shall be adequately graded and shall be compacted with a mechanical tamper specifically designed for the direct purpose of compacting subgrade material. The subgrade density shall conform to the compaction requirements of the TDOT Standard Specifications for Road and Bridge Construction, of latest issue.

### 3-9 Medians

#### 3-9.1 General

Medians are a desirable feature and where medians are planned, they shall be of adequate width to “shadow” a single unit design vehicle. A median shall not be less than 15 feet wide as measured from the face of curb located on each side of the median. However, where a left turn or U turn lane occupies a portion of a median, the medial separator shall be no less than 4 feet wide as measured from the face of curb located on each side of the medial separator. To comply with these requirements, in some designs the width of a median will transition to a wider cross-section in the vicinity of turn lanes and then transition back to the minimum width between turn lanes or intersections. The median cross-section may be raised or depressed, and may be landscaped. However, in no case shall the ground, plants, shrubs, or trees block the stopping or the intersection sight distances that are required for the specified design speed.

#### 3-9.2 Spacing

Median openings, cross streets or high traffic volume driveways shall be spaced no closer than 500 feet as measured from center of opening to the center of the adjacent opening on City roadways. Median opening spacing on state routes are determined by the Tennessee Department of Transportation (TDOT).

#### 3-9.3 Geometric Design

The geometric design of medians shall comply with the American Association of State Highway and Transportation Officials, A Policy on Geometric Design of Highways and Streets, latest edition, the Green Book.

#### 3-9.4 Median Curbs

Medians shall be curbed with a mountable curb as shown in the Construction Specifications. On non-residential streets the median curb may be a detached mountable curb conforming to the types approved by TDOT.

### 3-10 Safety Features

#### 3-10.1 General

Roadway hazards that may require shielding by a roadside barrier are classified in two categories: embankment hazards and fixed objects.

The design of guardrails shall be in accordance with the TDOT Standard Roadway and Structure Drawings manual of latest revision.

#### 3-10.2 Embankments

Embankment criteria for warranting guardrail in a fill section shall depend on the height and slope of embankments as specified in the TDOT Standard Roadway and Structure Drawings manual of latest revision, and the American Association of State and Transportation Official's Roadside Design Guidelines, of latest issue.

#### 3-10.3 Fixed Objects

A clear, unobstructed, flat roadside is highly desirable. When these conditions cannot be met, criteria to establish barriers needed for shielding roadside objects are necessary. The removal of fixed objects should be considered as the first alternative. If it is not feasible or possible to remove or relocate a hazard, then a barrier may be necessary. A barrier should be installed only if it is clear that the barrier offers the least hazard potential. Refer to the TDOT Standard Roadway and Structure Drawings manual of latest revision and the American Association of State and Transportation Official's Roadside Design Guidelines, of latest issue, for roadside clear zone and barrier requirements. Residential streets of the classification of minor collector and lower may be exempt from the clear zone requirements. However, this exemption should not preclude proper professional judgment when designing the roadside.

#### 3-10.4 Vertical Clearance

Permanently anchored overhead objects such as bridges shall have a minimum vertical clearance per the latest edition of AASHTO, as measured from the crown of the pavement to the lowest portion of an overhead obstacle located within the limits of the sidewalks on

each side of the street. The minimum vertical clearance shall be 10 feet for a bicycle path as measured from the crown of the path to the lowest portion of the overhead obstacle located within 5 feet of each edge of the bicycle path. Overhead traffic signals shall meet the minimum vertical clearance specified in the MUTCD of latest edition.

#### 3-10.5 Lateral Clearance

Lateral clearance between the curb face and the closest part of any fixed object not shielded by guardrail shall be a minimum of:

2 feet – Urban with low vehicle speed (under 30 mph),  
10 feet – Other Urban (Vehicle speed between 30 and 40 mph),  
and as per the TDOT Standard Roadway and Structure Drawings manual of latest revision for vehicle speed above 40 mph.

Mailboxes and mailbox support structures constructed as a fixed object will be exempt from this standard only along streets classified as residential by the Zoning Regulations of Kingsport. Fixed object mailboxes shall meet this standard when located on all other street classifications.

## 4. Traffic

### 4-1 Traffic Impact Study Requirements

#### 4-1.1 Criteria for a Traffic Impact Study

To adequately assess the impacts of any development proposal on the existing and planned transportation system, a Traffic Impact Study will be required, given any of the following conditions:

- A. Adjacent Roadway ADT:  
A traffic impact study shall be required for any development proposal for new development or redevelopment of an existing site that is proposed to add over 750 new trips to the existing roadway network.
- B. Minimum Peak Hour Volume:  
A traffic impact study shall be required if any development proposal for new development or redevelopment of an existing site will generate 100 or more added peak-direction trips to or from the site during the adjacent roadway's peak hours or the development's peak hour.
- C. Previous Traffic Studies:  
Any development proposal for new development or redevelopment of an existing site with a previous traffic impact study that is more than 1 year old will require an updated traffic impact study.
- D. Any new development which generates less than 750 trips per day will still need to include the following on submitted plans:
  - I. Intersection
    - a. Description of site including a location map
    - b. Type of project
      - 1. If residential, number and type of units
      - 2. If commercial or office, include square footage and occupancy
    - c. Site plan with access points shown to scale
  - II. Existing Conditions
    - a. Distance from nearest roadway intersection in both directions
    - b. Distance to nearest drive or access points in both directions
    - c. Location shown relative to opposing street, driveways, or access Points

- III. Proposed Conditions
  - a. Width, radius, and markings of proposed street, driveway, or access point
  - b. Proposed improvements adjacent to access point including but not limited to acceleration, deceleration lanes, and pavement marking adjustments

4-1.2 Preliminary Traffic Impact Study

A preliminary traffic impact study may be required to evaluate the traffic impacts of any development proposal required to undergo a concept review. The preliminary traffic impact study shall include the information required in Subsections 4-2.1 through 4-2.20 of this document.

4-1.3 Responsibility for the Traffic Impact Study

The applicant for a proposed development will be responsible for completing the Traffic Impact Study, with the City serving in a review and approval capacity.

4-1.4 Preparation of the Traffic Impact Study

An Engineer with adequate experience and expertise in transportation engineering shall prepare the Traffic Impact Study. The Engineer shall certify the study by placing and validating his professional seal on the report cover.

4-1.5 Coordination with the City

Transportation consultants and engineers preparing traffic studies shall discuss proposed development projects with the Traffic Engineering Division prior to initiating the study. Issues to be discussed include, without limitation, the major thoroughfare plan, the definition of the study area, relevant sub area plans, methods for projecting build-out volumes, background traffic conditions, trip generation, directional distribution of traffic, and trip assignment. The Traffic Engineering Division, prior to study preparation, shall approve these aspects of the Traffic Impact Study.

#### 4-2. Traffic Impact Study Format

For development proposed to add more than 750 trips per day.

##### 4-2.1 Study Requirements

The information provided in the Traffic Impact Study shall include the following sections as outlined below. The study shall be typed and bound, and clearly identify the data and information in the appropriate sections. In addition, the study shall contain a table of contents, lists of figures, and tables, and shall identify any map pockets and included drawings.

##### 4-2.2 Introduction

The Traffic Impact Study shall provide an introduction with an overview and discussion of the project or development proposal.

##### 4-2.3 Site Location and Zoning

Include a vicinity map detailing the property location, a conceptual site plan reflecting the boundaries of the project or development, and information detailing the designated zoning district, general terrain and physical features of the site and the surrounding area.

##### 4-2.4 Study Area Boundaries

Include the Study Area Boundaries as determined based on discussions with the Traffic Engineering Division, and include all roadways and transportation routes providing access to the site and the surrounding transportation system.

##### 4-2.5 Existing Area Street System Description

Describe and include roadway orientations, functional classifications and geometries, intersection geometries, and traffic controls, including without limitation signage and striping, speed limits, parking restrictions, sight distances, transit routes, the presence of bicycle and pedestrian facilities, and any other related traffic operations information and improvements approved or planned by government agencies. For identified improvements scheduled by government agencies, include the nature of the improvements, extent, implementation schedule, and the responsible agency or funding source.

- 4-2.6 Existing and Projected Roadway and Intersection Traffic Volumes  
Include diagrams that map existing traffic volumes, and each variation of projected traffic volumes, for all roadways and intersections within the study area.
- 4-2.7 Existing and Proposed Site Uses  
Include an identification of the existing land use and proposed land use (or the highest potential land use) based on zoning and maximum trip generation where a specific use has not been determined. If rezoning is proposed, the study shall provide a comparison between the highest trip generation uses for the existing zoning and the highest trip generation uses for the proposed zoning.
- 4-2.8 Existing and Proposed Land Uses in Vicinity of the Site  
Document any vacant land or potential redevelopment that may result in a change in traffic volume conditions within the study area during each time period studied. Perform and provide trip generation calculations on these parcels and include the trips generated from these parcels in the trip volume diagrams and level of service analyses for each appropriate time period studied.
- 4-2.9 Travel Demand Management Strategies  
include an outline of travel demand management strategies to mitigate traffic impacts created by proposed development and measures for promoting alternate modes of travel, including but not limited, to the following:
- A. Walking, biking, and use of transit services to access a proposed development, and
  - B. Include features that will increase convenience for using alternate modes and that will reduce multiple trips to and from the site, such as:
    - 1. transit shelter and bench amenities,
    - 2. connections to offsite pedestrian, bicycle, and transit systems, and
    - 3. vehicular, pedestrian, bicycle and transit connections to adjacent vacant and developed property.

#### 4-2.10 Trip Generation

Traffic estimates for the proposed project and potential developed or redeveloped properties in the study area shall be obtained by performing trip generation calculations using the procedures outlined in the most current edition of the Institute of Transportation Engineers' (ITE) Trip Generation Manual. If adequate Trip Generation Manual data is not available for a specific land use, the procedures used to estimate trip generation data shall be approved by the Traffic Engineering Division. Include the following specific trip generation information:

A. Summary Table:

List each land use that requires trip generation analysis, including the project plus developed or redeveloped land uses within the study area. For each trip generation summary include land use type, amount, density, average trip generation rates for total daily traffic and peak hour traffic (a.m., noon and/or p.m. peak hour traffic generation may be required), and the resultant total trips generated for each time period and each land use.

B. Calculations:

Calculation of projected trip generation for any land use, used to determine study area impacts, shall be based on the following:

1. Trip generation formulas (or rates, if formulas are not available) published in the most recent version of the Trip Generation Manual. Trip generation reports from other industry publications may be considered but are subject to the approval of the Traffic Engineering Division.
2. A local trip generation study, if no published rates are available and similar land uses can be studied, provided that the local trip generation study follows procedures outlined in the most recent version of the Trip Generation Manual.
3. Additional data or studies from other similar jurisdictions. Trip generation numbers obtained in this fashion are subject to the review and approval of the Traffic Engineering Division.

#### 4-2.11 Trip Generation Reductions

Credit for any trip reductions is subject to review and approval in advance by the Traffic Engineering Division. Anticipated trip reduction assumptions should be discussed and approved by the Traffic Engineering Division prior to the preparation of the Traffic

Impact Study. Trip reductions typically fall into one of two categories: those that reassign some portion of the trip generation from the surrounding roadway network (passerby and diverted trip reductions), and those that remove trips generated from the land use trip generation (internal and modal split reductions).

- A. Use of passerby and diverted trip reductions may be evaluated and considered in reducing the additional estimated total trip generation of a new land use. However, passerby and diverted trip reduction factors are not to be applied directly to reduce trip generation and turning movement volumes at driveways serving the studied land use. These factors are subject to the approval of the Traffic Engineering Division.
- B. Internal trip reductions and modal split assumptions may reduce the total trip generation of a land use. These factors considered in the Traffic Impact Study shall supply analytical support and detailed documentation to demonstrate how the estimates were derived and incorporated, and are subject to the approval of the Traffic Engineering Division.

#### 4-2.12 Trip Distribution / Assignment and Modal Split

Trip distribution / assignment of generated traffic estimates shall be clearly summarized and illustrated for each access route entering and exiting the generating land use, using the study area transportation system as a basis. Include the following specific trip distribution / assignment information:

- A. Trip Distribution:  
The trip distribution for each site shall be identified and illustrated with a graphical figure detailing the percentages of vehicles making each movement, at each intersection in the study area. The trip distribution shall be logically based upon factors such as existing traffic volume data in the study area, market analyses, applied census data, and/or professional engineering judgment. Trip distribution assumptions are subject to the approval of the Traffic Engineering Division.
- B. Trip Assignment:  
Trip assignment shall be done by applying the trip generation totals for each time period studied to the trip distribution percentages developed. The trip assignment shall develop anticipated traffic volumes for each of the movements identified by the trip distribution and each of

the time periods identified in the analyses. The resulting traffic volumes shall be illustrated with graphical figures detailing the anticipated volumes making each movement, at each intersection in the study area, during each time period studied.

#### 4-2.13 Existing and Projected Traffic Volumes

##### A. Traffic Volume Scenarios:

Five traffic volume scenarios and three separate times of the day may be required and included in a traffic impact study analysis. Prior to the development of the Traffic Impact Study, the applicant shall meet with the Traffic Engineering Division to determine the scenarios and time periods to be studied. The number of scenarios and time periods to be studied is subject to the approval of the Traffic Engineering Division. The potential scenarios and time periods include the following:

1. Scenario 1 - Existing Conditions:  
An analysis of existing traffic conditions will be required in the Traffic Impact Study. Existing Conditions analysis should attempt to model traffic conditions at the time the Traffic Impact Study is being prepared. Traffic counts that are older than the year the study is being prepared shall be factored up or adjusted to existing year volumes.
2. Scenario 2 – Anticipated Project Completion Year Without Project Volumes:  
Include an analysis of the anticipated traffic conditions during the year the project is intended to be finished and traffic is generated. The analysis shall anticipate the increase in background traffic volumes and the generation of other related projects that are not present in the existing condition, but would likely be completed and generating trips in this time period. The trip generation for the proposed project shall not be included in this scenario. If the project is intended to be completed the same year that the Traffic Impact Study is being prepared, then this scenario is the same as Scenario - Existing Conditions.
3. Scenario 3 - Anticipated Project Completion Year With Project Volumes:  
This scenario is the same as Scenario 2, except that the project volumes are assigned to the roadway

network and included in the analyses.

4. Scenario 4 - Future Build-out Conditions Without Project Volumes:

An analysis of the anticipated traffic conditions during build-out, using a projected build-out year approved by the Engineering and Traffic Divisions. The analysis shall anticipate the increase in background traffic volumes and the generation of other related projects that are not present in the existing condition, but would likely be completed and generating trips in this time period. The trip generation for the proposed project should not be included in this scenario.

5. Scenario 5 - Future Build-out Conditions With Project Volumes:

This scenario is the same as Scenario 4, except that the project volumes are assigned to the roadway network and included in the analyses.

B. Traffic Volume Projections:

The traffic volume projections shall identify existing and projected daily traffic counts and peak hour turning movement counts for each access point, intersection and street identified in the traffic impact study area for each of the aforementioned scenarios required in the study.

C. Time Periods:

Each scenario may be required to look at three different time periods (the a.m., noon and p.m. peak hour conditions). The Traffic Engineering Division will determine which time periods and scenarios are required for each Traffic Impact Study depending upon the project's size, location, types of land use and other pertinent factors.

D. Raw Traffic Count Data:

Include all raw traffic-count data for average daily and peak hour conditions and traffic analysis worksheets in the appendices of the Traffic Impact Study for reference. Computer techniques and associated printouts may be used for this part of the report.

NOTE: All total daily traffic counts must be actual machine counts, not based on factored peak hour sampling. Latest available machine counts from the City, and other agencies, may be

acceptable if not more than 2 years older than the year the Traffic Impact Study is being prepared. Data older than the year the Traffic Impact Study is being prepared shall be factored up to current year numbers, using growth rates approved by the Traffic Engineering Division.

4-2.14 Level of Service Analysis

- A. The Traffic Impact Study shall provide LOS analyses for all study area intersections (signalized and unsignalized) using methodologies outlined in the current Highway Capacity Manual. The analyses should be performed for Scenarios 1 through 5, described in Section 4-2.13, "Existing and Projected Traffic Volumes," and for each time period (a.m., noon and/or p.m. peaks) that is required in the Traffic Impact Study, unless otherwise required by the Traffic Engineering Division.
- B. Level of service analyses shall consider the appropriate infrastructure, lane usage, traffic control and any other pertinent factors for each scenario to be studied. Intersection improvements, planned by the City in the study area, are eligible for inclusion in the level of service analyses. The Engineer will verify if the Traffic Engineering Division want planned improvements included.
- C. Signalized intersection level of service analyses shall use the existing timing and phasing of the intersections for all scenarios. If the analyses are to deviate from existing timings or phasing, then a detailed signal progression analysis for the affected corridor may be required.
- D. The results of the level of service analysis for each scenario and each time period shall be summarized into one or more tables, which illustrate the differences in level of service for each scenario. At a minimum, these tables shall list the level of service results for each intersection to include the level of service for each approach and the total intersection level of service, as well as the corresponding delay values for each approach and the total intersection. These tables shall highlight any locations where the addition of project traffic has caused any approach of any intersection to fall below LOS C.

#### 4-2.15 Traffic Counts and Analyses Worksheets

Provide capacity analyses calculations based on the planning or operational analysis techniques contained in the current Highway Capacity Manual or subsequent highway capacity techniques established by the Federal Highway Administration, including the following:

- A. Raw Traffic Count Data:  
Include all raw traffic count data and traffic analyses worksheets in the appendices of the Traffic Impact Study for reference. Computer techniques and associated printouts may be used for this part of the report.
- B. Level of Service Analyses:  
Include all level of service analyses performed for intersections. If signal timing or phasing changes are proposed for traffic mitigation and the signal is currently part of a coordinated system, a progression analysis will be required to ensure that adequate progression is maintained or provided. All progression analysis and assumptions to be used shall be reviewed and approved by the Traffic Engineering Division.

#### 4-2.16 Traffic Control and Signals

The Traffic Impact Study shall discuss and analyze any traffic control measures that may be necessary to serve a proposed project or development. Any traffic control measures are to be evaluated based on the requirements established in the Manual on Uniform Traffic Control Devices, (MUTCD) and by the City or TDOT, and will be applied as necessary to ensure safe and efficient operation of the City's transportation system. The analysis shall demonstrate the need for traffic control measures, considering alternative site designs in order to minimize or mitigate traffic impacts from the proposed project or development. The following traffic control measures are to be addressed:

- A. Regulatory Signage, Markings and Islands:  
Regulatory signage, markings and islands shall be applied as necessary in conformance with the MUTCD and City standards and policies.
- B. Traffic Signals:  
The need for new traffic signals will be based on warrants contained in the MUTCD and on City policies. In determining the location of a new signal, safety and community traffic circulation and progression will be the

primary considerations. If a traffic signal is suggested as part of a mitigation package, and the intersection lies within a series of coordinated traffic signals, then a progression analysis may be required to ensure that adequate progression may still be provided. Generally, a spacing of one-half mile between all signalized intersections is to be maintained, to achieve optimum capacity and signal progression. Pedestrian movements shall be considered in all cases and adequate pedestrian clearance is to be provided in the signalization design.

- C. Intersection and Access Locations:  
When signalization is proposed, to provide flexibility and safety for the existing roadway system and to ensure optimum two-way signal progression, an approved traffic engineering analysis shall be made to properly position all proposed intersections and development access points.

#### 4-2.17 Traffic Accidents

The Traffic Impact Study may need to include accident analyses at one or more locations in the study area. The Engineer will verify if the Traffic Engineering Division want an accident analysis included in the Traffic Impact Study. When an accident analysis is required, estimates of increased or decreased accident potential shall be evaluated for the proposed project or development and appropriate safety-related mitigation measures are to be included. Traffic accident data is available from the Traffic Engineering Division of the City of Kingsport Public Works Division.

#### 4-2.18 Recommendations

The Traffic Impact Study shall include a section in the report that provides any recommendations of the Engineer. These recommendations shall include the Engineer's recommended location, nature and extent of proposed transportation improvements associated with the project or development to ensure safe and efficient roadway operations and capacity.

- A. These recommendations are to be supported with appropriate documentation and discussion of the technical analyses, assumptions and evaluations used to make the determinations and findings applied in the Traffic Impact Study. In the event that any traffic impact study analyses or recommendations indicate unsatisfactory levels of service on any study area roadways, a further description of proposed improvements or mitigation measures to remedy deficiencies shall be included.

- B. These proposed improvements or mitigation measures may include projects by the City or The Tennessee Division of Transportation for which funds have been appropriated and obligated. These proposals may also include improvements to be funded and constructed by the applicant as a part of project or development construction. Assumptions regarding future roads, widths and lane usage in any analyses are subject to the approval of the Traffic Engineering Division.
- C. In general, the recommendation section shall include:
  - 1. Proposed and Recommended Improvements:  
Provide a detailed description and sketch of all proposed and recommended improvements. Include basic design details showing the length, width and other pertinent geometric features of any proposed improvements. Discuss whether these improvements are necessary because of development traffic or whether they would be necessary due to background traffic. Specify the approximate timing necessary for each improvement.
  - 2. Level of Service Analysis at Critical Points:  
Provide another iteration of the LOS analyses that demonstrates the anticipated results of making recommended improvements, such as movement LOS, and operational and safety conditions. In association with LOS analyses for recommended improvements, include a comparison of these results with the background LOS analyses without the proposed project or development. Where appropriate, this step is to be provided for both near term (year of project completion) and built-out scenarios.

#### 4-2.19 Conclusion

Include a conclusion in the report that provides a clear and concise description of the study findings and recommendations, and serves as an executive summary.

#### 4-2.20 Revisions to the Traffic Impact Study

- A. Following City review, the Traffic Engineering Division may require revisions to a traffic impact study based on the

following considerations:

1. Completeness of the study;
2. Thoroughness of the level of service and impact analyses and evaluations;
3. Compatibility of the study with the proposed access design, project or development plan, and local transportation system;
4. Compliance with local and state regulations and design standards, and;
5. An analysis of study deficiencies, errors, or conflicts.

B. Revisions may also be required as a result of the public process with surrounding neighborhoods and land uses, or review by BMA or the Kingsport Regional Planning Commission. Additional details requiring traffic impact study revisions may include but are not limited to, the following:

1. An enlarged study area,
2. Alternative trip generation scenarios,
3. Additional level of service analyses, and
4. Site planning and design issues.

#### 4-3 Site Access

##### 4-3.1 General

The efficiency and safety of a street, road, or highway is greatly affected by vehicles entering, leaving, or crossing the roadway. Commercial and multi-family residential developments are major contributors to increased volume of traffic upon municipal streets, roads, and highways. Such developments also give rise to increased traffic volume of a type and pattern characterized by frequent ingress and egress to the same. Therefore, such development significantly affects the efficiency and safety of streets, roads, or highways within the municipality. In the interests of safety, the city must regulate access to the streets, roads, and highways within its city limits in a uniform manner that is fair to the general public, land-owners, and developers. All regulations shall be upheld unless good engineering judgment indicates otherwise. This will be determined by the Traffic Manager or designee.

A. Demolition permits:

When a demolition permit is issued for the removal of a building, the point of ingress and egress to serve the new use must comply with the standards set forth in this article. Any driveway or part thereof rendered useless by demolition, remodeling or renovation not in compliance must be removed, at the expense of the developer, and the curbing, parkway, sidewalks, etc., replaced to meeting existing city specifications.

- B. Removal or Modification:  
The City of Kingsport requires that when the use of any parcel is changed making any or all of the existing driveways unnecessary or non-conforming, the owners of the property shall at the owner's expense remove the driveway and replace all necessary curbs, gutters, sidewalk, and other features within the border area to a condition consistent with the neighborhood and/or the border areas of the adjacent properties. The required changes shall be made concurrent with other improvements to or on the site or, if none, within 6 months following such change in use.

#### 4-3.2 Access to City Right-of-Way

When connecting a development to a City Street, a permit is required for the following cases;

- A. When a Building or Grading Permit is Required:  
If a Building or Grading Permit is required, then a driveway permit is also required for any access being proposed. Access associated with a site plan must be reviewed to determine if it complies with City Code and the requirements of this document before the building or grading permit process is complete.
- B. Existing access to Vacant Property Proposed for Development:  
Existing access to vacant property being proposed for development must be reviewed to determine if the existing access design meets the minimum standards established by City Code and this document.
- C. Existing access to Developed Property Proposed for an Upgrade:  
When an upgrading, such as remodeling of an existing development is proposed, the existing access design must be upgraded to meet the minimum standards established by City Code and this document.

D. New Access for Development Proposed for Construction or Reconstruction:

Development proposed for construction or reconstruction and planning new access to City streets and alleys require a permit, as set forth in Section 90-248, of the City of Kingsport Code.

All driveway permits shall be in strict accordance to Section 90-248, of the City of Kingsport Code.

Permit may be revoked if work does not conform to specifications established by this document.

4-3.3 Access Permit Required on State Right-of-Way

Accesses and curb-cuts proposed for construction or reconstruction on state routes require a permit from the Tennessee Division of Transportation. The TDOT permit is issued from Knoxville, Tennessee. When a TDOT access permit is required, it will additionally act as the City access permit, and all requirements of Section 4-3.2 shall apply.

Prior to sending any application to TDOT, a site plan of the proposed development shall be submitted to the Traffic Division of the Public Works Division for review. The site plan shall indicate the proposed access point or points, the type of construction, the width of the driveway, and meet the plan requirements.

Additions or deletions to the design may be requested. When the review comments have been addressed in accordance with the requirements of the Traffic Engineering Staff an approval stamp will be placed on 6 copies of the site plan and 2 copies of the grading plan. The Traffic Division will retain one copy of each to keep on file.

Kingsport Traffic staff will provide necessary documentation and the 5 city-approved site plan copies to the developer, and he or she will be responsible for contacting TDOT Region One in Knoxville for any bond monies required for work in ROW. The TDOT Region One Traffic Engineer will review the application and site plan, and when all TDOT review requirements have been met by the applicant, the TDOT Region One Traffic Engineer will give approval. TDOT will send a copy of the approved permit to both the applicant and the City Traffic Engineer.

#### 4-3.4 Number of Driveways Permitted

In order to minimize interference to traffic flow on the public streets, the number of driveways will be limited to those needed to provide adequate ingress and egress to private property. The number permitted will be determined based on the type of development, the functional classification of the street, and the length of frontage the property has on a given street.

| Single Family Residential Driveways Allowed – based on available street frontage |                    |                                  |
|----------------------------------------------------------------------------------|--------------------|----------------------------------|
| Street Classification                                                            | 1 Driveway Allowed | 2 Driveways Allowed <sup>1</sup> |
| Arterial Streets                                                                 | <200'              | ≥ 200'                           |
| Collector Streets                                                                | <125'              | ≥ 125'                           |
| Local Streets                                                                    | <75'               | ≥ 75'                            |
| Residential Streets and Lanes                                                    | <50'               | ≥ 50'                            |

<sup>1</sup> More than 2 driveways will not be allowed for single family residential properties unless otherwise determined by the City of Kingsport Traffic Division.

| All other uses Driveways Allowed – based on available street frontage |                    |                     |                                       |
|-----------------------------------------------------------------------|--------------------|---------------------|---------------------------------------|
| Street Classification                                                 | 1 Driveway Allowed | 2 Driveways Allowed | Additional Driveways <sup>1</sup>     |
| Arterial Streets                                                      | <200'              | 200' – 400'         | 1 additional for every 400' over 400' |
| Collector Streets                                                     | <200'              | 200' – 400'         | 1 additional for every 200' over 400' |
| Local Streets                                                         | <100'              | 100' – 200'         | 1 additional for every 200' over 200' |
| Residential Streets and Lanes                                         | <100'              | ≥ 100'              | No more than 2 Driveways Allowed      |

<sup>1</sup> Only allowed based on need demonstrated in a traffic impact study or otherwise determined by the City of Kingsport Traffic Division.

For the purpose of this section, shopping centers, planned developments or developments where there is a series of attached buildings, and associated out-parcels, or developments that are served by a common parking area are considered as one lot.

For the purpose of calculating the number of driveway accesses allowed, where there are one-way traffic movements, one entrance and one exit are considered one driveway access.

Where a lot has more than one street providing access, the secondary street frontages are not automatically entitled to additional driveway accesses. However, if all of the other requirements in this policy can be met, additional driveway accesses could be allowed. Generally, the primary access to a lot will be required to be located on the roadway that has the lower classification or, if the same classification, the lower volume roadway.

##### A. Interconnection of On-Site Circulation Required:

In addition to the primary access, developments having off-street parking facilities shall provide on-site vehicular circulation allowing access to all portions of the site without

using the adjacent street system, and shall interconnect on-site vehicular circulation with adjoining development or vacant property. Additionally, pedestrian access shall interconnect with adjoining development or vacant property.

B. Joint Access

The City will facilitate use of joint-access driveways serving two or more adjoining parcels. Where joint-access driveways are feasible the Traffic Engineering Division may require:

- A. Owners of parcels using the joint-access driveway to share the cost of construction or reconstruction of the driveway;
- B. Owners of parcels using the joint-access driveway to share the cost of traffic signals at the driveway; and,
- C. Locate or relocate the joint-access driveway to conveniently serve all parcels using it.
- D. Signed documentation for both properties involved.

4-3.6 Prohibited Locations of Access

- A. Residential Access Prohibited Near Intersections:  
No residential driveway approach, including curb transitions, shall be permitted within 25 feet of the edge of a cross street or within 5 feet of the point of curb radius at the cross street, whichever is greater on residential/local roadways, 50 feet of the cross street on collector roadways and 100 feet of the cross street for arterial roadways.
- B. Commercial Access and Private Roadways Prohibited Near Intersections:  
No commercial driveway or private roadway approach including the curb transitions shall be permitted within 75 feet of the edge of a cross street or within 10 feet of the point of curb radius at the cross street, whichever is greater, 100 feet for collector roadways and 150 feet for arterial roadways.
- C. Locations with Insufficient Sight Distance Prohibited:  
Driveways shall not be permitted at locations hidden from the user of the public street,
  - 1. Where possible, access will not be located where intersection sight distance cannot be provided as specified in the American Association of State Highway and Transportation Officials', A Policy on Geometric Design of Highways and Streets, latest version (The Green Book).

2. Access will only be granted if the recommended sight distance outlined in the above mentioned design book are met based on current roadway speed limit. The sight distance will be measured from a point offset 14.5 feet from the cross traffic and at an eye height of 3.5 feet, while sighting a target height of 3.5 feet.
- D. Locations Requiring Backing Into the Street Prohibited:  
With the exception of one and two family dwellings, access will not be permitted in locations that would require or encourage vehicles to exit a driveway or parking lot by backing into the public right-of-way or roadway.
- E. Locations Conflicting with Public Facilities or Utilities Prohibited:  
No driveway approach shall be permitted to encompass any city or other public utility within a minimum of 5 feet. The applicant may be authorized to relocate any such utility upon application to the subject utility provider and upon making suitable arrangements for financial reimbursements to such provider.
- F. Locations Adjacent to Property Lines:
1. Single and Two Family Residential Driveway:  
No single or two family driveway approach, excluding curb transitions and radii, shall be located within 5 feet of a property line.
  2. Multifamily and Commercial Driveway:  
No multifamily or commercial driveway, excluding curb transitions and radii, shall be located within 15 feet of a property line.

#### 4-3.7 Access Width

- A. Single and Two family Residential Access:  
The minimum width for residential driveways shall be 10 feet for single driveways with a maximum of 24 feet (30 feet maximum for shared, joint use driveways) not including the curb transitions and radii.
- B. Multi-family and Commercial Access:  
The minimum width for commercial driveways shall be 24 feet and a maximum of 40 feet not including curb

transitions or curb radii.

- C. Industrial Access:  
The minimum width for Industrial driveways shall be 24 feet and a maximum of 50 feet not including curb transitions or curb radii.
- D. Radius of Driveway Access:  
The radius of a non-residential driveway access shall be no less than 15 feet and no more than 50 feet. The radius of a residential driveway shall be a minimum of 5 feet.
- E. One Way Access:  
The minimum for one way access shall be 12 feet and a maximum of 16 feet. Access shall be signed per MUTCD for the one way access.

#### 4-3.8 Access Spacing

When measuring distances to or between driveways, distance shall be measured from the edge-of-throat to edge-of-throat.

- A. Driveways on individual lots providing access to residential streets shall be spaced a minimum of 25 feet apart,
- B. Driveways providing access to non-residential local and collector streets shall be spaced a minimum of 50 feet apart,
- C. Driveways providing access to minor arterial collector streets shall be spaced a minimum of 125 feet apart,
- D. Driveways providing access to principal arterial streets shall be spaced a minimum of 300 feet apart.

However, the Traffic Engineering Division may approve a design that will result in different spacing when all of the following factors are present:

- 1. The parcel does not have adequate frontage on the street to provide the spacing shown above.
- 2. For multifamily and commercial applications, after good faith attempts, the owner of the parcel is unable to secure joint access through an adjoining parcel,

3. The parcel to be served cannot be served from another street, and
4. The resultant driveway provides maximum spacing from adjacent driveways giving access to the street, and proper corner clearance is provided. For the following street classifications, the following requirements specify the minimum allowed distances between driveways for Multi-family and commercial access:

| Street Classification         | Distance between Driveways |
|-------------------------------|----------------------------|
| Arterial Streets              | 300 feet                   |
| Collector Streets             | 200 feet                   |
| Local Streets                 | 150 feet                   |
| Residential Streets and Lanes | 50 feet                    |

The City may require joint permanent access easements to minimize the number of driveways along a roadway. Joint permanent access easements shall maintain access control for a minimum length of 40 feet perpendicular from the right-of-way or as determined by a traffic impact study. Single Family Residential properties are exempt from the above local street requirement for the distance between driveways.

#### 4-3.9 Access Alignment and Minimum Length

Horizontal approach angles between the centerline of the driveway and the centerline of the public street shall be no more than 30 degrees off perpendicular for one way or two way operation.

Access to developments on opposite sides of a collector or arterial, where turning movements are not controlled by a center median or access island, shall either be aligned or offset by at least 125 feet on residential, local roadways or lanes, 200 feet for collector roadways and at least 300 feet on arterials. Greater offsets may be required if left-turn storage lanes are required.

All driveways must extend to the back of the Right of Way or 20 feet into the property from the line of the abutting street before the edge of the driveway may be intersected by a parking space, aisle or drive.

#### 4-3.10 Access Restrictions

Along non-residential, collector and arterial streets, or where necessary for the safe and efficient movement of traffic, the City will require access points that limit turning movements, as follows:

- A. Access Islands:  
Where restricted turning movements are required by the City, and where the abutting street does not have a median, an access island will be required. Islands shall have a minimum area of 150 square feet, be bounded by vertical curb.
- B. Access Island Lanes:  
Access island lanes shall be at least 12 feet wide, have a radius of at least 20 feet, and be designed to accommodate the largest vehicle using the access on a daily basis. The island shall provide congruent curb ramps or cut through for sidewalks. The minimum width of the island along the abutting roadway frontage shall be 30 feet for right-in, and right-out-only islands, and 15 feet for islands allowing right-in, right-out and left-turn movements.
- C. Access With Median Dividers:  
Median dividers may be permitted where a median design can improve traffic circulation, safety or overall site access. Where permitted, medians shall be at least 4 feet wide and extend at least 25 feet beyond the right-of-way.

#### 4-3.11 Traffic Control

All accesses shall be designed and constructed with appropriate traffic control and signage conforming to the MUTCD, and these standards.

#### 4-3.12 One-Way Access Lanes

One-way access lanes may be permitted where restricted access is limited to one turning movement, or where the one-way access improves traffic circulation and safety. One-way access lanes shall be at least 12 feet wide, have a radius of at least 20 feet, and be designed to accommodate the largest vehicle using the access on a daily basis.

#### 4-3.13 Speed Change Lanes

Speed change lanes may be required on collectors and arterials to lessen the proposed access's impact on the public street level of service.

- A. Acceleration Lane:  
Acceleration lanes may be required when it is critical not to interrupt the traffic speed on the public street, or if an access is located near an adjacent deceleration lane for a separate access and joining the two lanes will provide a

safe speed change area for both access locations.

B. Deceleration Lane:

A Deceleration lane may be required in conjunction with new or improved accesses on all collector and arterial streets.

The minimum width of a deceleration lane shall be 11 feet, and the minimum storage lane length shall be 75 feet.

The taper shall be a minimum of 75 feet long for collectors or arterials with posted speeds that are less than or equal to 45 mph.

When posted speed exceeds 45 mph, the taper shall be designed in accordance with the taper length equation given in the MUTCD, Part 6, Traffic Controls for Street and Highway Construction, Maintenance, Utility and Emergency Operations. Small dimensional deviations may be allowed for the deceleration lane when:

1. property limitations are preexisting and not the creation of the applicant,
2. if interference occurs with access locations for existing development not owned by the applicant and combination of access is impractical, or
3. if major drainage or utility structures would block deceleration lane construction.

C. Additional Lanes:

For collector, and arterial streets, additional through lanes and turn lanes may be required at the expense of the applicant / developer:

1. if the lanes are found to be needed by the Traffic Impact Study, or
2. when a development is not required to do a full traffic impact study as outlined in Section 4-1 and 4-2 of these standards, and the City requires a scaled-down study, the addition of lanes shall be required if existing or 20 year projected traffic volumes are in excess of 3,000 ADT and turning movements are projected to exceed 5% of the through traffic ADT at full build-out.

D. Vehicle Storage:

Adequate driveway storage capacity for both inbound and outbound vehicles to facilitate safe, unobstructed, and

efficient traffic circulation and movements from the adjacent roadway and within the development shall be provided, except for single-family or duplex residential driveways on local streets. Adequate driveway length will be subject to approval by the Traffic Engineering Division and shall extend at least 20 feet beyond the right-of-way before accessing the first off-street parking space or parking lot aisle.

#### 4-3.14 Construction Details

The construction details for access through curb and sidewalk, and for cases where no curb exists, are shown in the Construction specifications.

### 4-4 Traffic Control Devices

#### 4-4.1 Traffic Signs and Pavement Markings

The applicant for construction approval shall be responsible for the installation of all traffic control devices and markings prior to the opening of roadways, bike paths, etc.

##### A. Signing and Striping Plan:

A complete signing and striping plan shall be submitted as part of project or development construction plans, to be approved by the Traffic Engineering Division prior to installation. The plan shall specify the various types and combinations of approved signs, pavement markings, and barricades required for each project or development.

##### B. Conformance with MUTCD:

All signs, sign materials, and barricade warning lights shall conform to the standards set forth in the Manual on Uniform Traffic Control Devices, (current edition), and these Standards.

##### C. Materials:

The quality and type of material used in traffic signs, all vandal-proof sign hardware, and all metal u-channel sign posts shall be in conformance with these Standards.

#### 4-4.2 Traffic Signals

The applicant for construction approval shall be responsible for the installation of all traffic signal devices and related equipment prior to the opening of roadways.

##### A. Traffic Signal Plan:

A complete traffic signal plan shall be submitted as part of project or development construction plans, to be approved by the Traffic Engineering Division prior to installation. The plan shall specify the various types of equipment involved in a traffic signal installation, and it shall show the location of the traffic signal poles and traffic signal heads in relation to the intersection layout. The plan shall indicate the location of sensor loops and other detection and preemption equipment. The design shall meet the minimum requirements established by the MUTCD, TDOT, and the City of Kingsport Traffic Engineering Division

- B. Conformance with MUTCD:  
All traffic signal layouts and equipment shall conform to the standards set forth in the Manual on Uniform Traffic Control Devices (current edition) , TDOT specifications and any other specifications set forth by the Traffic Engineering Division and these Standards.
- C. Materials:  
The quality of material used in traffic signals, type and quality of all controller equipment, traffic signal poles, traffic signal heads, electric wiring and conduit, and all related items shall meet the minimum specifications of TDOT and the Traffic Engineering Division.

#### 4-5 Street Lighting

##### 4-5.1 Subdivisions

The City of Kingsport will be responsible for lighting all roadways for subdivisions that utilize overhead power; this will include wooden poles and cobra head fixtures.

The property owner/developer will be responsible for all upfront costs for underground decorative street lights in their development.

The City of Kingsport will coordinate with developer and appropriate power provider for the development design. Each power provider has different costs associated with underground lighting.

#### 4-6 Construction Zone Traffic Control

##### 4-6.1 Plan Required

Any construction activity which will impact the traveling public of Kingsport shall prepare a traffic control plan for the warning and detouring of traffic within the construction zone. The plan shall be included in the construction plans and must receive approval from the Traffic Engineering Division prior to commencement of any construction activity.

##### 4-6.2 Conformance with MUTCD

The plan shall meet the minimum standards established in the MUTCD, TDOT and City of Kingsport specifications.

##### 4-6.3 Responsibility for Design

The owner's Engineer shall be responsible for the design of the Construction Zone Traffic Plan. The Engineer shall be trained in the design of construction zone traffic plans and shall certify the plan by placing and validating his seal on the Construction Zone Traffic Control Plan. The Traffic Engineering Division shall review the plan for compliance with minimum standards.

## **5. Excavation and Pipe Trenches**

### **5-1 Side Slopes, Embankments, and Utility Trenching**

The maximum cut and fill slope permitted shall be 50% or two horizontal units to one vertical unit (2:1). Any terrain with a slope greater than 2:1 shall be designed by a professional engineer and approved by the City Engineer. The City Engineer withholds the right to require a geotechnical report for any slope that could endanger the welfare of the general public.

Fill embankments shall be formed of suitable material placed in successive layers not to exceed more than 8 inches in depth for the full width of the roadway cross-section, and 12 inches in the slope and embankment area. No stumps, trees, brush, rubbish or other unsuitable materials or substances shall be placed in the embankment. Each successive layer shall be thoroughly compacted by a sheepsfoot tamping roller, 10-ton minimum power roller, pneumatic-tired roller, or other standard method approved by the City Engineer.

Spreading and compacting of material shall be performed in accordance with the pertinent section of the Tennessee Division of Transportation Standard Specifications for Road and Bridge Construction, of latest issue.

The Contractor shall be responsible for having a registered Geotechnical Engineer provide appropriate compaction testing of the excavation. Compaction testing shall be taken at a frequency determined by the Geotechnical Engineer, but the City Engineer reserves the right to require tests to be taken in questionable areas. The Geotechnical Engineer shall provide the City with compaction testing results and certify that all excavations were constructed per TDOT and City of Kingsport requirements. The Geotechnical Engineer shall be a licensed engineer and place his seal and signature on the certification. The certification shall be received by the City Engineer prior to construction of any pavement sections, curbs, gutters or other structures on the excavations.

### **5-2 Excavation Near Utilities**

Contractor shall not fill over existing utilities (water, wastewater, or stormwater) unless approved in writing by the City Engineer. The contractor shall not excavate near or uncover existing utilities without prior approval by the City Engineer and review by the appropriate utility.

## **6. Water Distribution**

### **6-1 General**

All proposed and authorized new extensions or modifications to the Water Distribution System shall conform to these Water System Design Standards and City Standard Operating Procedures and be constructed in accordance with TDEC and the City of Kingsport Construction Specifications.

Under no circumstances shall a contractor operate any parts of the Water Distribution System without approval from the Water/Wastewater Division. This includes all valves, hydrants, pumps, etc. Such operation will result in the dismissal of the contractor from the project.

### **6-2 Engineering Plans and Approval**

All new extensions or modifications to the Water Distribution System, shall be provided on engineering plans conforming to these standards, sealed by a Registered Professional Engineer, and approved by the Engineering Division or TDEC. Hydraulic calculations shall accompany the plans.

Design shall further conform to all other applicable federal, state, and local laws and regulations, and all required permits shall be obtained prior to construction.

Engineering plans shall clearly show and label the proposed water line extension, all fittings and appurtenances, and service lines and water meter locations to be installed; existing and/or proposed roads and road right-of-way; water line easements; lot lines; lot numbers; proposed location of all new underground utilities within the same right-of-way as the proposed water system improvements; topographic information or profile view to include proposed final depth of bury of water mains and facilities; north arrow; location map; applicable and current City of Kingsport construction details; and any other information necessary for the appropriate and accurate construction of the proposed water system extension or modification.

### **6-3 Right-of-Way and Access**

All water distribution system extensions or modifications (including meters) to be owned and maintained by the City of Kingsport shall be within a publicly owned and maintained street right-of-way or easement with sufficient access from public right-of-way. Whenever practical, water mains shall be located outside of paved or otherwise improved surfaces and shall maintain a horizontal separation of at least 3 feet from other utilities with the exception of sewer which shall have a horizontal separation of 10 feet. The right-of-way and/or easement shall be dedicated to the City of Kingsport.

- 6-4     Pre-Construction Meeting and Notice to Proceed  
No construction of extensions or modifications shall begin before plans are approved for construction and Authorization to Construct Permit is granted by the Engineering Division through a Pre-Construction Meeting coordinated by the Engineering Division. Any construction done prior to this Notice may be summarily rejected or refused without further investigation. In addition, beginning construction without authorization violates State regulations and subjects the offender to State enforcement actions.
- 6-5     Contractor License Requirement  
All contractors and subcontractors performing any construction on water distribution system extensions or modifications, except Personnel of the Water Division, shall be licensed Utility Contractors by the State of Tennessee. The developer shall provide the Engineering Division with the names and license number of each contractor or subcontractor before each begins construction on the water system.
- 6-6     Accessibility During Construction  
The construction site shall be accessible at all times from the Notice to Proceed for inspection of progress by the Engineering or Water/Wastewater Division. Failure to provide accessibility may result in rejection of the work.
- 6-7     Connections to Existing Water System
- 6-7.1   Refer to City of Kingsport Construction Specifications for appropriate detail drawings for use in plans. Temporary backflow devices shall be required on all taps to existing water lines.
- 6-7.2   All connections to or modifications of existing water mains shall be performed using the current Standard Operating Procedures of the Water/Wastewater Division. These procedures will be made available upon request.
- 6-7.3   The Contractor shall provide a minimum of 72 hours advance notice to the Water/Wastewater Division for water interruption for a tie-in, and the Contractor is strongly encouraged to provide additional notice when possible. All requests, except emergency repairs, of less than 72 hours will be denied.
- 6-7.4   All new service connections installed on water main extensions shall be tapped on the new water main before the water main is

hydrostatically tested and disinfected, and the service connections shall be disinfected to the meter cut-off valve as the water main is being disinfected. If a contractor taps a water main for any purpose in violation of these standards after the disinfection test but before the Letter of Acceptance, the disinfection test shall become invalid and will be required to be repeated.

## 6-8 Water Mains

### 6-8.1 Size

The size of water mains shall be justified by hydraulic analysis. The standard size water main shall be 8 inches in diameter, except smaller water mains may be established under the following conditions:

- A. A water main may be 6 inches in diameter within local areas of distribution where the extent of present and future service demand can be fully defined and adequate residual water pressure can be maintained throughout as required by the TDEC and the Water/Wastewater Division. Predicted residual pressure shall be confirmed through engineering hydraulic calculations, for both peak domestic flow conditions and a maximum fire flow condition during average day demand. Such calculations shall use  $C=130$  and shall be approved by the City of Kingsport. However, in no case may a 6-inch main extend beyond the last connection with another water main greater than 2,000 feet, except as follows: an exception may be granted by the City Engineer when the following are all true:
  - 1. The existing main at the point of connection is 6 inches
  - 2. The proposed extension as a 6 inch main will provide adequate volume and pressure over its entire distance, including peak demands and fire protection;
  - 3. The most recently adopted Master Plan does not specify otherwise for this location; and
  - 4. There is no practical means to connect the extension to another existing main (6 inches or larger) anywhere along its route (when the proposed main passes within 400 feet of an existing main 6 inches or larger and a connecting water main can be placed across this separation in accordance with these standards, connection is considered practical).

- B. A water main may be 2 inches in diameter in a cul-de-sac beyond the last fire hydrant, not to exceed 3000 feet in length, provided adequate residual water pressure can be maintained at peak flow as required by the TDEC, and provided no future extension of the water main beyond the cul-de-sac will be permitted and no fire hydrants are required. A water main may also be 4 inches in diameter in areas where all abutting land is developed as single family residential, connected at both ends to a larger water main, requires no fire hydrant or fire suppression service within this length of proposed 4 inch pipe, and satisfies peak demand and residual pressure requirements.

#### 6-8.2 Design

All water mains 6 inch or larger shall be constructed of ductile iron pipe and fittings as specified by AWWA C150 and C151 for laying condition Type 2 and as required by the Construction Specifications. All fittings, bends, tees, and crosses, and all straight pipe joints within encasement pipe shall be adequately restrained. All ductile iron pipe up to 12 inch shall be pressure class 350. Ductile iron pipe 16 inch and larger shall be pressure class 250.

All water mains below 6 inch in diameter shall be constructed of SDR-17 PVC pipe as specified by AWWA C900 and required by the Construction Specifications, unless working pressures require a higher pressure rating pipe. Pipe shall be installed according to AWWA C605 and Construction Specifications

All water main pipe and fittings shall be rated for a working pressure at least 1.5 times the highest design static pressure in the location where the pipe is being provided.

All water mains shall be specified to be installed with a minimum of 36 inches of ground cover, but not greater than 4 feet of ground cover except where prohibitive conflicts of limited distance require deeper construction. Ground cover shall be measured as the distance from the top of the pipe to final grade. When grading is to be altered during construction, the proposed final grade shall be shown on the plans for water system construction. Sections of water main to have greater than 4 feet of cover or less than 30 inches shall be profiled on the plans to show required elevation and show conflict being avoided, for the approval of the Engineering Division.

### 6-8.3 Location and Service Connections

Meter boxes shall be set near the property line (on public ROW) in front of the property being served. Each meter shall have its own service line.

When the required service line size for multiple-family, commercial, or industrial property may be accurately defined, such service lines and meter boxes/vaults shall be included with construction of water mains. All service lines, meter boxes, and meter vaults to be constructed as part of the water main extension shall be shown to scale on the approved plans for construction.

## 6-9 Fire Hydrants and Blow-Offs

### 6-9.1 Location and Spacing of Fire Hydrants

Fire hydrants shall be supplied by not less than a 6-inch diameter main. A gate valve shall be provided on each branch line to a fire hydrant assembly and shall be located within 18 inches of the hydrant branch tee. The minimum fire flow for fire hydrants shall be determined by the needed fire flows for the property being served. Where building sizes have not been determined, the minimum base fire flow shall be 1,000 gpm for single family dwellings and 1,500 gpm for other uses, unless otherwise determined by the Fire Official.

Fire hydrants shall be within 600 feet of structures, when possible. When structures are located over 600 feet from the ROW, a private fire system may be required as determined by the Fire Official. Where the building sizes have not been determined the minimum locations shall be as follows:

- A. In areas consisting exclusively of one- and two-family residential homes, the maximum distance between hydrants, measured along street centerlines, shall be 1,200 feet, except as noted otherwise below. In cul-de-sacs serving one- and two-family residential homes exclusively, the last hydrant shall be within 600 feet of the end of the cul-de-sac as measured along the street centerline.
- B. In all other districts, including multiple-family residential, the maximum distance between hydrants, measured along the street centerlines, shall be 1,200 feet. In cul-de-sacs, the last hydrant

shall be within 600 feet of the end of the cul-de-sac as measured along the street centerline, unless otherwise determined by the Fire Official.

- C. Fire hydrants shall be located at street intersections when possible; however, additional fire hydrants may be located between intersections when necessary to meet spacing requirements. Hydrants between intersections shall be located adjacent to boundaries between adjoining properties in subdivided areas.
- D. Fire hydrants may be placed in a staggered arrangement on both sides of any street classified as a major thoroughfare with the spacing specified above, when approved by the Fire Official.

When new buildings are constructed or existing buildings are expanded, required fire hydrant locations shall be determined by the latest International Fire Code. The Owner/Developer of the extension or modification to the Water Distribution System shall demonstrate by actual tests that the system will supply the required fire flow. These tests may be required to be witnessed by the Fire Official.

#### 6-9.2 Location of Blow-offs

Blow-offs shall be installed at the end of all dead-end water lines at points to allow for natural drainage. Fire hydrants may serve as a blow-off on lines 6 inches to 12 inches in diameter. Blow-offs on transmission mains larger than 12 inches shall be sized to provide a flushing velocity in the transmission main up to 5 feet per second. Blowoffs shall not be located where there is a possibility of flooding private property.

### 6-10 Valves

#### 6-10.1 Location

Valves shall be installed within 18 inches of branch fittings (either tee or cross) at the intersection of two water mains, or a water main and either a hydrant or blow-off branch line. Maximum separation between valves along a water main shall be 1,000 feet.

The number of valves at a branch fitting shall be determined as follows:

- A. At a cross fitting with only one direction supplying

from the water source, a minimum of three valves shall be installed, one on each of the “dead-end” directions.

- B. At a cross fitting with three directions supplying from the water source, a minimum of three valves shall be installed, one in each supply direction.
- C. At a cross fitting with two directions supplying from the water source, four valves shall be installed, one in each direction.
- D. At a cross fitting with all four directions supplying from the water source, three valves shall be installed in the directions with smaller diameter mains (if the main size is the same in all directions, designer choice).
- E. At a tee fitting with only one direction supplying from the water source, a minimum of two valves shall be installed, one on each of the “dead-end” directions.
- F. At a tee fitting with two directions supplying from the water source, a minimum of two valves shall be installed, one in each supply direction, except at a hydrant tee one valve shall be on the hydrant branch and the second on either side of the tee.

When there already exists a valve within 200 feet of a tee or cross intersection in one or more directions and the requirements above would specify a new valve in that direction, the existing valve is deemed to be sufficient and an additional valve in that direction is not required.

## 6-11 Water Service Lines & Meters

### 6-11.1 Size and Location

Individual water services shall be provided from the main to each water meter for single family residences. No individual water meter may serve more than one property.

On property where two or more meters are provided to serve more than one building or unit on the same property, each meter shall be located directly in front of the unit or building served, or the meter

boxes shall be clearly labeled to describe the address of the unit or building served. If labeling is used, a permanent nameplate with engraving of address shall be permanently secured to the interior wall of each meter box within 3 inches of the top of the box, of non-corrosive materials. The developer or builder is also responsible for insuring that plans for construction define which meter goes with which unit or building, and that the plumber hired to connect the plumbing to the building or units connects the plumbing to comply with the schedule shown on the plans and labeled on the meter boxes.

All service connections shall be made perpendicular from the main line and shall run straight to the meter which shall be located at the edge of the serviced lot's right-of-way or easement. All new water meter boxes or vaults shall be located outside the street, sidewalk, or parking areas in residential areas. In non-residential areas, meter location shall be considered on a case-by-case basis, but generally as close to the main as possible.

Service taps on new water lines shall be made by the Contractor when required by these Standards. Taps made by the Contractor may be made by wet tap or dry tap. Wet taps shall be made after the new water system is pressurized, but before the new water main is hydrostatically tested, disinfected, and connected to the active water system.

The size and type of water meter shall be determined under consultation with the Water/Wastewater Division based on type of facility receiving service, projected peak water demand, and expected fluctuation in water demand, and shall be selected to insure high standards for accuracy for all service conditions. The size shall be the smallest, which is designed for a normal test flow rate covering both the minimum and maximum flow rate expected by the customer. AWWA Manual M22 shall be used as a reference for sizing of water meters.

## 6-12 Relation of Water Mains to Other Utilities

### 6-12.1 Sanitary and Storm Sewers

Normal Conditions – Water mains shall be laid at least 10 feet horizontally from any sanitary sewer, storm sewer, or sewer manhole, whenever possible; the distance shall be measured edge-to-edge.

Unusual Conditions – When local conditions prevent a horizontal separation of 10 feet, a water main may be laid closer to a storm or

sanitary sewer provided that:

- The bottom of water main is at least 18 inches above the top of the sewer.
- Where this vertical separation cannot be obtained, the sewer shall be constructed of materials and with joints that are equivalent to water main standards of construction and shall be pressure tested to assure water tightness prior to backfilling.

#### 6-12.2 Crossing of Sanitary and Storm Sewers

Normal conditions – Water mains crossing house sewers, storm sewers, or sanitary sewers shall be laid to provide a separation of at least 18 inches between the bottom of the water main and the top of the sewer, wherever possible.

Unusual conditions – When local conditions prevent a vertical separation as described above, the following construction shall be used:

- Sewers passing over or under water mains shall be constructed of materials and with joints that are equivalent to water main standards of construction and shall be pressure tested to assure water tightness prior to backfilling.
- Water mains passing under sewers shall, in addition, be protected by providing:
  - A vertical separation of at least 18 inches between the bottom of the sewer and the top of the water main;
  - Adequate structural support for the sewers to prevent excessive deflection of joints and settling on and breaking the water mains;
  - That the length of water pipe be centered at the point of crossing so that the joints will be equidistant and as far as possible from the sewer;
  - Both the sewer and the water main shall be constructed of water pipe and pressure tested.

Sewer manholes - No water pipe shall pass through or come into contact with any part of a sewer or sewer manhole.

#### 6-12.3 Natural Gas Mains, Cables, and Other Utilities

Other utilities shall have a minimum horizontal clearance of 2 feet and vertical clearance of 4 inches, to permit proper maintenance of the water main.

6-13 Cross Connection

Backflow protection devices shall be installed and maintained by the customer. The determination of the requirement for a backflow protection assembly shall be made according to the City's current Cross Connection Control Plan. The plan will be supplied upon request.

6-14 Water Booster Pump Stations

6-14.1 Applicability

When required, a booster pump station, reservoir, and instrumentation controls shall be designed and constructed as part of an extension or modification of the Water Distribution System to maintain necessary available water volume and necessary but not excessive water system pressures to points of service.

Except as specifically approved otherwise in writing by the City Engineer, pumping units shall not cause drop in suction pressures greater than 20 psi between operating and stopped condition, and shall not cause service pressure at any meter in water distribution system under peak demand conditions to drop below 40 psi or increase above 120 psi under static (no demand) condition.

Pump design flow rate in gallons per minute, and reservoir storage volume in gallons, shall be stipulated in the Letter of Commitment. Guidelines used by the Water/Wastewater Division in developing these requirements include the following:

- A. Satisfy peak demand projections with minimum 40 psi residual at all points in the Water Distribution System;
- B. Satisfy projected average day demand coincident with fire flow demand with minimum 20 psi residual at all points in the Water Distribution System, with 25% of the reservoir volume conserved at the end of the fire demand period if the reservoir was full when the fire demand began;
- C. Maximum residual static pressure at any point in the Water Distribution System not in excess of 120 psi with booster pump off

6-14.2 Intent

Because of the significant variability of pump station designs depending on location and site specific characteristics, these standards are intended to be general guidelines of the basic

requirements and are not intended to be specific or detailed. The designer shall develop detailed specifications for construction as a part of the pump station design.

A separate and unique site plan for each pump station shall be developed based on the topographic and subsurface features of the specific site. For pump design, the design flow rate shall be as specified in the Letter of Commitment. Total dynamic head requirements shall be calculated by the engineer of record based on flow rate, pipe sizes, and specific reservoir elevation and characteristics through the development of a System Curve, and Pump Curve data provided by acceptable pump manufacturers.

#### 6-14.3 Pump Design

The Engineer of record shall determine the pumping capacity and a total dynamic head of the pumping units based on the specific elevation requirements, storage availability, pipe head loss calculations, acceptable pressure range for all customer service connections, average demand with fire flow required, and peak demand.

#### 6-14.4 Building or Enclosure

Pump station shall be designed for ground level entry to pumping units, internal piping and accessories, and electrical switchgear and controls, through a standard doorway. Access designed for confined space entry will not be acceptable. Building or enclosure shall be low maintenance, insulating walls with air conditioning and thermostat controlled unit to maintain maximum temperature of 80 degrees F when outdoor temperature reaches 100 degrees F. Heating unit shall maintain temperature of at least 60 degrees F when outdoor temperature reaches -10 degrees F. Space shall be adequate to meet all building and electrical codes and permit maintenance of individual equipment components without disassembly of other equipment or interruption of service. Minimum 50-year design life shall be used.

The building shall incorporate natural light by use of skylights. The building shall be interfaced with the water plant.

Overhead beam and crane shall be provided if weight of pump assembly exceeds 500 pounds. When not provided, adequate space shall be provided between pumping units to access portable A-frame with pulley to lift pump assemblies. Security fencing with minimum three barbed wire strands, dead bolt door locks, or equivalent access security shall be provided.

Factory built package units may be accepted provided they meet the requirements of these standards. The developer shall submit such requests to the Engineering Division for approval. Exterior architectural features and landscaping may be designed to “fit into” the theme of surrounding properties, subject to these standards and approval by the Water/Wastewater Division.

## **7. Sanitary Sewer Collection System**

### **7-1 General**

All proposed connections and authorized new extensions or modifications to the existing Public Sewer Collection System shall conform to these Design Standards and be constructed in accordance with Tennessee Division of Environment and Conservation – “Design Criteria for Sewage Works” and the City of Kingsport Construction Specifications.

### **7-2 Engineering Plans and Approval**

All new extensions or modifications to the Sewer Collection System shall be provided on engineering plans conforming to these standards, sealed by a Registered Professional Engineer, and approved by the City of Kingsport Engineering Division or TDEC. Hydraulic calculations shall accompany the plans.

Design shall further conform to all other applicable federal, state, and local laws and regulations, and all required permits shall be obtained prior to construction. Engineering plans shall clearly show and label the proposed sewer line extension, all fittings and appurtenances, and public sewer lateral locations to be installed; existing and/or proposed roads and road right-of-way; water line, sanitary sewer, and storm sewer easements; lot lines; lot numbers; proposed location of all new or existing underground utilities within the same right-of-way as the proposed system improvements; topographic information or profile view to include proposed final depth of bury; north arrow; location map; applicable and current City of Kingsport construction details; and any other information necessary for the appropriate and accurate construction of the proposed system extension or modification.

### **7-3 Right-of-Way and Access**

All proposed extensions or modifications to the system that are to be owned and maintained by the City of Kingsport shall be within a publicly owned and maintained dedicated street right-of-way or easement.

Whenever practical, mains and appurtenances shall be located outside of paved or otherwise improved surfaces and shall maintain a horizontal separation of at least 3 feet from all utilities, with the exception of water which shall have a horizontal separation of 10 feet.

### **7-4 Pre-Construction Meeting and Notice to Proceed**

No construction of extensions or modifications shall begin before plans are approved for construction and Authorization to Construct Permit is granted by the Engineering Division through a Pre-Construction Meeting coordinated by the Engineering Division. Any construction done prior to this Notice may be summarily rejected or refused without further investigation. In addition, beginning construction without authorization

violates State regulations and subjects the offender to State enforcement actions.

7-5 Contractor License Requirement

All contractors and subcontractors performing any construction on sewer collection system extensions or modifications, except Personnel of the Kingsport Water/Wastewater Division, shall be licensed Utility Contractors by the State of Tennessee. The developer shall provide the Engineering Division with the names and license number of each contractor or subcontractor before each begins construction.

7-6 Accessibility During Construction

The construction site shall be accessible at all times from the Notice to Proceed for inspection of progress by the Engineering or Water/Wastewater Division. Failure to provide accessibility may result in rejection of the work.

7-7 Connections to Existing Sewer System

7-7.1 Refer to City of Kingsport Construction Specifications for appropriate detail drawings for use in plans.

7-7.2 All connections to the existing Sewer Collection System shall be made by or approved by the City of Kingsport Water/Wastewater Division. Connections include tapping of existing active sewer mains or existing manholes.

7-7.3 8 inch and larger Sewer Taps

The contractor shall perform all excavation and backfill, through trenching and shoring practices which at all times meet the requirements of City of Kingsport Construction Specifications and TOSHA, and shall provide all safety barricading, traffic control devices, required permits, and other protection of the excavation. The contractor shall expose the sewer infrastructure or main to be tapped and clean all dirt and debris from the existing structures.

The contractor shall pay the appropriate fees for the Water/Wastewater Division to make the tap into the system or hire a City approved company to build the connection, meeting these standards and the Construction Specifications, and test the connection with compressed air to insure it is properly installed.

7-7.4 6 inch and smaller Sewer Taps

The City of Kingsport's Water/Wastewater Division will furnish and install 6 inch and smaller sewer taps onto the Public Sewer System, after the appropriate fees are paid, and extend a 6 inch

public sewer lateral to the nearest property line and will terminate with a two-way cleanout for the Contractor/Developer to connect onto.

The Contractor shall provide a minimum of three weeks advance notice to the Water/Wastewater Division to request a tap, and the Contractor is strongly encouraged to provide additional notice when possible. All requests, except emergency repairs, of less than 72 hours will be denied.

## **8. Wastewater Pump Stations**

### **8-1 General**

#### **8-1.1 Location and Flood Protection**

Wastewater pump stations should be located as far as practicable from present or proposed built-up residential areas, and a paved access road shall be provided, with 6 inches of stone and 2 inches of binder, minimum. Noise control, odor control, and station architectural and landscaping design should be taken into consideration. Sites for stations shall be of sufficient size for future expansion or addition, if applicable. The station site for all above ground stations shall also be fenced and locked.

The station's operational components shall be located at an elevation that is not subject to the 100-year flood or shall otherwise be adequately protected against the 100-year flood damage. The top (floor) of the pump station shall be a minimum of 6 inches above the finished grade of the site around the station.

Where the wet well is at a depth greater than the water table elevation, special provisions shall be made to ensure watertight construction of the wet well. Any connections to the pump station shall be made at an elevation higher than the maximum water table elevation, where possible.

The site for the pump station shall be a minimum of 25 feet by 25 feet in size. Larger sites will be required dependent upon the size of the station. A chain link fence shall be provided around the site. The site shall be large enough to allow maintenance trucks to turn around on the site. The site shall be dedicated to the City as public property and the site shall have access to a public street.

For accessibility, a 25 foot right-of-way (connecting to a public street) shall be provided for all pump stations. The width of an access road shall be 12 feet minimum. Storm drainage ditches and culverts shall be provided. All graded areas along the access road shall be a maximum slope of 2:1 (horizontal:vertical). All graded areas shall be satisfactorily seeded and mulched. Vertical gradient for the access road shall not exceed 12%. Provisions shall include sufficient right-of-way for overhead power and telephone service. Site shall be graded to allow drainage and prevent ponding of storm water.

#### **8-1.2 Pumping Rate and Number of Units**

At least two pump units shall be provided, each capable of handling the maximum design flow (residential pump stations shall be simplex – one unit). Pump and system head curves shall be submitted to the City of Kingsport Engineering Division for review and approval.

Where three or more units are provided, they shall be designed to fit actual flow conditions and shall be of such capacity that, with any one unit out of service, the remaining units will have capacity to handle the maximum sewage flow. The number of pump units may be controlled by the reliability classification of the adjacent receiving waters.

When the station is expected to operate at a flow rate less than one half the average design flow for an extended period of time, the design shall address measures taken to prevent septicity from long holding times in the wet well.

For standardization purposes, the following pump stations shall be specified:

- A. For duplex submersible grinder pump stations – Hydromatic, Barnes, and/or Zoeller.
- B. For simplex, submersible residential grinder pump stations – Environment One (E-One).
- C. For duplex, submersible solids handling/non-clog pump stations – Flygt, and/or KSB.
- D. For duplex, suction lift/self priming pump stations – Gorman-Rupp.

Plan sheets showing the requirements for these standardized pump stations can be obtained from the City of Kingsport Engineering Division. These standard plan sheets shall be completed by a registered professional engineer. The completed plan sheets shall be reviewed and approved by the City of Kingsport Engineering Division prior to construction.

### 8-1.3 Pumping Units

#### 8-1.3.1 Pump Openings

Solids handling/non-clog pumps and suction lift/self priming pumps shall be capable of passing solids of at least 3 inches in diameter.

#### 8-1.3.2 Priming

Pumps shall be so placed that under normal operating conditions they will operate under a positive suction head (except for suction lift pumps).

#### 8-1.3.3 Intake

Each pump shall have an individual intake. Wet well design should be such as to avoid turbulence near the intake.

#### 8-1.3.4 Controls

Control float switches should be so located as not to be affected by the flows entering the wet well or by the suction of the pumps. Controls shall be able to activate additional pumps if water in the wet well continues to rise. Provisions should be made to automatically alternate the pumps in use. Pump stations with motors and/or controls below grade should be equipped with a secure external disconnect switch. If float switches are used, an “intrinsically safe” power source shall be considered.

Where a pump station requires and utilizes a controller device, the Multitrode Multismart controller shall be used.

### 8-1.4 Flow Measurement

Suitable devices for measuring sewage flow should be provided at pumping stations with flow capacity greater than 1.0 million gallons per day (mgd). Hour timers (totalizers) shall be installed on all pumps unless otherwise approved by the Division.

### 8-1.5 Alarm System

An alarm system shall be provided for all pumping stations. Consideration of telemetry alarm to 24-hour monitoring stations or telephone alarms to duty personnel shall be given when reliability classifications or property damage warrants it. When telemetry is not used, an audiovisual device should be installed at the station for external observation.

Alarms for high wet well and power failure shall be provided, as a minimum, for all pump stations. For larger stations, alarms signaling pump and other component failures or malfunctions should also be provided.

A backup power supply, such as a battery pack with an automatic switchover feature, shall be provided for the alarm system, such that a failure of the primary power source will not disable the alarm system. Test circuits should be provided to enable the alarm system to be tested and verified that it is in good working order.

8-1.6 Emergency Overflow Pumping

A separate valve vault with appropriate valving, piping, fittings, and connections shall be provided for all pump stations to hook up portable pumps.

8-2 Special Details

8-2.1 Materials

In the selection of materials, consideration should be given to the presence of hydrogen sulfide and other corrosive gases, greases, oils, and other constituents frequently present in sewage.

8-2.2 Electrical Equipment

Electrical systems and components (e.g., motors, lights, cables, conduits, switchboxes, control circuits) in enclosed or partially enclosed spaces where flammable mixtures occasionally may be present (including raw sewage wet wells) shall comply with the National Electrical Code requirements for Class I Division 1 locations.

Electrical equipment shall be enclosed in a weatherproof stainless steel enclosure.

8-2.3 Water Supply

There shall be no physical connection between any potable water supply and a wastewater pump station which under any conditions might cause contamination of the potable water supply.

A freeze proof yard hydrant with backflow preventer shall be installed at all wastewater pump station locations.

8-2.4 Lighting

Adequate lighting for the entire pump station shall be provided.

8-2.5 Pump and Motor Removal

Provisions shall be made to facilitate removing pumps, motors, and other equipment, without interruption of system service.

8-2.6 Access

Suitable and safe means of access should be provided to equipment

requiring inspection or maintenance. Stairways and ladders shall satisfy all OSHA requirements.

#### 8-2.7 Valves and Piping

Suitable shutoff valves shall be placed on suction and discharge lines of each pump for normal pump isolation. A check valve should be placed on each discharge line between the shutoff valve and the pump. Pump suction and discharge piping should not be less than 4 inches in diameter except where design of special equipment allows. The velocity in the suction line should not exceed 6 feet per second and, in the discharge piping, 8 feet per second. A separate shutoff valve is desirable on the common line leaving the pump station.

A separate valve vault shall be installed at each pump station location. All pipe within the wet well and valve vault shall be ductile iron or stainless steel. A quick connect/disconnect fitting shall be installed in all the valve vaults. See standard pump station plan sheet for details.

#### 8-2.8 Ventilation

Ventilation should be provided for all pump stations during all periods when the station is manned. Where the pump is below ground, mechanical ventilation is required and should be arranged to independently ventilate the dry well. If screens or mechanical equipment, which might require periodic maintenance and inspection, are located in the wet well, then it should also be mechanically ventilated. There should be no interconnection between the wet well and the dry well ventilation systems. In pits over 15 feet deep, multiple inlets and outlets are desirable. Dampers should not be used on exhaust or fresh air ducts, and fine screens or other obstructions in air ducts should be avoided to prevent clogging. Switches for operation of ventilation equipment should be marked and conveniently located above grade and near the pump station entrance.

Consideration should be given also to automatic controls where intermittent operation is used. The fan wheel should be fabricated from nonsparking material. In climates where excessive moisture or low temperature is a problem, consideration should be given to installation of automatic heating and/or dehumidifying equipment. Where heat buildup from pump motors may be a problem, consideration should be given to automatic ventilation to dissipate motor heat.

#### 8-2.9 Emergency Power Supply

Provision of an emergency power supply for pumping stations may be made and may be accomplished by connection of the station to at least two independent public utility sources, or by provision of in-place internal combustion engine equipment that will generate electrical or mechanical energy, or by provision of portable pumping equipment. Emergency power shall be provided for all stations which are 1 MGD or larger. Emergency power shall be provided that, alone or combined with storage, will prevent overflows from occurring during any power outage that is equal to the maximum outage in the immediate area during the past 10 years. If available data is less than 10 years, an evaluation of a similar area served by the power utility for 10 years would be appropriate.

#### 8-3 Wet Wells and Valve Vaults

##### 8-3.1 Materials

For grinder pump stations, wet wells and valve vaults shall be fiberglass. Integral wet wells and valve vaults are recommended.

For solids handling/non-clog and suction lift/self priming pump stations, wet wells and valve vaults shall be concrete. Wet well and valve vault shall be separate structures.

##### 8-3.2 Wet Well Size

The effective capacity of the wet well should be evaluated based on pumping requirements and reliability classifications.

##### 8-3.3 Floor Slope

The wet well floor should have a minimum slope of 1-to-1 in the hopper bottom. The horizontal area of the hopper bottom should be no greater than necessary for proper installation and function of the inlet.

##### 8-3.4 Ventilation

Wet well shall be designed to allow ventilation. Vents shall be constructed of stainless steel.

## 8-4 Suction Lift/Self Priming Pump Stations

### 8-4.1 Priming

Conventional suction lift/self priming pumps should be of the self-priming type, as demonstrated by a reliable record of satisfactory operation. The maximum recommended lift for a suction lift pump station is 15 feet, using pumps of 200 gallons per minute (gpm) capacity or less.

### 8-4.2 Capacity

The capacity of suction lift/self priming pumps should be limited by the net positive suction head and specific speed requirements, as stated on the manufacturer's pump curve, for the most severe operating conditions.

### 8-4.3 Air Relief

#### 8-4.3.1 Air Relief Lines

All suction lift/self priming pumps shall be provided with an air relief line on the pump discharge piping. This line should be located at the maximum elevation between the pump discharge flange, and the discharge check valve to ensure the maximum bleed-off of entrapped air. Air relief piping shall be sized appropriately. A separate air relief line shall be provided for each pump discharge. The air relief line should terminate in the wet well or suitable sump and be open to the atmosphere.

#### 8-4.3.2 Air Relief Valves

Air relief valves should be provided in air relief lines on pumps not discharging to gravity sewer collection systems. The air relief valve should be located as close as practical to the discharge side of the pump.

### 8-4.4 Pump Location

Suction lift/self priming pumps shall not be located within the wet well.

### 8-4.5 Access to Wet Well

Access to the wet well should not be through the dry well, and the dry well should have a gastight seal when mounted directly above the wet well.

## 8-5 Submersible Pumps

### 8-5.1 Pump Removal

Submersible pumps shall be readily removable and replaceable without dewatering the wet well or requiring personnel to enter the wet well. Continuity of operation of the other units shall be maintained.

A hoist and accessories for removing the pumps from the wet well should be provided.

### 8-5.2 Controls

The control panel shall be located outside the wet well and suitably protected from weather, humidity, and vandalism. Control panel shall be constructed of weatherproof stainless steel.

### 8-5.3 Valves

All control valves on the discharge line for each pump should be placed in a convenient location outside the wet well in separate pits and be suitably protected from weather and vandalism. Outside valve covers should not be installed.

## 8-6 Operability and Reliability

### 8-6.1 Objective

The objective of reliability is to prevent the discharge of raw or partially treated sewage to any waters and to protect public health by preventing backup of sewage and subsequent discharge to basements, streets, and other public and private property.

### 8-6.2 Backup Units

A minimum of two pumps shall be provided in each station. Each pump shall be capable of delivering the maximum design flow.

## 8-7 Force Mains

### 8-7.1 Size

Minimum size force mains should be not less than 4 inches in diameter, except for grinder pumps. All force main inside the wet well and valve vault and within 5 feet of the wet well, and valve vault shall be stainless steel or ductile iron. Remainder shall be AWWA C900 or C905 piping with metallic tracing tape or wire.

8-7.2 Velocity

At pumping capacity, a minimum self-scouring velocity of 2 feet per second (fps) should be maintained. Velocity should not exceed 8 feet per second.

8-7.3 Air Relief/Vacuum Valve

An air relief/vacuum valve shall be placed at the necessary high points in the force main where the elevation differential is greater than 5 vertical feet to relieve air locking. Air relief valves shall be installed according to the City of Kingsport Engineering Division's detail.

8-7.4 Termination

The force main shall enter the receiving manhole with its centerline horizontal and with an invert elevation that will ensure a smooth flow transition to the gravity flow section; but in no case shall the force main enter the gravity sewer system at a point more than 1 foot above the flow line of the receiving manhole. The design should minimize turbulence at the point of discharge.

Consideration should be given to the use of inert materials or protective coatings for the receiving manhole to prevent deterioration as a result of hydrogen sulfide or other chemicals where such chemicals are present or suspected to be present because of industrial discharges or long force mains.

8-7.5 Pressure Tests

Before backfilling, all force mains shall be tested at a minimum pressure of at least 50 percent above the design operating pressure for at least 30 minutes. Leakage shall not exceed the amount given by the following formula:

$$L = \frac{ND(P)}{7,400}^{0.5}$$

Where L is allowable leakage in gallons per hour,  
N is the number of pipe joints (18 foot joints),  
D is the pipe diameter in inches,  
P is the test pressure in psi.

8-7.6 Restraint

Force mains shall be sufficiently anchored and restrained within the pump station and throughout the line length. The number of bends shall be as few as possible. Thrust blocks and restrained joints shall be provided where restraint is needed.

8-7.7 Friction Losses

A “C” factor shall be used that will take into consideration the conditions of the force main at its design usage. A pipe that is coated with grease after several years will not have the same “C” factor as it did when it was first placed into operation.

8-7.8 Water Hammer

The force main design shall investigate the potential for the existence of water hammer.

8-7.9 Flushing & Cleanouts

There shall be a means of cleaning the system, particularly to clear any settleable solids or grease accumulation.

Cleanouts and valves shall be provided at a maximum of 400 foot intervals.

8-7.10 Location

Force mains may be installed within the same ditch line as gravity sewer provided that the same spacing requirement regarding to water lines is maintained. Special care shall be provided to protect both the force main and the gravity sewer during construction and during the operation of the sanitary sewer system.

**9. Storm Water Management, Erosion Prevention, and Sediment Control**

9-1 Erosion Prevention and Sediment Control

Refer to the Tennessee Division of Environment and Conservation  
Erosion Prevention and Sediment Control Handbook of latest issue.

9-2 Storm Water Management

Refer to the City of Kingsport Stormwater Management Ordinance of  
latest issue.

## **10. Landscaping**

### **10-1 Types of Landscaping**

Landscaping may consist of, but is not limited to:

- A. Lawn Installation:  
Soil Preparation, Application of Soil Amendments, Seeding, Sodding, Mulching, Watering, Initial Maintenance, Replanting of Unsatisfactory or Damaged Turf.
- B. Plant Material Installation:  
Proper Selection, Backfilling and Bed Preparation, Handling of Plant Material, Planting, Weed Removal, Mulching, Initial Maintenance and Care
- C. Lawn Maintenance:  
Mowing, Watering, Fertilizing, Aeration, Topdressing, Insect and Disease Control
- D. Shrub, Groundcover, and Tree Maintenance:  
Pruning, Watering, Fertilizing, Mulching, Insect and Disease Control
- E. Excavation, Backfilling or other preparations of an area where future landscaping may be installed.

### **10-2 Standards**

#### **10-2.1 Documents**

The design and execution of work shall comply with the provisions of the latest editions of the following specifications, standards, ordinances, and zoning requirements except as otherwise shown or specified herein.

- A. AMERICAN STANDARD FOR NURSERY STOCK, (Latest Edition Available)
- B. AMERICAN NATIONAL STANDARDS FOR ARBORICULTURAL AND TREE CARE OPERATIONS (Latest Editions Available)
- C. ORDINANCE NO. 5171, ALSO KNOWN AS THE CITY OF KINGSFORT'S TREE ORDINANCE
- D. ORDINANCE NO. 3191, ALSO KNOWN AS THE CITY OF KINGSFORT'S LANDSCAPING ORDINANCE

E. SECTION 114 OF THE CITY OF KINGSPORT'S CODE OF ORDINANCES

10-2.2 Topsoil

Topsoil shall be natural, fertile, friable sandy loam soil, typical of the locality and obtained from well-drained areas. It shall be without admixture of subsoil or slag and shall be free of stones, lumps, sticks, plants or their roots, toxic substance or other extraneous matter that would be harmful to plant growth or would interfere with future maintenance. Topsoil pH range shall be 5.5 to 6.5.

10-2.3 Soil Conditioners and Amendments

- A. Agricultural limestone shall contain not less than 95 percent calcium carbonate equivalent and shall be ground to such fineness that at least 98 percent will pass a 20-mesh sieve and at least 50 percent will pass a 100-mesh sieve.
- B. Aluminum sulfate shall be horticultural grade.
- C. Peat shall be a natural product of sphagnum moss peat (peat moss), derived from a freshwater site conforming to ASTM D2607 except as otherwise specified. Peat shall be measured in a dry condition, containing not more than 35% moisture by weight.
- D. Sand shall be clean and free of toxic materials.
- E. Vermiculite shall be horticultural grade and free of any toxic materials.
- F. Gypsum shall be 90 percent pure, free of any toxic materials, and at least 95 percent by weight shall pass a 4-mesh sieve.
- G. Other amendments as recommended shall be approved by the Landscape Specialist upon requested use.

10-2.4 Seed

Seed shall be the best blend of certified lawn grass and/or ground cover. Seed must be common to the site location and comply with established tolerances for germination and purity in accordance with the U. S. Division of Agriculture Rules and Regulations under the latest edition of the Federal Seed Act. Seed mixture and seeding rate shall be specified on the drawings.

10-2.5 Fertilizer

All fertilizers shall be complete formula fertilizers and shall conform to the applicable State and Federal Laws. All fertilizers shall be uniform in composition, free-flowing and suitable for application with approved equipment. Fertilizers shall be fully labeled and shall bear the name, trade name, trademark, and warranty of the producer.

#### 10-2.6 Planting Mixture

Planting mixtures shall consist of a uniform mixture of three parts topsoil and one part peat moss. The mixture must be thoroughly ground up and mixed so that there is no visible segregation of material.

#### 10-2.7 Pesticides

A. All pesticides must comply with all applicable State and Federal Laws and be registered with the U. S. Environmental Protection Agency.

B. Pesticides may only be applied by a Tennessee Division of Agricultural Licensed Company.

#### 10-2.8 Water

Water shall not contain elements toxic to plant life and shall be obtained from a locally approved water source.

#### 10-2.9 Mulches

A. Mulches for plant stock shall be Shredded Pine Bark Mulch. It shall be of a relative uniform particle size with a median size of one and one-half inches (1-1/2") and shall be free of sticks, stones, leaves and any other debris.

B. Mulches for lawn areas:

1. Seeded areas 3:1 slope or less shall be clean, dry, weed-free straw suitable for placing with mulch blower equipment or by hand.

2. Seeded areas over 3.1 slope shall be:

a) A clean, dry and weed-free straw matting with binding material of a readily decomposing nature.

b) A wood cellulose fiber for use with hydraulic application of grass and seed and fertilizer. The wood cellulose shall consist of commercially prepared natural wood cellulose fiber or wood pulp processed to contain no growth or germination-inhibiting factors. The wood cellulose fiber shall be manufactured so that the fibers disperse readily and uniformly as homogeneous slurry.

#### 10-2.10 Plant Stock

A. Plant Material shall be first quality stock and shall conform to the code of standards set forth in the current edition of the American Standards for Nursery Stock sponsored by the American Association for Nurserymen, Inc.

B. Species and variety as specified shall be certified true to their genus, species and variety.

C. Planting stock shall be well branched and well formed, sound, vigorous, healthy, free from disease, sun-scale, windburn,

abrasion, and harmful insects or insect eggs, and shall have healthy, normal unbroken root systems. Deciduous trees and shrubs shall be symmetrically developed or uniform habit of growth, with straight trunks or stems.

D. All plant material measurements shall be in strict accordance with the latest edition of the American Standard for Nursery Stock. Please refer to the "Landscape and Land Use Approved Plant List for acceptable types and minimum sizes. Any plant not on this list must be approved before use by the City's Landscape Specialist.

E. Tree caliper measurements shall be taken at a point on the trunk, six inches (6") above natural ground for trees.

### 10-3 Execution of Work

#### 10-3.1 Underground Obstructions

The location of underground obstructions or utilities shall be the responsibility and at the expense of the installer. Care shall be taken when excavating plant pits and placing stakes and anchors in the proximity of such obstructions to avoid damaging them or any work done by others.

#### 10-3.2. Protection of Existing Vegetation

A. If lawns have been established prior to planting operations; the surrounding turf shall be covered in a manner that will protect turf areas before excavations begin.

B. During excavation, conflicts with existing plant roots and branches should be avoided. However, if pruning is required, a proper cut shall be performed smoothly and neatly without splitting or crushing. Do not use tree paint or wound dressing.

#### 10-3.3. Installation of Topsoil

A. Prior to topsoil placement, areas to receive topsoil shall be cleared of all debris.

B. A minimum of six inches (6") of topsoil shall be placed over all areas to be established in turf, shrubs or groundcover, except planter islands as specified below. The topsoil layer shall bring all landscape areas to finish grade.

C. A minimum of twenty-four inches (24") of topsoil shall be placed in any areas where plants and trees are to be installed or plan to be installed at a future date. (This is also referred to as a planter island). Depending on the design this may require the removal of the sub-grade or existing material.

D. Planter islands shall be bermed to a high point of six inches (6") above the adjacent curb or lawn area (or higher if necessary) to ensure positive drainage (a minimum of 5% slope).

- E. Fertilizer and soil amendments as recommended shall be thoroughly tilled in before placing into planter areas.
- F. After soil amendments have been thoroughly tilled in to soil, all areas are to be rolled in to firm up and compact the soil. Care shall be taken as not to over compact the soil (Maximum Compaction of 85% Standard Proctor). During the rolling, all depressions caused by settlement of rolling shall be filled with additional topsoil and the surface shall be re-graded and rolled until presenting a smooth and even finish to the required finish grade.
- G. Finish grading shall be done just prior to seeding or sodding. The entire area shall be raked to a smooth surface free of all clods, roots, stones 1" or larger, any other debris that might interfere with planting or maintenance operations.

#### 10-3.4. Seeding

- A. Topsoil, fertilizer, lime and seed shall be applied to all areas to be seeded as specified herein and in accordance with standard horticultural practices.
- B. Any irregularities in the surface resulting from fertilizing, liming, tilling, or other causes shall be smoothed prior to application of seed.
- C. Seeding shall not be done during windy weather or when the ground is excessively wet, frozen or otherwise un-tillable.
- D. Seeding may be applied with a mechanical hand seeder or by hydro-seeding at the normally expected rate for the type applied.
- E. Immediately after seeding, all areas shall be lightly rolled. If, due to slope conditions, rolling cannot be done, seed shall be raked unto top ¼" of soil. Mulch as specified below shall be applied immediately after seed has been sown.
- F. All seeded areas shall be mulched immediately after seeding. Mulch may be either dry straw or wood cellulose fiber. Straw shall be applied at a rate of 100 pounds per 1,000 square feet.
- G. Seeded areas shall be watered regularly to ensure good germination and growth.

#### 10-3.5. Sodding

- A. Topsoil, fertilizer, lime and seed shall be applied to all areas to be sodded as specified herein and in accordance with standard horticultural practices.
- B. Any irregularities in the surface resulting from fertilizing, liming, tilling, or other causes shall be smoothed prior to application of sod.
- C. Sodding shall not be done when the ground is excessively wet, frozen or otherwise un-tillable.
- D. Sod is to be "American Sod Producers Association" certified, cultivated, turf type grass sod.

- E. Sod must also be a minimum age of 18 months, with a root development that will support its own weight without tearing when suspended vertically by holding the upper corners, free of stones and not containing more than 10 weeds per 1000 sq.ft.
- F. Sod must be delivered on pallets or in rolls and the roots protected from dehydration.
- G. Sod is to be laid tight with no open joints visible and not overlapping, with staggered end joints of a minimum of 12 inches.
- H. Where sod is used on slopes 3:1 or steeper, along stream banks, and/or along ditch linings; sod is to be laid perpendicular to the slope and every row secured with pegs at a minimum of 5 feet on center.
- I. Sod shall be watered properly and immediately after installation, saturating the sod and the topsoil layers.

#### 10-3.6. Planting of Trees, Shrubs, and Groundcover

- A. All planting shall be performed by a licensed Contractor familiar with the accepted Horticulture and Arboriculture practices.
- B. No digging or planting operations shall be conducted when the soil or plants are excessively wet, muddy, or in a frozen condition.
- C. When considered advisable and in keeping with proper horticultural procedures, a request may be made to delay installation until favorable conditions occur.
- D. Existing plants remaining on the site shall be protected from soil compaction and other damages during the planting operations.
- E. Planting pits shall be excavated to in such a way as to alleviate glazing and loosen any hard subsoil in the bottom of pit.
- F. Mechanical "Tree Spade" transplanting equipment and augers may be used to dig and install plants. However provisions shall be made to assure natural subsurface water circulation, surface water circulation and surface water absorption.
- G. B&B and container-grown plants shall be handled and moved only by the ball or container. Plants shall be set plumb and held in position until sufficient soil has been placed around roots or ball. Plants shall be set in relation to surrounding grade so that they are even with the depth as which they were grown.
- H. All plants shall be planted in soil mixture as specified and backfilled properly to eliminate voids and air pockets.
- I. Containers, Burlap and tying materials shall be carefully removed

#### 10-3.7 Mulching and Weed Removal:

- A. The mulched bed outline shall be continuous and cut vertically
- B. Any undesired vegetation or weeds within the bed shall be removed (roots included) prior to mulching.

- C. Mulch for planting beds shall be installed to a minimum depth of three inches (3") in all areas specified.
- D. Mulch shall be kept out of the crowns of shrubs and off buildings, sidewalks, and other structures.
- E. The top of all areas of mulch shall be even to 1" below the top of adjacent curb, walk or edge of pavement.

10-3.8 Pruning:

- A. Plant materials shall be pruned following planting operations to remove broken or damaged branches.
- B. Damaged or otherwise excessively damaged and improperly pruned plants shall be cause for rejection.

10-3.9 Completion and Acceptance

- A. Constant care should be exercised to maintain a safe and clean work site.
- B. The landscape installer shall be responsible for the repair and any damage to lawns, paved areas, roads, walks, curbs, or underground utilities which may result from their work.
- C. If required, any replacement plants or materials shall be subject to all requirements previously stated in this document.
- D. All work and design is subject to review and inspection by the City's Landscape Specialist or his designee.

## **11. Submittal Requirements**

### **11-1 General Layout**

All roadway and public utility construction plans shall comply with the TDOT format for roadway construction plans. Some exemptions are made for subdivision and private development site plans as specified in the following discussion.

### **11-2 Technical Specifications**

Construction workmanship and quality of construction materials shall be as specified in the latest edition of the City of Kingsport Construction Specifications.

### **11-3 Standard Drawings**

The Tennessee Division of Transportation Standard Roadway and Structure Drawings manual of latest revision shall be utilized in the design of subdivision, public, and private development unless otherwise specified in this document.

### **11-4 Standard Notes**

The Standard Notes of latest revision, as published in the Tennessee Division of Transportation Design Guidelines shall be used, as they would apply to the type of construction being specified in the plans.

### **11-5 Right-of-way Plans**

When required, right-of-way plans shall conform to the TDOT right-of-way plan format, as specified in the TDOT Design Guidelines.

### **11-6 Construction Plans**

#### **11-6.1 Organization of Plans**

Sheets shall be arranged per the list in this section. The standard symbols specified by TDOT shall be used to represent different existing and proposed features on the plan sheets. These symbols are shown in the front section of the TDOT Standard Roadway and Structures Drawings manual. Each sheet that follows the cover sheet shall be numbered in the upper right corner.

Preferred scales for the Present and Proposed Layout Sheets are 1"= 50', 1"= 40", or 1"= 20', with a maximum allowable of 1"=50'. Sheet size shall be 24"x36" or 22"x34".

#### 11-6.2 Cover Sheet

The construction plans shall have a cover sheet containing:

- A. A project name,
- B. A location map scaled to no less than 1' = 1000 feet,
- C. Subdivision, area, or institution to be served,
- D. The name and address of the professional designer, or the professional design firm,
- E. Current and projected ADT, design hour volume, and design speed,
- F. The current date, and
- G. The revision date, if the plans have been revised during the review process.
- H. Case number of any previous planning actions (i.e. rezoning, variances, etc.)

#### 11-6.3 Sheet for the List of Quantities and Tabulation Tables

Any private development and infrastructure will be exempt from providing this sheet. Following the cover page, a sheet will be provided which will list the estimated quantities and show applicable footnotes associated with individual construction items. Tables consisting of drainage structures and pipe sizes may be included on this sheet. Other sheets may be provided when room is insufficient on the first sheet of this section. Other construction items, which require tabulation, shall be included in this section.

#### 11-6.4 Standard Drawing Sheet

When TDOT standard drawings will depict construction items being specified, a list of standard drawing numbers may be substituted on a plan sheet following the cover sheet. If TDOT has made a revision to the standard drawing being specified, then the effective date of TDOT's revision will be shown along with the standard drawing number.

#### 11-6.5 Details Sheet

Details, which are not included in the TDOT Standard Roadway and Structures Drawings notebook, shall be shown following the

list of applicable standard drawings.

11-6.6 Right-of-Way Sheet

Subdivisions and plans for private development will be exempt from providing this sheet. When right-of-way will be acquired, a sheet will be provided with a right-of-way index map at a scale that will show effective detail. The corresponding tract numbers shall be listed on each tract. If room allows, a TDOT style right-of-way table shall be included. If necessary, the right-of-way table may be included on a separate sheet.

11-6.7 Present Layout and Right-of-Way sheets

Subdivisions and plans for private development will be allowed to vary some from this format. However, to preserve a degree of compliance to a standard style, subdivision and private development construction plans should follow this pattern as close as possible.

Site plans for private development shall include existing contour lines at 2-foot intervals, and if this sheet is to be a grading plan, include the proposed contour lines at 2-foot intervals.

A plan view of the present topographic features of the area under construction shall be shown on this sheet. If the sheet will become cluttered with the standard topographic and proposed right-of-way information, a second sheet may be included for the right-of-way information.

The proposed right-of-way sheet shall conform to the style used by TDOT. Topographic features to be shown on the present layout sheet are not to be limited to the following, but this list is to provide a minimum example:

1. Centerline of the proposed street with station numbers,
2. Edge of pavement, and back of curb,
3. Storm water drainage inlets and sanitary, telephone, and electric power manholes,
4. End of pipes, centerline of storm water drainage ditches, stream banks, and springs,
5. Water and natural gas valves,
6. Water meters, electric line pull boxes, and sanitary sewer clean-out caps,
7. Underground utility lines such as; storm water, sanitary sewer, natural gas, telephone / communication, electric power, etc.,
8. Electric power, telephone, cable television, street light,

- traffic signal poles,
- 9. Buildings, sidewalks, driveways, significant trees and planted / landscaped areas,
- 10. Proposed street centerline, and proposed slope lines,
- 11. Property information, iron pins, property lines with calls and distances, and public and private easements,
- 12. Traffic and business signs.
- 13. FEMA flood fringe and flood way limits.

#### 11-6.8 Proposed Layout Sheets

The proposed layout sheet shall show all new construction items being proposed, station numbering and centerline of the proposed street.

Additionally, horizontal curve data shall be included on this sheet. The requirements set forth by TDOT for their proposed layout sheets shall apply. Subdivision and site plans for private development shall include existing and proposed contour lines at 2 foot intervals if they are not shown on a separate, existing layout sheet.

Where applicable, identify/show the quantity of all impervious surfaces (square footage) and FEMA flood fringe and flood way limits.

Include site data block – provided by the City of Kingsport Engineering Division - on the plan cover sheet. Data block includes information for zoning, density, disturbed area, impervious area, building size, etc.

#### 11-6.9 Profile Sheets

A profile along the project centerline of existing ground and proposed finished grade shall be shown on this sheet. Vertical curve information shall be indicated on this sheet along with any superelevation being planned for horizontal curves. The profile of existing and proposed storm water, sanitary sewer, water, and natural gas lines shall be shown.

#### 11-6.10 Cross-section Sheets

Subdivision and site plans for private development are exempt from providing cross-section sheets. All roadway plans shall include cross-sections at 50-foot intervals along the centerline of the proposed street. The information shall be presented in the same

format as TDOT cross-section sheets.

#### 11-6.11 Miscellaneous Sheets Which are Required

- A. Erosion and Sediment Control Plan
- B. Work Zone Traffic Control Plan

#### 11-6.12 Miscellaneous Sheets Which May be Required

- A. Detailed Intersection Geometric Layout
- B. Traffic Signal Layout
- C. Landscaping Plan

### 11-7 As-Built Plans

#### 11-7.1 General

As-built plans are required for all permitted development. The plans shall be prepared by a professional surveyor, and shall accurately record the as-built location of the street and storm drainage system.

Submit to the City of Kingsport Engineering Division two hard copies and one digital copy (AutoCad and Adobe .pdf) of the As-Built Drawings with a transmittal letter containing date, project title, Developer/Owner's name and address, list of documents, and signature of Developer/Owner. A licensed surveyor or engineer shall certify that the submitted As-Built Drawings accurately portray what has been built. The As-Built Drawings shall accurately illustrate the installed location of all utilities, roads, storm water facilities, and any other public infrastructure. The installed locations shall be verified by a certified survey showing dimensions, locations, elevations, profiles, and cross-sections of construction. All easements and Rights of Way (ROW) shall be shown on the As-Built Drawings. The As-Built Drawings shall be standard size plan sheets (24"x36" or 22"x34") with a scale no greater than 1"=50'. The digital copy shall be full scale and shall be coordinated to the KGRN coordinate system.

#### 11-7.2 Contents

The as-built plans shall be of the same format as the construction plans, and contain the following information:

- A. Cover Sheet with an area map and project identification;
- B. Plan view of the horizontal layout of the completed street:
  - 1. Curve radii, center line bearing, street widths,
  - 2. Street, Curb and gutter, sidewalks, handicap ramps;
  - 3. Storm inlets, storm manholes, storm pipe end walls;
  - 4. Ground mounted electric transformers, street light poles;
  - 5. Water valves, gas valves, and sanitary sewer manholes;
  - 6. Notes of all revisions made to the design during construction.
- C. Profile of the vertical alignment of the completed street:
  - 1. Tangent grades, vertical curve lengths, finished street grade;
  - 2. Location of storm inlets and manholes;
  - 3. The profile of storm pipes indicating their slope and diameter;
  - 4. The profile of water and sewer lines and their sizes;
- D. A typical cross-section of the different types of streets in the development.
- E. Typical details of storm water structures, and bridges.
- F. The completed detention basin, indicating its location and volume.
- G. Typical details of the detention basin outlet structure.
- H. Location of special drainage easements.
- I. The 100 year flood boundary and flood way limits,
- J. Location and volume of sinkholes receiving storm water from public streets,
- K. Typical details of constructed sinkhole treatments, and
- L. The validated seal of the engineer that produces the as-built

plans.

M. Location of all permanent stormwater BMPs.

11-8 Review Requirements

All reports, final plans and specifications should be submitted at least 30 days prior to the date on which action by the Engineering Division is desired. However, subdivision plans and reports are subject to the deadline for the Kingsport Regional Planning Commission.

It is highly recommended that the developer and design consultant schedule a pre-development meeting with the City of Kingsport to discuss each particular project.

11-8.1 Preliminary Submittals

Submittal of partially completed plans to these offices for an informal or preliminary review is encouraged. This can usually reduce the number of comments transmitted to the designer during later reviews, leading to an expedited approval of the final construction plans.

11-8.2 Approval of Construction Plans

Approval of construction plans will be granted when the plans, construction documents, and specifications are found to be complete as compared to these City Design Standards, Construction Specifications, pre-development meeting with City staff, permits, and any other criteria specified in this document.