City of Farmington, Missouri
Design Standards
for
Public Improvements

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PREPARED IN CONJUNCTION WITH

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CHAPTER I - DEFINITIONS AND POLICIES

A. DEFINITION OF TERMS, PHRASES, AND WORDS

This section contains definitions relevant to public improvements. Additional definitions specific to the type of work being performed are presented in some of the subsequent chapters of this document.

1. Alley. A permanent public service way dedicated for, or in, public use, other than a street, place, road, crosswalk or easement, and designed to provide a secondary means of access to the back or side of abutting properties and not intended for general traffic circulation.

2. Arterial Street (Primary). A street or highway primarily intended to provide for high volume, moderate speed, and extended trip length traffic movement between major activity centers, with access to abutting property subordinate to major traffic movement.

3. Arterial Street (Secondary). A street which interconnects with and augments the primary arterial system. The secondary arterial is intended to provide for moderate volume, moderate speed, and short to moderate trip length while providing partially controlled access to abutting property

4. Bench Mark. A permanent object of known elevation and location that is in an area where disturbance is unlikely.

5. Block. That property abutting on one (1) side of a street between the two (2) nearest intersecting streets or other natural barriers.

6. Board of Adjustment. The zoning regulations for the City of Farmington include procedures for appeals or requests for variances to be made to the Board of Adjustment. This board is appointed by the Mayor and City Council and consists of five regular members and three alternate members who serve without compensation. The board is an administrative appeals body independent of the city administration or city council.

7. Bridge. A structure having a clear span greater than twenty (20) feet or a multiple span structure where the total length of the span is in excess of twenty (20) feet.

8. City of Farmington Standard General Conditions and Technical Specifications for Public Works Construction. The official General Conditions and Technical Specifications used on public city improvements within the City of Farmington, Missouri. This document contains data for public improvements from the

advertising stage of a project through the actual construction and acceptance of the project.

9. Collector Street. A street which collects and distributes traffic to and from local and arterial street systems. The collector is primarily intended to provide for low to moderate volume, low speed, and short length trips while providing access to abutting property.

10. Consultant. An individual, firm, association, partnership, corporation, or other legal entity registered in the State of Missouri and engaged in the practice of engineering or architecture.

11. Crosswalk. A right-of-way, dedicated to or set aside for public use, which cuts across a block or street to facilitate pedestrian access to adjacent streets and properties.

12. Cul-de-sac or Dead-end Street. A minor street with only one outlet.

13. Culvert. A closed conduit for the passage of surface drainage water under a roadway, railroad, canal or other impediment.

14. Curb Return. The portion of curb at the beginning of a driveway approach, which serves as a transition from the height of the curb to the level of the approach.

15. Driveway. An area intended for the operation of automobiles and other vehicles from the street right-of-way line to a garage, parking area, building entrance, structure, or approved use located on the property. Any dimensions relating to the width of a driveway or driveway surface shall be measured at the right-of-way line.

16. Driveway Approach. An area intended for the operation of automobiles and other vehicles giving access between a roadway and abutting property. The driveway approach includes the sum of the curb returns on each side of the driving surface, plus the driving surface.

17. Easement. A grant by the property owner to the public, a corporation, or persons of the use of land for specific purposes.

18. Gutter. That portion of the driving surface of an improved street, driveway, approach, or other public way, which abuts the curb and provides for the runoff of surface drainage.

19. Improved Street. A public street which has been accepted by the City Council having concrete curbs, or curb and gutters, or other such equivalent physical features, which serve to establish a permanent street grade.

20. Intersection. The general area where two or more roadways meet, join, or cross at a common point establishing an area within which vehicles traveling different roadways may come in conflict.

21. Joint Driveway. A driveway which provides access to a public street for more than one parcel of land.

22. Local Street. A street primarily providing direct access to abutting property and designed to accommodate low-volume, low-speed traffic.

23. Lot. A parcel of ground which is a part of a subdivision, the map or plat of which has been recorded in the office of the St. Francois County Recorder of Deeds or a parcel of land, the deed of which has been recorded in the office of the St. Francois County Recorder of Deeds.

24. Owner. Any individual, firm, association, syndicate, partnership, corporation, trust, or any other legal entity having sufficient proprietary interest in the land sought to be subdivided to commerce and maintain proceedings to subdivide the same.

25. Parkway. That portion of the street right-of-way between the edges of the roadway and the adjacent property line, or lines, on the same side of the street except any portion used for sidewalks.

26. Preliminary Plat. A map or plan of a proposed land subdivision showing the character and proposed layout of the tract in sufficient detail to indicate the suitability of the proposed subdivision of land.

27. Property Description. Description of a lot, tract, or parcel by metes and bounds, by reference to a plat or by reference to government survey.

28. Property Line. The boundary between two or more lots, tracts or parcels of land.

29. Public Improvements. Those things that are constructed, installed, or performed on public land, or on land that is to become public in the subdivision process, including but not limited to street and alley pavement, curbs, storm drainage facilities, sidewalks, and sanitary sewers, and including the grading of such land.

30. Reference Points. Points of reference located by a survey of the project. The points are to be tied or referenced to at least three identifiable features.

31. Right-of-Way. A general term denoting public ownership or interest in land, usually in a strip, which has been acquired for or devoted to the use of a street or alley.

32. Right-of-Way Line or Street Right-of-Way Line. The boundary between any public street or alley and one or more lots, tracts or parcels of land.

33. Roadway. That area of a street right-of-way intended and used for vehicular travel.

34. Shall, May. The word "Shall" is to be deemed as mandatory. The word "May" shall be deemed as permissive.

35. Sidewalk. That paved portion of a parkway intended for the use of pedestrians.

36. Sight Distance Triangle. A triangular-shaped area of street right-of-way, generally acquired at major intersections to ensure adequate sight distance.

37. Storm Water Detention Facility. A drainage facility designed and constructed for the purpose of detaining the peak rate of storm water runoff from a specified rainstorm.

38. Streets. "Street" is a way for vehicular traffic, whether designated as a street, highway, thoroughfare, parkway, throughway, road, avenue, boulevard, lane, place, or however otherwise designated.

39. Subgrade. The surface of a street on which a base course or riding surface is to be placed.

40. Subdivision. The division of land into two (2) or more lots, tracts, or parcels for the purpose of transfer of ownership or building development, or, if a new street or easement of access is involved, any division of a parcel of land. The term includes resubdivision and, when appropriate to the context, shall relate to the process of subdividing or to the land subdivided.

41. Surveying. The act of determining the positions of points on the earth's surface by means of measurement of distance, direction, and elevation.

42. Tendering. The legal transfer of ownership and maintenance responsibility of a public improvement to the City of Farmington.

43. Unimproved Street. A street not having concrete curbs, or curbs and gutters, or other such equivalent physical features which serve to establish a permanent street grade.

44. Vehicle. Every device in, upon, or by which any person or property is, or may be transported, or drawn upon a street, except devices used exclusively upon stationary rails or tracks.

B. PUBLIC WORKS POLICIES

1. Minimum Standards for Design. All plans for public improvements within the City of Farmington must be approved by the Public Works Director prior to beginning construction. This approval is a conceptual approval only and does not give detail approval to any particular design item or data shown on the plans, nor does it give approval for any deviation from City specifications unless that deviation is shown on the plans by a general note. The Engineer who sealed the plans is responsible for all lines and grades, field data, constructability of the design, and all other items affecting the project including compliance with the City specifications.

VARIANCE FROM THIS STANDARD.

ALL DESIGN REQUIREMENTS WILL BE STRICTLY ADHERED TO UNLESS WRITTEN JUSTIFICATION FOR A DESIGN VARIANCE IS PRESENTED TO AND APPROVED BY THE PUBLIC WORKS DIRECTOR PRIOR TO PRELIMINARY PLAT APPROVAL.

SHOULD A REQUEST FOR A DESIGN VARIANCE OCCUR AFTER PRELIMINARY PLAT APPROVAL AND THIS CAUSES NONCONFORMANCE WITH THE PRELIMINARY PLAT, THE PLANNING AND ZONING COMMISSION AND CITY COUNCIL WILL HAVE TO APPROVE THE AMENDMENT TO THE PRELIMINARY PLAT, AS THE AUTHORITY TO ACCOMPLISH THIS DOES NOT REST WITH THE PUBLIC WORKS DIRECTOR.

2. Acceptance of Public Improvements. No streets, alleys, water mains, sanitary sewers, storm sewers, or other public improvements will be accepted or approved by either the City Council or Director of Public Works, unless the improvements were constructed in accordance with Plans, Special Provisions, and Technical Specifications approved by the Director of Public Works.

3. Utility Location Policies.

a. General. The following criteria have been established for the uniform treatment of the location or relocation of utility facilities within the right-of-way of the public street system in order to preserve the traffic-carrying capacity of the street and to minimize interference with normal maintenance operations. These requirements apply to all public and private utilities including power

transmission, telephone, cable television, telecommunications, water, gas, oil petroleum products, pipelines, and any other utility facilities (excluding Sanitary Sewers). The requirements apply to underground, surface, or overhead facilities located within or crossing street right-of-way. Exceptions to the requirements set forth will be considered when major utility extensions are proposed or when improvements by their size necessitate special consideration. All utilities installing any facilities in a public right-of-way must meet the requirements of the Department of Public Works and shall receive advance approval from Public Works prior to commencing construction on a public right-of-way. In order to receive approval, an engineering drawing detailing the installation shall be required. This engineering drawing shall depict adequate data to determine location and impact on other facilities located in the public right-of-way. In the case of reconstruction or rehabilitation where existing utilities will not be relocated and where break repairs or normal maintenance are needed, the requirement for an engineering drawing shall be waived.

b. New Subdivisions – Residential. Parallel installation of underground facilities, including meters, valves, and other appurtenances within the street right-of-way are to be located within a ten (10) foot area adjacent to the right-of-way line where no sidewalks exist. In no case will the City allow the facility to be constructed within the street pavement area except for valves necessary for tapping existing facilities, nor will it be allowed to conflict with the street drainage. Careful consideration must be given to the location of valves, meter boxes, and other appurtenances, so that interference with the sidewalk and street curb is minimized. Minimum cover shall be 42 inches for water mains and 36 inches for all other underground facilities.

c. New Subdivisions – Nonresidential. Parallel overhead and underground facilities are to be located within ten (10) feet of the right-of-way line. Street lights and poles used to support transverse crossings of the right-of-way shall not be located closer than two (2) feet of the curb or edge of roadway or paved shoulder. Poles, guys, anchors, braces, and other appurtenances for overhead facilities shall not encroach into sidewalks or streets. Parallel installation of the underground facilities, including meters, valves, and other appurtenances, within the street right-of-way, are to be located within ten (10) feet of the right-of-way line. In no case will the City allow the facility to be constructed within the street pavement area except for valves necessary for tapping existing facilities, nor will it be allowed to conflict with the street drainage. Careful consideration must be given to the location of valves, meter boxes, and other appurtenances, so that interference with the sidewalk and curb is minimized. Minimum cover shall be 36 inches or conforming to federal, state, or local agency requirements, whichever is greater.

d. Existing Subdivisions – Residential and Nonresidential. Plans developed for new underground or overhead facilities must be designed to take into account existing utilities, as well as possible future utilities. Where possible, corridors outlined in 3(b) and 3(c) are to be adhered to. Due to existing facilities, this may be impractical. Design based upon remaining within corridor is encouraged, but it is understood local, state, and federal codes may make this impossible. Since existing conditions must be taken into account, deviation from the corridor requirements in 3(b) and 3(c) may be accepted.

e. Permits.

(1) City Maintained Streets. All utility work to be performed within the right-of-way limits of City-owned streets and alleys will require an excavation permit from the Public Works Department prior to the work being done by the utility or the utility's contractor. In emergency situations where necessary repairs to an existing utility facility must be made immediately in order to protect the public health, safety, and welfare, a permit must be obtained as soon as possible after emergency repairs have commenced.

(2) State Maintained Streets and Highways. All utility work to be performed on state-maintained facilities will require a permit from the Missouri Highways and Transportation Commission. All requirements of the state must be met.

f. Excavation or Cutting of City Streets: All excavation and cutting of city streets shall be done in conformance with Section 510.120 of the City Ordinance.

g. Utilities Constructed Through Storm Sewer Structures.

If a utility is found in a storm sewer structure during the course of that structure's rehabilitation or reconstruction, the utility would have to be relocated outside of the structure. Further, any new utility will be prohibited from passing through any storm sewer structure regardless of the age of the structure, and regardless of whether there are existing utilities in the structure. Relocation expense will be responsibility of the utility owner.

h. Reimbursement to Public Utilities.

On Public Works' projects constructed either by contract or by City forces where conflicts occur with existing utilities, the utility company shall be required to relocate their existing utilities in accordance with the policies set forth in these Design Standards. Where the utility is privately owned, all costs related to the relocation will be borne by the utility. Both the designer and the utility must make a good faith effort and agree on the approximate location of the utility. Disclaimer clauses will not be accepted as good faith effort. Charges for

reimbursement must include credits for all salvageable materials and must not include costs for betterment.

CHAPTER II - PLAN PREPARATION

A. DRAWING STANDARDS

This section presents general guidelines for drawings for public improvements. Additional requirements for drawing submissions are presented in some of the subsequent chapters, as needed for the specific type of project being addressed.

1. General. All engineering drawings shall be of uniform size, 22”x 34”. The plan sheet shall have a City of Farmington standard title block on the lower right corner of the sheet. Consultants shall place their own title block above or to the left of the City title block.

   The registration seal of the responsible professional engineer, licensed in the State of Missouri, shall be placed in the lower right-hand corner of each sheet of plans.

2. Drawing Scale. Engineering plans and profiles shall be prepared on a scale of 1” = 40’ horizontal and 1” = 4’ vertical or an approved scale easily plotted at half scale. When requirements for detail necessitates a larger scale, a horizontal scale of 1” = 20’ and 1” = 4’ vertical, may be used. Drainage area maps, construction details, cross sections, and contour maps shall be drawn to a scale suitable to show complete detail.

3. Elevation Datum. Elevations for profiles and cross-sections or at particular locations indicated on plans shall be U.S.G.S. datum. At least two permanent bench marks in the vicinity of each project shall be noted on the first plan sheet of each project, and their location and elevation shall be clearly defined.

4. Stationing and North Arrow. The top of each plan sheet shall be either north or east, and a standard north arrow should be used. The stationing on street plans and profiles shall be from left to right, but on drainage, sanitary sewer, and storm sewer plans, the stationing shall always begin at the low point.

5. Topography. When more than one drawing sheet is required for a project, an overlap of not less than fifty (50) feet shall be provided. Each project shall show at least fifty (50) feet of topography on all sides of the project limits. Subdivision plans shall show at least fifty (50) feet of topography outside the plat limits. All existing topography and any proposed changes, including utilities, telephone installations, etc., shall be shown on both the plan and profile portion of the drawing.

6. Revisions to Drawings. Revisions to drawings shall be noted on the plan above the title block and shall show the nature of the revision and the date made. Revisions do not need to be tracked until after the plans have been approved the first time.

7. Symbols. Typical symbols used in the preparation of engineering drawings shall be indicated and named on the plan and profile sheet. In utilizing the standard symbols for engineering plans, all existing utilities, telephone installations, sanitary and storm sewers, pavements, curbs, inlets, and culverts, etc., shall be shown with a broken line; proposed facilities with a solid line; land, lot, and property lines to be shown with a slightly lighter solid line. All easements must be shown, as well as the book and page number, if recorded.

8. Minimum Requirements. It shall be understood that the requirements outlined in these standards are minimum requirements and shall be applied when conditions, design criteria, and materials conform to the City specifications. When unusual subsoil or drainage conditions are encountered, an investigation should be made and a special design prepared in conformance with good engineering practice.

9. Owner's Name. The title sheet must indicate the owner's name and address for whom the improvements are to be constructed. For subdivision developments, the name of the subdivision shall be included along with the owner's information.

10. Dimensions. Lot lines, dimensions, and subdivision name shall be shown where applicable.

11. Cover Sheet. All plans shall have a cover sheet showing the general location of the project in relation to the Farmington City street system. The cover sheet shall show the complete project area to a scale of 1" = 100' or an appropriate scale for small projects.

B. SUBMISSION OF ENGINEERING PLANS

1. Original Submission. Two sets of prints of the engineering construction plans for streets, stormwater systems, water main, sanitary sewer, and storm sewer shall be submitted to the Public Works Department for approval. All other utilities must be contacted as necessary.

2. Future Submissions. After the first submission of engineering plans, all future submissions shall consist of two sets of plans to the Public Works Department. Projects involving State highways will require the approval of the Missouri Highway and Transportation Department.

3. Originals. After final approval of the plans, the original drawings shall be brought for filing in the Public Works office. The originals shall not be submitted until they are approved. After filing, the original drawings shall become the property of the City of Farmington.

4. Drawings on File. Original drawings on file in the Public Works office may be checked out for revisions by the project engineer, only with approval of the Public Works Director. Prior to checking out the drawings, a redlined print showing the proposed revisions must be submitted for approval. Drawings must be returned within one week. All revisions must be approved by the Public Works Director prior to construction.

C. PRE-CONSTRUCTION REQUIREMENTS

1. Fees. After plans have been approved by the City, it is the Applicant's responsibility to pay all necessary fees prior to construction.

2. Copy of Contract. A detailed copy of the construction bid, showing unit costs for all items included in the contract, and showing the total contract value, must accompany the fee.

3. Start of Construction. No construction of public facilities shall be permitted prior to approval and filing of the plans and/or paying of fees. In addition, 24-hour notification must be given to the Public Works Office prior to the commencement of any work on public facilities. No street construction will be permitted prior to completion of construction of all private and/or public utilities within the street footprint.

4. Easements. All easements required for construction, which are not included on the plat, shall be approved in accordance with the requirements of Section 420 of the Farmington Municipal Code and recorded with the County prior to filing of original plan sheets.

CHAPTER III – EARTHWORK

A. EARTHWORK SCOPE

Earthwork shall be performed as required for specific types of construction including utilities (water, sanitary sewer and storm sewers), streets, sidewalks, and other public improvements.

B. USE OF EXPLOSIVES

When explosives are used in the prosecution of the work, the contractor shall follow federal, state, county, and municipal laws and regulations pertaining to the use and storage of explosives for rock and earth excavation. All explosives shall be stored and used in a safe manner and in compliance with all existing statutes and ordinances and all places used for such storage shall be marked clearly "DANGEROUS EXPLOSIVES." The contractor must obtain a separate permit from the City of Farmington for each job and obtain a special conditions permit from the City of Farmington if blasting within 150 feet of a well. To obtain a permit the contractor must submit along with an application for a Fire Prevention Permit a site plan, which shall indicate the blast area, location of the storage magazine, and quantities and type of explosives being used. The contractor shall be responsible for providing a copy of the City permits and conducting pre-blast surveys when blasting within congested areas or within 350 feet of any structure, well, railway, road, highway, or other installation before any blasting can occur on a project site.

The contractor shall take precautions to minimize earth vibrations and air blast effects and shall use blasting mats or other protective means to prevent fragments from being thrown. In addition, a) No fly rock shall leave the immediate area, b) A minimum of one seismograph shall be used on all blasting areas and the inspector may require more depending on the surrounding area congestion, c) Seismic readings shall not exceed 1.0 inches per second at the closest structure or well, d) Monthly seismic readings and copies of the blasting log shall be provided to the inspector and Fire Official, unless more frequent readings and logs are requested, and e) Sound levels shall not exceed 140 decibels at the seismic area.

Blasting periods shall be limited to normal daylight hours. Except by special agreement with the City Engineer, these hours shall be limited to between 9:00 a.m. and 4:00 p.m. each working day. In addition, the contractor shall as a minimum provide the following warnings before each blast:

a. The blasting contractor or facility operator shall be responsible for ensuring that the blast area is visually inspected and made clear of people and/or animals before each shot.

b. Three (3) 5 to 10 second soundings from a siren, air horn, or other approved warning device, with a minimum sound level of 140 decibels at one hundred (100) feet shall be sounded.

c. WAIT a full thirty (30) seconds.

d. Sound another 5 to 10 second sounding.

e. Immediately following the two (2) 5 to 10 second soundings, give a VOICE COMMAND from an amplified bullhorn or equal stating "DETONATION TO FOLLOW."

f. No person shall enter the blast area until such time that the blaster in charge has determined that no danger exists.

g. An "ALL CLEAR" voice command shall be given after the blast and when the blast area is safe to enter for inspection.

The contractor shall save the City and its agents, officers, and employees harmless from any claim arising out of the use of such explosives. Removal of any item or material of any nature by blasting shall be done in such manner at such time as to avoid damage affecting the integrity of the design and to avoid damage to any new or existing structure included in or adjacent to the work. Unless the plans, special provisions, or the City Engineer restricts such operation, it shall be the contractor's responsibility to determine a method of operation to insure the desired results and the integrity of the completed work. Blasting will not be permitted until the contractor has obtained proper insurance (see Sec. F-12b of this chapter) and has obtained a permit from the City Building Inspector.

It shall be the responsibility of the contractor to notify each public utility company, having structures or service in proximity of the site of work, four (4) working days before any blasting can take place. It is the contractor's responsibility to protect all structures from damage or to repair or replace those structures at his own expense.

If during the course of the blasting program a complaint is lodged, or a claim for damage stated, a post-blast inspection shall be conducted on the property in question. The post-blast inspector should investigate each complaint or claim thoroughly, and using, where appropriate, the pre-blast inspector's report to compare pre-existing damages with those being claimed. The post-blast inspector should in no way make either comment or commitment to the complainant or claimant. The contractor shall furnish the inspector two copies of the complete

investigation and status of the claim within two weeks of being notified of the complaint or claim.

No additional payment will be made for blasting or complying with all the blasting laws, regulations, or these requirements.

C. EMBANKMENT CONSTRUCTION

All embankments (fill) required for construction of public streets and alleys must be compacted. The method of compaction and densities are as required in the latest revision of the City of Farmington Standard General Conditions and Technical Specifications for Public Works Construction. All trees, shrubs, and plants designated to remain within the public right-of-way shall be shown and clearly noted on the plans. All other plantings shall be removed from the right-of-way. The plans shall require that the public right-of-way be left in a finished and neat appearing condition.

D. SUBGRADE COMPACTION

The plans shall require that the street subgrade for both public and private improvements be compacted as required in the latest revision of the City of Farmington Standard General Conditions and Technical Specifications Public Works Construction. All street sub-grades shall have compacted aggregate (meeting Type 1 or Type 5 Aggregate Base requirements) base in thicknesses as required in Table VII-1. Aggregate should extend 1’ outside the limits of the street.

CHAPTER IV – WATER SYSTEM DESIGN

A. WATER MAIN DESIGN

1. The water main system shall be designed in accordance with the Minimum Design Standards Design Guide for Missouri Community Water Systems (December 10, 2013 or most recent edition) published by the Missouri Department of Natural Resources. The criteria in latest revision of the City of Farmington Standard General Conditions and Technical Specifications for Public Works Construction shall also be utilized. In the event of conflict, the more stringent requirements shall prevail.

2. Design Details.

   a. Minimum Size. No public water main shall be less than six (6) inches in diameter.

   b. Location. Water mains shall be placed in utility easement within and adjacent to the street right-of-way where feasible. Water mains shall not be at the rear of lots unless special approval is received from the Public Works Director.

   c. Layout. The water main design shall be a loop layout, providing water service for each lot unless special approval is received from the Public Works Director. In the event a dead end layout is approved, a fire hydrant and shut off valve shall be located at the end of main. An Eclipse 9700 flushing device (with collar lock and splash pad) will be required on said hydrant.

   d. Fire Hydrants. Fire Hydrant shall be a Mueller Super Centurion 250, A423 (with integral 5” Storz adapter) placed at street intersections and not more than six hundred (600) feet for all zoning classifications.

   e. The separation of water mains from other underground utilities, such as sanitary sewers and storm sewers, shall conform to Missouri regulations and the Design Guide for Missouri Community Water Systems.

B. DRAWINGS AND DOCUMENTS TO BE SUBMITTED

1. Water System Drawings. Water system drawings shall be prepared on plans separate from other utilities.

   a. Plan. The plan view shall be at the top of the drawing. Standard symbols shall be used. A standard north arrow shall be located on each sheet (pointing up or to the right).

      (1) Scale shall be 1” = 40’ horizontal for undeveloped areas and 1” = 20’ for developed areas, or an approved scale easily plotted at half scale.

(2) Method of Indicating Location. Water mains within streets and adjacent developed areas shall be located in plan by dimensions from property markers or other well-defined physical features.

b. Profile. The profile shall be shown under the plan.

c. Scale. Scale shall be 1" = 4' vertical, and 1" = 40' horizontal for undeveloped areas and 1" = 20' for developed areas, or an approved scale easily plotted at half scale.

d. Utilities. All existing and proposed utilities shall be accurately and clearly shown in plan and profile. Elevations of existing utilities shall be obtained where possibility of conflict exists.

e. Location and Design Information. An index sheet shall be supplied, indicating the entire area to be served by the proposed water mains and indicating the sheet number on which each segment of water system line is drawn. The scale shall be 1" = 100'. When this cannot be done without attaching an extra drawing, then the scale will be 1" = 200'. Benchmarks based on USGS datum shall be shown on the drawings as per the Survey Requirements included as Chapter II of these Design Standards. The Department of Public Works will review the plans to determine its compatibility with the entire water system. The developer or owner's name shall be shown on the cover sheet along with the subdivision name.

2. Department of Natural Resources Water Main Extension Permit Application. Copies of drawings and reports submitted to the Missouri Department of Natural Resources for permitting shall also be submitted to the Public Works Department for review and approval. Missouri Department of Natural Resources approval of plans and specifications shall be provided upon receipt.

CHAPTER V – SANITARY SEWERS

A. GENERAL

1. Materials. All materials used in the construction of sanitary sewers shall conform to the latest revision of the City of Farmington Standard General Conditions and Technical Specifications for Public Works Construction and the Missouri Department of Natural Resources requirements unless specifically designated otherwise by special provision drawings and prior approval is obtained.

2. Structures. Whenever possible, structures shall be constructed as shown in the standard drawings. Structures other than those shown in the standard drawings shall be considered to be special structures and must be designed and detailed by the design engineer.

3. Tendering. Tendering of the sanitary sewer line and appurtenances must be made prior to acceptance of the sanitary sewers by the City.

4. Construction on Fill. Where a sewer must be constructed on fill, a profile of the original undisturbed ground line along sewer centerline shall be shown. All sewers to be constructed on fill must have a special design approved by the Public Works Director.

B. DRAWINGS AND DOCUMENTS TO BE SUBMITTED

1. Sewer Drawings. Sewer drawings shall be prepared on plans separate from other utilities.

   a. Plan. The plan shall be at the top of the drawing. Standard symbols shall be used. A standard north arrow shall be located on each sheet (pointing up or to the right).

      (1) Scale shall be 1” = 40’ horizontal for undeveloped areas and 1” = 20’ for developed areas, or an approved scale easily plotted at half scale.

      (2) Method of Indicating Location. Sewers and manholes within streets and adjacent developed areas shall be located in plan by dimensions from property markers or other well-defined physical features.

   b. Profile. The profile shall be shown under the plan.

      (1) Scale. Scale shall be 1” = 4’ vertical, and 1” = 40’ horizontal for undeveloped areas and 1” = 20’ for developed areas, or an approved scale easily plotted at half scale.

(2) Grades. Elevations of existing manholes shall be determined in the field. Existing ground and proposed pavement over sewer shall be shown and labeled. Existing or proposed building floor elevations or sufficient ground elevation 100 feet either side of centerline shall be shown to determine required depth and slope of service lines.

c. Utilities. All existing and proposed utilities shall be accurately and clearly shown in plan and profile. Elevations of existing utilities shall be obtained where possibility of conflict exists.

d. Location and Design Information. An index sheet shall be supplied, indicating the entire area to be served by the proposed sewers and indicating the sheet number on which each segment of sewer line is drawn. The scale shall be 1" = 100'. When this cannot be done without attaching an extra drawing, then the scale will be 1" = 200'. Benchmarks based on USGS datum shall be shown on the drawings. The Department of Public Works will review the plans to determine compatibility with overall city planning.

2. Department of Natural Resources Sewer Extension Permit Application. Copies of drawings and reports submitted to the Missouri Department of Natural Resources for permitting shall also be submitted to the Public Works Department for review and approval. All downstream capacities required on the permit application are to be accurate. Missouri Department of Natural Resources approval of plans and specifications shall be provided upon receipt.

C. SANITARY SEWER DESIGN

1. Design Guidelines. Sanitary sewer systems shall be designed in accordance with the applicable laws and regulations of the State of Missouri, including but not limited to Design Guides presented in 10 CSR 20-8.

2. Design Details.

a. Minimum Size. No public sewer shall be less than eight (8) inches in diameter.

b. Private Sewer laterals shall be connected utilizing a "wyes" connection as defined in the City of Farmington, Missouri General Conditions and Technical Specifications.

c. Location. Public Sewers shall be placed in street right-of-way where feasible. Plans shall show the stationing of all changes in direction and grade. Also, connections and sewer laterals. Manholes shall not be located in the gutter pan or the curb of the roadway.

d. Depth. Public Sewers shall be designed deep enough to prevent freezing, and to allow house sewer laterals to cross under water mains at such an elevation that the bottom of the water main is at least eighteen (18) inches above the top of the sewer service line. If the proposed sewer service is parallel to a water main, it shall be designed to provide a minimum of 10-foot horizontal clearance from the water main. Unless approved by the Director of Public Works, no sewer shall be designed and/or constructed that will not provide a minimum depth of three (3) feet to top of pipe. All PVC sewers over 12' deep shall be SDR 21, Class 200 pipe. All sewers over 12' deep shall have a minimum of 12" of aggregate bedding material over the top of the pipe.

e. Alignment. Sewers in streets should be placed in or near the center of one of the outside drive lanes where possible. Sewers located at back property lines shall be a minimum of three feet to one side of the property line and on the opposite side from pole lines or other utilities. The ends of sewer lines shall extend at least fifteen feet beyond the property line of the last lot served to a terminal manhole. This will provide room for the house connection with a "Wyes" sewer lateral below the terminal manhole.

f. Curved sewer alignment will not be permitted. Only under extreme circumstances will curved sewer alignment be considered, and then only for sewers larger than twenty four inches (24") in diameter. Written approval must be given by the Missouri Department of Natural Resources and the Public Works Director for curved sewer alignment to be installed. If a curved sewer alignment is approved, the minimum radius of curvature shall not be less than 300 feet, the maximum deflection of any individual joint shall not be more than two (2) degrees, and the areas being skewered are presently developed (streets are in place). Tracer wire as required for sewer force mains shall be installed for curved sewer alignments and shall consist of standard electric service wire; a single No. 12 U.L. approved copper wire of the solid type with insulation for 600 volts. The tracer wire shall be laid within 6 inches from top of pipe. Wire shall be brought up at manholes and securely anchored to manhole frame with galvanized bolt.

g. A <u>minimum</u> permanent easement of 7.5' either side of sewer is required when locating outside of public Right of Ways. A temporary construction easement shall be provided, as necessary. All crossing and/or cutting of streets must be backfilled with granular material. All sewers with a trench wall within two feet of the back of the street curb shall be backfilled with granular material.

h. The separation of sanitary sewers from other underground utilities, such as water mains and storm sewers, and from streams shall conform to the Missouri Department of Natural Resources regulations and guidelines.

i. Non Sanitary sump pump foundation drain systems will not be allowed to connect to the sanitary sewer system. Location of sump pump discharge to the storm sewer systems shall be defined on design plans.

3. Manholes.

a. Diameter. The minimum diameter of manholes shall be 48 inches (4 feet), and shall conform to the latest revision of the City of Farmington Standard General Conditions and Technical Specifications. All new inside drop manholes shall have a minimum diameter of 60 inches (5 feet).

b. Manhole Covers. All sanitary sewer manhole covers shall be NEENAH R-1642 or approved equal.

c. Stationing and Elevation. Stationing and elevations should be shown at all manhole locations.

4. Lampholes. Lampholes are not permitted due to problems they cause for sewer maintenance.

D. LIFT STATIONS

1. General.

a. A sewage lift station shall consist of a wet well, sewage pumps, control systems, electrical systems (normal and emergency), superstructures, site security systems, grading, and access. The purpose and goal of a lift station is to serve as a sewage collection point for a development and to pump that sewage to a gravity line serving the area in a safe, economical, and easily-maintained manner.

b. Lift stations shall be designed in accordance with the applicable laws and regulations of the State of Missouri, including but not limited to the design criteria in 10 CSR 20-8.130.

2. Buildings and Grounds.

a. The lift station design shall include provisions for security and access as described in this section.

b. Fencing. A fence surrounding the station site shall be provided. The fence shall be eight (8) feet high (minimum) with a twelve (12)-foot wide, double-leaf gate and a 3' wide personnel gate. The fence shall be galvanized chain link with privacy slats. Supporting posts for all types of fences shall not be more than eight (8) feet apart and be concrete encased below grade. Minimum bury depth of posts to be two and one-

half (2-½) feet. Wooden fences are not acceptable. The gate is to be located so that entranceway does not go over manholes. The pump station and generator unit is to be easily accessible for maintenance from entranceway. The gate is to be set back twenty-five (25) feet from edge of road. Wire mesh is to be 9 gage. All posts and gates shall be SS40. Top rain shall be SS20, Bottom tension wire shall be 7 gage. Aluminum ties shall be 9 gage. Rail ends, post caps and loop caps shall be steel.

c. Surfacing of Lift Station Area. The area inside the fence must be constructed of four (4) inches of Type 1 aggregate, compacted according to City Specifications, on four (4) mil polyethylene sheeting placed over the entire enclosed area. This sheeting shall have one (1)-inch diameter perforations spaced not more than two feet in each direction. Prior to placing the sheeting, the soil to be covered is to be treated with a soil sterilant Diuron (Karmer by DuPont), or equal, and applied as directed by the manufacturer. Final wearing surface shall consist of 6-inches of concrete per the City of Farmington, Missouri General Conditions and Technical Specifications, Chapter VII, Rigid Pavements.

d. Accessibility to Site. The pump station must be accessible by an acceptable all-weather, hard-surface road meeting the same pavement section requirements as other roads in the development. Junction of pump station road and public street shall have a culvert of acceptable diameter and length in ditch if necessary.

e. Outside Lighting. An outside weatherproof pole-mounted, LED lighting fixture with a minimum system wattage of 126 watts at 120 volts, color 5000K and with a photocell for dusk-to-dawn operation, on a dedicated circuit shall be provided. The height of pole shall be a minimum of 15’ but shall be adequate to provide lighting for the entire site.

f. Generator Unit, Switching Gear and Controls. Generator unit, switching gear, and controls shall be mounted inside a weatherproof enclosure.

g. The lift station facility shall be setback from the property line to match requirements of adjacent development.

3. Design. The following items should be incorporated in the design of sewage pumping stations:

a. Type. Sewage pumping stations shall be wet well, submersible-lift type.

b. Structures.

(1) Separation. Wet and dry wells including their superstructure shall be completely separated.

(2) Pump Removal. Provision shall be made to facilitate removing pumps and motors.

(a) Submersible pump stations shall have a stainless steel slide-coupling and guide-rails lifting system. A stainless steel lifting cable, with one end permanently attached to the pump-lifting lug and the other end secured at grade level, shall be provided.

(b) Where pump station is enclosed in a building, equipment shall be provided for moving pumps and motors to the access doorway.

(3) Access. For Dry or wet wells that have mechanical equipment that require personnel to access equipment inside the structure, access shall be provided per 10 CSR 20-8.130. Section (4) Design, subsection (B) structures paragraph 3.

(4) Dry Well. The dry well (overflow) must be an enclosed vault. Open overflow ponds will not be permitted.

(5) The wet and dry wells shall be constructed as detailed on the plans, as approved by the Public Works Director, and per these specifications. The base of the wet well shall be grouted on the inside at a 1:1 slope to prevent the accumulation of solids.

c. Pumps.

(1) Duplicate Units. At least one (1) pump meeting the requirements of the City of Farmington General Conditions and Technical Specifications shall be provided. They must have the same capacity and each shall be capable of handling flows in excess of the expected maximum flow.

(2) Protection Against Clogging. There shall be stainless steel or aluminum trash basket located at the inlet pipe with a stainless steel lifting chain to provide for periodic removal and cleaning.

(3) Minimum Pump Size. The minimum allowable pump size shall be 5 HP. If flow rates dictate a smaller pump, a Flygt NP3085 may be considered. Written approval must be given to use less than 5 HP size pumps.

(4) Priming. The pump shall be so placed and a minimum water level maintained such that under normal operating conditions it will operate under a positive suction head.

(5) Intake. Each pump shall have an individual intake. Wet well design shall be such as to avoid turbulence near the intake.

(6) Submersible Pump Seals. Tandem mechanical seals are required on submersible pumps.

d. Valves. A shut-off valve shall be placed on the discharge lines of each pump. A check valve with external arm shall be placed on each discharge line between the shut-off valve and the pump.

e. Ventilation. The wet well shall have a 3" minimum diameter Type 304 stainless steel air vent extending through the top slab with a 180 degree turn. All vents shall have a charcoal filter at the end of the vent pipe. The filter shall be such that the filter material may be replaced without replacing the vent filter piping.

f. Water Supply. Potable water shall be supplied; however, there shall be no physical connection between the potable water supply and a sewage pumping station. Potable water supply line shall not be smaller than one-half (1/2) inch. A double check type back flow preventer and freeze-proof hydrant with hose bib shall be located within ten (10) feet of pumping station but not in the traffic path.

g. Dry Well Covers and Safety Grates. Covers and safety grates shall be made of aluminum and constructed so that it may be easily opened by one person. If force required to open cover is in excess of fifty (50) pounds, shock absorbers or opening springs must be provided.

h. Spare Parts. Pump stations are to be provided with two (2) mechanical seals and two (2) gasket kits to install with seals. If seal filters are used, six (6) spares are to be included. Two (2) complete sets of NEMA rated contacts and coils for starters and one (1) spare NEMA rated alternator relay or timer shall also be furnished.

i. Force Main Interface. A force main interface consisting of piping, a 45-degree "Y," 45-degree elbow, and flanged, full-flow valve shall be provided.

(1) All pipe and fittings shall be the same material and the same size as the force main.

(2) The interface shall be constructed within a valve vault of required depth located external from but adjacent to the pump station. Drain from valve vault to discharge to the wet well.

j. General Electrical Requirements. All electrical equipment and wiring shall comply with the currently adopted revision of the National Electrical Code. Particular attention should be given to electrical equipment enclosed in places where gases

may accumulate (hazardous areas). Submersible pumps in lift stations are considered to be in a hazardous area and shall be compliant with the NEC Class I, Group D, Division 1. This rating shall include pumps, removal systems, and controls. All conduit shall be of galvanized rigid type and shall be installed below grade wherever possible. Dry-type transformers for 110-Volt utility service and control systems power shall be provided as necessary.

(1) Primary power to the station shall be no higher than 480 Volt, 3 Phase, and shall be provided by connection to a commercial utility service. A single disconnect is to be provided between the pump station and the utility.

(2) Emergency Operation. Provision of an emergency power supply for pumping stations shall be made, and may be accomplished by connection of the station to a second independent public utility source or by provision of in-place engine generator.

(3) The meter base and transformer will be provided by the City of Farmington.

(4) Provide a Square D phase pad lockable service entrance disconnect with fuses. Ground the service entrance disconnect with #2 bare copper conductor in ¾" RGS conduit and a 5/8" diameter, 12" long, driven rod.

(5) Provide three (3) THW service conductors with insulated grounding conductor to the package pump controller in conduit to the disconnect and transformer.

(6) The pump controller shall be capable of operating both pumps simultaneously and provide circuit breaker for outside light and 15A circuit breaker for GFCI receptacle.

(7) Provide a junction box between the control panel and wet well.

(8) Provide two (2) conduits from the junction box to the control panel shall have sealing fittings installed per the latest revision of the National Electrical Code.

(9) Provide two (2) RGS conduits for motor cables from the junction box to the pump basin.

(10) Provide one (1) RGS conduit for float cable from the junction box to the pump basin.

(11) Provide one (1) RGS conduit to valve box for sump pump from valve box to pump basin unless valve box has a gravity drain.

(12) Provide one (1) RGS conduit from the transformer to the service disconnect.

(13) Mount panels and boxes rigidly on galvanized unistrut with anchored base.

(14) All conductors entering the junction box from the wet well shall be sealed with a cord grip at the junction box.

(15) The pump cable entering the junction box shall be a single cable containing the power and sensor conductor in one jacket.

(16) The junction box shall contain two (2) terminal blocks; one for power cables and the other for sensor wiring.

(17) All boxes shall be NEMA 4 rated, lockable and made of stainless steel.

(18) The control panel shall be heated and have one lockable handle that is capable of opening and locking the door when actuated.

(19) Provide an audible and visible alarm that may be canceled with the push of a single button.

(20) The control circuit shall contain a phase monitor with indication contacts.

(21) Contactors shall be NEMA size 3 or 4 with thermal protection with resets and indicators for “on” and “Over Load”

(22) Each motor contactor shall be on a dedicated circuit breaker.

(23) The terminal block for service entrance shall be divided for the dual pumps

(24) The transformer secondary shall be fused.

(25) Provide an additional 120 volt control circuit.

(26) Provide an alternator to cycle the pumps.

(27) The seal fail probe shall indicate a seal failure but not disable the pumps. The City reserves the ability to run the pumps with a seal failure.

(28) The control panel shall have a hand-off-auto switch, a run and seal fail light and an hour meter for each pump.

(29) The contractor is responsible for the cost and installation of communication lines for SCADA system.

(30) A 120 volt circuit shall be provided for SCADA system.

(31) No Wood of any kind is to be used for the permanent fixture.

(32) A lightning arrestor shall be provided to protect electrical system.

(33) Three (3) copies of the Operation & Maintenance Manual and a spare pump shall be provided to the City before final acceptance

k. Controls. Control of pumps shall be Multitrode liquid level sensing probe or Mercury Float Switch System with 4 sensors. The sensors shall be used to indicate "PUMPS OFF," "FIRST PUMP ON," "SECOND PUMP ON," "HIGH LEVEL ALARM." The control panel shall include automatic pump alternation to equalize operating time on all duplex components. Elapsed time meters to be calibrated in one-tenth (0.1) hour increments on all pumps. Provisions shall be made to bypass the alternator in the event that either pump is out of service for maintenance. Motor starter coils to be rated 100 Volts, 60 Hertz. On larger lift station installations other control systems may be required. Hand-off-auto switch and elapsed time meters to be visible and operable through control panel door.

l. Alarm Systems. Alarm systems shall be provided for all pumping stations to work with the existing SCADA system the City has for the lift stations.

m. Power Generating Equipment.

(1) General. The power module shall consist of an engine, generator, and control panel assembly, all mounted with anti-vibration mounts onto a fabricated steel skid base. An automatic transfer switch may be mounted separately or in the control panel assembly to automatically switch to emergency power in the event of commercial power failure. The engine generator shall be sized for starting one (1) pump and all auxiliary loads, with an additional 50% overload capacity. The complete power module shall be factory assembled and factory tested to ensure that all controls and protective devices are in proper working order. The motor starting capability shall be tested by a simulation of the exact operating load, with certified test results provided. The power module must be coordinated with the pump station.

(2) Engine. The engine shall be multi-cylinder, diesel or natural gas, and water-cooled. Water-cooled engines shall be provided with mounted radiator, fan and water pump with anti-freeze added to the cooling system to bring it to 20 degrees F. below zero protection. The fuel system shall consist of a carburetor with an automatic choke and an electric shutdown solenoid, and a dry-type air cleaner. The engine shall run on any reputable commercially available natural gas with minimum low-heat value of 950 BTU/cubic foot. The governor shall be

capable of 3-5% speed regulation from no load to rated load. The lubrication system shall be force fed by gear oil, pumped to all connecting rods, main bearings, and rocker arms. Oil filter shall be spin-on, full-flow type. Engine may be operated continuously when tipped up to 15 degrees in any direction. The engine starting system shall consist of a 12-volt battery and a 12-volt Bendix-type drive, solenoid-equipped electric starter. The charge on the battery shall be maintained by a 32-amp or larger charging alternator. A water-cooled engine shall be equipped with a jacket water heater to aid in starting and engine longevity.

(3) Alternator. The alternator shall be a full 3-phase, 4-pole, self-excited, brushless, revolving field type with static exciter. It shall be self-regulated and designed specifically for motor starting application. The alternator shall be directly connected to the engine flywheel housing and driven through a semi-flexible driving flange to ensure permanent alignment. It shall have drip-proof construction. Voltage regulation shall be within plus or minus 5% of rated voltage from no load to full load.

Insulation shall be Class F with a 70 degree C maximum temperature rise. A completely wired and assembled generator control panel shall be furnished. It shall contain the following items: 1. One ammeter with phase selection switch; 2. One voltmeter with phase selection switch; 3. One vibrating-vane type frequency meter; and 4. Integral battery charger 0-10 amp. 6. A line circuit breaker for alternator output leads.

(4) Automatic Transfer Switch. The automatic transfer switch shall be a mechanically-held, double throw. The transfer action must be completely electrical and not rely on springs or counterweights. Operating coils must be momentarily energized from the source to which the load is being transferred. The switch must be interlocked both mechanically and electrically to prevent both sources from feeding the load at the same time. Electrical operation must not allow a neutral position. The main contacts of the transfer switch shall meet with a rolling and wiping action. They shall be copper with cadmium plating up to and including 100 amps and silver plating on all sizes above 100 amps. They shall be rated for all classes of load to 480 volt AC and equipped with blowout coils and arc chutes. They shall have air inrush current rating of 20 times rated current and an interrupting capacity of 1.5 times rated current. The transfer switch shall include auxiliary contacts to provide for the locking out of the standby pump and connection to alarm system. It shall also have three voltage-sensitive relays with dropout 70-80% adjustable pickup at 90%. Upon sensing of under-voltage condition, the generator startup and transfer sequence shall be initialed automatically. Provision shall also be made to manually initiate the sequence.

(5) Engine Control Panel. The engine control panel is to include five (5) ten-second-on/10-second-off cranking cycles, a switch for testing the automatic operation, a switch for deactivating the automatic operation, an oil pressure gauge, coolant temperature gauge, battery charging DC ammeter, elapsed time meter, indicating lights for fail-to-start, line-power-on, and standby-power-on, protective shut-down, with indicating lights for engine overspeed, low oil pressure, overload, high coolant temperature, manual start-run-stop switch, 0-60-second time delay on transfer Normal to Emergency, 0-30-minute time delay on transfer Emergency to Normal, 0-5-minute time delay after transfer to normal for engine cool down, contacts to signal emergency power on, contact to signal fail-to-start, contact to signal protective shut-down and fail-to-start, and a weekly exercise timer.

(6) Placement. The unit shall be bolted in place. Facilities shall be provided for unit removal for purposes of major repair or routine maintenance.

(7) Engine Location. The unit internal combustion/diesel engine shall be located above grade with exhaust muffler and outlet located outside of housing. The muffler system shall be residential type or better. Exhaust sleeve from building to be approved by National Fire Protection Association Code.

(8) Engine Cooling Ventilation.

(a) Cooling air shall be provided by venting from the outside to the engine. The vent shall be properly located and sized to assure an adequate air supply. Vents are to have screen on inside to prevent bugs and birds from entering.

(b) Engine housing shall have adequate ventilation to maintain a safe equipment operating temperature.

(9) Emergency Power Generation. All emergency power generation equipment shall be provided with instructions indicating the essentiality of routinely and regularly starting and running each unit at full load.

(10) Generator Spare Parts. Generator spare parts are to include one (1) spare circuit board of each type used, or provide a means for bypassing and testing circuits.

4. Acceptance of Lift Station.

a. Shop Drawings. Shop drawings shall be submitted on lift station, stand-by power source and structures, and shall be approved prior to installation.

b Testing. Prior to acceptance of lift stations by the City, testing of each equipment item shall be required in the presence of the Contractor, a City representative, and

the equipment manufacturer's representative. Final acceptance will not be made until all deficiencies are corrected and retesting is performed. A draw-down test to verify performance of the pump rate will be required.

c . As-Builts. Prior to acceptance of operation of lift station, generator units, and other related appurtenances by the City, two (2) sets of "As-Built" drawings shall be submitted.

d. Operation and Maintenance Manuals. Two (2) complete sets of operational instructions shall be provided to include emergency procedures, maintenance schedules, maintenance manuals, and service manuals on all equipment. Special tools and such spare parts as may be necessary shall be furnished to the City for the facilities to be accepted.

E. FORCE MAINS

1. Velocity. At design average flow, a cleansing velocity of at least two (2) feet per second shall be maintained.

2. Air Release Valve. An APCO Sewage Air Release Valve Model 401, or approved equal, shall be placed at high points in the force main to prevent air locking. A standard four-foot diameter manhole with standard frame and cover to be installed around force main and relief valve for maintenance access to valve.

3. Connection to Gravity System. The force main shall connect to the gravity sewer system at a point not more than two (2) feet above the flow line of the receiving manhole.

4. Design Pressure. The force main pipe and fittings shall be designed to withstand normal pressure and pressure surges.

5. Thrust Blocks. MegaLug restrained joints or approved equal shall be provided at all bends 22 ½ degrees or greater. Concrete thrust blocking shall not be used.

6. Force Main Pipe. All force main pipe shall be SDR21, Class 200 PVC pipe. Pipe types must be shown on the plans.

7. Depth. Force main pipe shall be designed and so constructed to provide a minimum depth of three (3) feet of cover over the top of the pipe.

8. Casing. Force mains designed to cross public streets must be encased with either reinforced concrete pipe or steel casing of adequate size to allow for future removal of the force main pipe.

9. Testing. Testing of the force main is required in accordance with the requirements of AWWA C-605.

10. Tracer Wire. Tracer wire for force mains shall be the same as that specified for water lines in the City of Farmington General Conditions and Technical Specifications.

CHAPTER VI STORM SEWERS AND DRAINAGE DESIGN

Storm water management is of the upmost importance to the City of Farmington, Missouri. Storm water collection, conveyance, detention/retention and discharge shall be in strict compliance with the City of Farmington Ordinance Section 420, The City of Farmington, Missouri General Conditions and Technical Specifications for Public Improvements, and The City of Farmington, Missouri Drawing Details for Public Improvements.

Chapter VII – STREETS, ALLEYS, CUL-DE-SACS AND INTERSECTIONS

A. STREETS

1. Street Construction. City streets shall be constructed in accordance with the City of Farmington, Missouri General Conditions and Technical Specifications for Public Improvements.

   a. The streets are to be constructed of Portland Cement Concrete with integral curb (or concrete curb and gutter) or bituminous plant mix roadway with a concrete curb and gutter. Alley pavement shall be of either asphalt or concrete design, with an inverted crown and the curb omitted. Asphaltic streets will require a wearing course on "full depth" asphalt base.

   b. Subbase, aggregate base, asphalt and concrete compacted thicknesses are shown below in Table VII-1.

Table VII-1
DESIGN CHARACTERISTICS OF STREET PAVEMENT

Concrete		
Type of Street	Minimum Uniform Thickness	Type 5 Aggregate Base Course
Primary Arterial	8"	4"
Secondary Arterial	8"	4"
Collector	8"	4"
Local (Residential)	6"	4"
Local (Non-Residential)	8"	4"
Alley	6"	4"

Asphalt			
Type of Street	Surface Wearing Course	Base Asphalt	Type 1 Aggregate Base Course
Primary Arterial	2"	8"	8"
Secondary Arterial	2"	8"	8"
Collector	2"	6"	8"
Local (Residential)	2"	3"	6"
Local (Non-Res.)	2"	4"	6"
Alley	2"	3"	6"

c. Subgrade soil inspection shall consist of following two methods:

(1) Moisture and Density Control. When compaction of embankment is a requirement of the contract and testing has been specified as a pay item AASHTO T99 testing procedures shall be used to determine the field density of the constructed embankment for the following conditions with all results being reported to the City:

(a) Embankment in place (Cut Section). Subgrade is to be scarified to a depth of 6 inches below grade for a distance of 2 feet beyond the proposed edge of pavement and compacted to a minimum of 95% maximum density. The rate of density testing shall be a minimum of one test per 500 linear feet of roadway.

(b) Borrow Material (Fill Section). When embankment construction requires imported material, that material shall be placed in lose lifts with a maximum thickness of 8 inches and compacted to a minimum of 90% maximum density to within 18 inches of top layer of subgrade which shall require a minimum 95% maximum density. Testing frequency shall be one test per 500 linear feet of roadway.

(2) Visual Inspection. When compaction of embankment is a requirement of the contract but has not been specified as a pay item the contractor shall distribute all equipment movements over the entire embankment area. Prior to placement of aggregate sub-base the City shall be contacted to visually observe proof-rolling operations consisting, at a minimum, of a single-axle dump truck with a minimum load of ten (10) cubic yards of crushed rock material. If any area(s) are determined by the City to be substandard the City will be responsible for delineating the extent of the substandard areas and the contractor shall remove and replace all designated areas with suitable fill material as determined by the City. Compactive efforts shall continue, if necessary, until the City approves all areas of embankment.

e. Prior to construction of street or alley pavements, adequate surface and sub-surface drainage facilities, if required, are to be installed by the developer. Design requirements are found in Chapter VI. All drainage facilities shall be sized and specified by a professional engineer, registered in the State of Missouri.

3. Roadway Sections. Typical roadway sections showing various widths of roadway and right-of-way and required thickness are as shown on Standard Drawing ST-1 included in these design standards. Primary arterials are not included in these design standards since such projects require individual study.

4. Street Design. In the preparation of street design, the following criteria must be observed. These controls are intended to be the absolute minimum (or maximum)

permitted. Any design not meeting this requirement must have prior approval. Road classification greater than those listed will require a special design to meet current AASHTO Standards.

a. Longitudinal Grades	– minimum	1.0% All Classifications
	- maximum	Secondary Arterial 5%
		Collector 8%
		Local 10%
		Alleys 10%
	Cross Slope	¼" per foot or 2% (Typical)

b. Vertical Curves. The length of vertical curves shall be no less than that determined by the formula:

L = KA, where:

L = Length of vertical curve
A = Algebraic difference in grades
K = Determined by following table:

Table of "K" Values

	Crest	Sag
Secondary Arterial	80	70
Collector (Non-Residential)	60	60
Collector (Residential)	40	50
Local (Non-Residential)	30	40
Local (Residential)	20	30
Alleys	10	20

c. Minimum centerline radii (R) and Maximum superelevation (E)

Secondary Arterial	R = 600'	E = 0.04
Collector (Residential and Non-Residential)	R = 400'	E = 0.03
Local (Non-Residential)	R = 300'	E = 0.02
Local (Residential)	R = 175'	E = 0.02
Alleys	R = 175'	Inverted 6" Crown

Minimum length of super-elevation runout = 100'

d. Reverse Curves/Street Jogs. Between reverse curves on secondary arterial streets, there shall be a tangent of not less than one hundred (100) feet. On collector and local streets there shall be a tangent of not less than forty (40) feet. Street jogs with centerline offsets less than one hundred twenty-five (125) feet shall be avoided.

e. Minimum curb radii at intersections:

	Intersecting Res. Local and Collector	Street Non-Res. Local and Collector
Secondary Arterial	30’	50’
Collector	20’	30’
Local Residential	15’	20’
Non-Residential	20’	30’

f. Minimum Safe Stopping Sight Distance

Secondary Arterial	500’
Collector	300’
Local Non-Residential	200’
Local Residential	150’

g. Minimum Safe Stopping Distance at Intersections

Secondary Arterial	500’
Collector	450’
Local Non-Residential	300’
Local Residential	250’

h. Intersections. All curb returns shall be designed with a wheel chair ramp meeting the requirements of Standard Drawings ST-6 and ST-7. No drainage structures shall be allowed in the wheelchair path. Intersections shall be approached on all sides by leveling areas. Where the approach grade for either or both streets exceed 3 percent, the leveling area shall be a minimum length of 100 feet measured from the intersection of the edge of gutter flag or edge of road, within which no grade shall exceed a maximum of 3 percent with a maximum crossfall of 6” at the throat of the radius returns of the intersecting street. Right angle intersections shall be used whenever practicable. When local streets intersect collector or arterial streets, the angle of intersection of the street centerlines shall not be less than 75°. A diagonal sight distance easement must be provided as shown Table VII-3, “Right-of-Way Triangle Requirements” on the property lines substantially parallel to the chord of the curb radius.

i. Elevations at street intersections shall be computed by extending curb grades to the point of intersection (P.I.) of the intersection of curbs. A minimum of 0.3 feet fall around a curb return is required. Elevations at every 10 feet around the curb return and centerline stationing at all radius points shall be shown on the plan. All pavement stationing shall be shown using face of curb data.

j. Turnaround provisions. Dead-end street centerline length shall not exceed one hundred fifty (150) feet without a turnaround complying with Table VII-2 and VII-3.

k. Temporary turnaround provisions. Except as otherwise provided herein, temporary dead-end streets may be approved where necessitated by the layout of the subdivision or staging of development; provided that such temporary unpaved turnarounds shall be constructed where lots are fronting on such temporary dead-end street. The additional width of the right-of-way required for such temporary turnaround shall be the same as that required for permanent turnarounds. The extra right-of-way in excess of the street right-of-way shall be vacated upon extension of the temporary street and the reconditioning of said street and front yards concerned shall be at the expense of the developer.

l. Cul-de-sacs. Information for the design of cul-de-sacs is shown on Standard Drawing ST-9.

m. Expansion Joints. Expansion joints in concrete paving shall be placed as shown on Standard Drawing ST-5 at intersections (unless otherwise shown on plans) and at all structures crossing the roadway such as bridges, box culverts, etc. Expansion joints are required around junction boxes, inlets, etc.

n. Contraction Joints. Contraction joints in concrete paving shall be placed as shown on Standard Drawing ST-5 at intervals of not more than 25 feet and not more than 25 feet from any expansion joint. Contraction joints shall be without dowels unless otherwise specified on plans.

o. Longitudinal Joints. Longitudinal joints shall be placed meeting the requirements of Standard Drawing ST-5.

p. Approaches to existing streets. All approaches to existing curb and gutter streets shall be Portland Cement Concrete to the radius points.

q. Traffic Circulation. Certain proposed streets, where appropriate, shall be extended to the boundary of the tract to be subdivided so as to provide for normal circulation of traffic within the vicinity.

r. Marginal Access Streets. Whenever the subdivision contains or is adjacent to a railroad right-of-way or a highway designated as a “Limited Access Highway” by the appropriate highway authorities, provision shall be made for a marginal access street, or a parallel street at a distance acceptable for the appropriate use of the land between the highway or railroad and such streets.

5. Street Plan Sheets

a. Plan. The following information shall be shown on the plan portion of each plan sheet:

(1) Width of right-of-way.

(2) Width of pavement (back-of-curb to back-of-curb).

(3) Curb and right of way radii with elevation and stationing.

(4) Location and size of all existing utilities, meters, valves, poles, street markers, signs, traffic signals, trees, shrubs, drainage ditches, structures, storm sewers, easements, sanitary sewers and manholes. This requirement to show existing utilities will not be waived due to locations not being marked by the utility owner. The plans must show existing utilities. The location of any proposed utilities must also be shown.

(5) Other Information Central angle, centerline radius, arc length, and tangent distance of horizontal curves. Stationing of beginning and end of paving, PC and PT stationing of curves and ties to lot corners. All lot dimensions.

(6) Grading. Both existing and proposed contours shall be shown on the plan sheets along with the limits of proposed grading.

b. Profile. The following information shall be shown on the profile portion of each plan sheet:

(1) Existing ground lines at centerlines lines with elevations shown at 50' intervals.

(2) Proposed Centerline Grades. Grades shown in percent (%)

(3) Centerline elevation and stationing labeled at 50' intervals.

(4) Vertical Curve Information. PI, PT, PC, k value, Length, Radius, Hi/Low Point elevation and stationing shall be labeled.

(5) Cross Street Intersections. Where a cross street intersects the name, station and elevation shall be labeled.

(7) Beginning and Ending Stationing.

(8) Underground Utilities. When possible all underground utilities that cross the centerline are to be shown and labeled with type, size and elevation.

c. Typical Section. A typical section shall be shown on the first plan sheet indicating:

(1) Pavement type, width, and thickness

(2) Crown

(3) Curbs

(4) Parkway width

(9) Right of way width

(10) Sidewalks

(11) Grades

d. Manholes. Manhole designation and elevation of top of manhole must be given when located within right-of-way.

e. Storm Sewers. Flow line elevations must be given for storm sewers within right-of-way.

6. Additional Requirements See the City of Farmington, Missouri General Conditions and Technical Specifications for Public Improvements and Section 410 of the Farmington City Code for additional requirements.

7. Changes During Construction All construction shall be completed in accordance with the approved project plans and specifications. If changes are necessary during construction, written approval from the Public Works Director shall be secured prior to the execution of such changes.

TABLE VII-2
STREET CROSS SECTION STANDARDS
CITY OF FARMINGTON

Commercial or Industrial Development											
Street Type	Cross Section Widths*				Street Width (see note 5)	B.O.C. Width	Number of Lanes	Lane Width	Parking		Right-of-Way Width
	1	2	3	4					1-Side	2-Side	
Primary Arterial	1.5’	5’	6’	30’	60’	65’	5	12’	N.A.	N.A.	90’
	2.5’	5’	6’	24’	48’	53’	4	12’	N.A.	N.A.	80’
Secondary Arterial	2’	5’	4’	24’	48’	53’	4	12’	N.A.	N.A.	75’
	3’	5’	4’	18’	36’	41’	3	12’	N.A.	N.A.	65’
	1.5’	5’	4’	12’	24’	29’	2	12’	N.A.	N.A.	50’
Collector and LOCAL (Non. Res.)	2’	5’	2’	26’	52’	57’	3	12’	-	8’	75’
	2’-6’	5’	2’	22’-26’	44’	49’	3	12’	8’	-	75’
	2.5’	5’	2’	18’	36’	41’	3	12’	-	-	60’
	3’	5’	2’	20’	40’	45’	2	12’	-	8’	65’
	3’-7’	5’	2’	16’-20’	32’	37’	2	12’	8’	-	65’
	3.5’	5’	2’	12’	24’	29’	2	12’	-	-	50’
LOCAL (Residential-see notes 3 & 4)	1.5’	5’	2’	16.5’	33’	38’	-	-	-	YES	55’
	1.5’	5’	2’	14’	28’	33’	-	-	YES	-	50’
	3.5’	5’	2’	12’	24’	29’	2	12’	-	-	50’
ALLEY	-	-	-	-	22’	22’	2	11’	-	-	24’

* Refer to Figure VII – 1

Notes:

1. The dimensions of cross section components 1, 2, 3 may vary to suit local or specific conditions, but in no instance shall dimension 2 be less than 4 feet.
2. On street where parking is permitted, it shall be regulated at intersections to comply with sight distance requirements.
3. Parking will be permitted on both sides of Local Residential Streets, but full 12’ lanes and 8’ parking stripes are not required due to low traffic volume.
4. Two lane Local Residential streets to be approved by Public Works Director.
5. Street Width dimension does not include width of curb and gutter.

FIGURE VII-1

STANDARD ROAD SECTION WITH CURB AND GUTTER

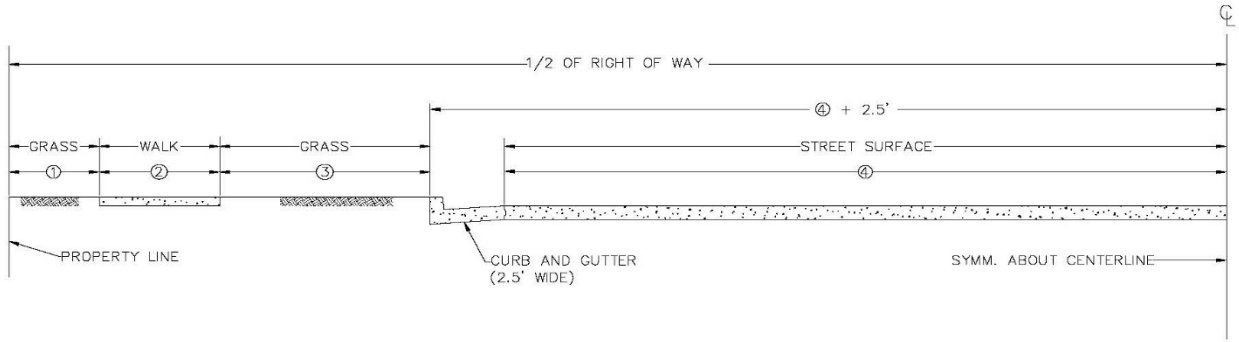

TABLE VII-3
RIGHT-OF-WAY TRIANGLE REQUIREMENTS
CITY OF FARMINGTON

Intersection of / With	Major Arterial	Secondary Arterial	Non-Res. Collector	Residential Collector	Non-Residential Local	Residential Local
Major Arterial	A	A	B	B	B	C
Secondary Arterial	A	B	B	C	C	D
Collector	B	B	C	C	C	D
Residential Collector	B	C	C	C	C	D
Non. Res. Local	B	C	C	C	C	D
Residential	C	D	D	D	D	E

KEY: A – 100’ X 100’ ROW triangle w/separate right turn lanes

B – 30’ X 30’ ROW triangle w/50’ corner radii

C – 10’ X 10’ ROW triangle w/30’ corner radii (or 15’ ROW radius)

D – 10’ X 10’ ROW triangle w/20’ corner radii (or 15’ ROW radius)

E – No ROW triangle w/15’ corner radii

CHAPTER VIII –CONCRETE CURB AND GUTTER, SIDEWALKS AND DRIVEWAYS

A. SIDEWALKS

1. General. The construction of sidewalks will be required to provide pedestrian access to facilities. The extent of sidewalks within a subdivision shall be determined by the Planning and Zoning Commission and approved by the City Council. Generally, sidewalks are required in subdivisions on at least one side of collector and arterial streets. All new constructed walks shall meet the requirements of the current Americans with Disabilities Act. For alterations to existing facilities sidewalks shall meet the requirements, to the maximum extent feasible, of the current Americans with Disabilities Act. The phrase "to the maximum extent feasible" applies to the occasional case where the nature of the facility makes it virtually impossible to comply fully with applicable accessibility standards through a planned alteration. In these circumstances, the alteration shall provide the maximum physical accessibility feasible. Any altered features of the facility that can be made accessible shall be made accessible. All deficiencies shall be reported to the City for approval. Refer to Standard Drawings ST-6 through ST-7.

2. Design. On low speed roadways (posted speed of 45 mph or less), sidewalks are to be separated from the travelway by a barrier curb. In the event a sidewalk is located adjacent to a high-speed roadway, another type of physical separation between the vehicle and the pedestrian such as a guardrail or concrete traffic barrier will be considered. Sidewalks are not to be designated on paved shoulders located behind a mountable curb; nor shall paved shoulders be designated or striped as a pedestrian pathway.

   b. Sidewalks are to be 5 foot in width. Freestanding objects mounted on posts, pylons, etc., may overhang a maximum of 12 inches from 27 inches and 80 inches above the ground, although this situation should be avoided whenever possible. Obstacles below 27 inches are not to reduce the sidewalk width to less than 3 feet. Obstacles reducing the sidewalk width below 4 feet but not less than 3 feet, should be corrected, bit if not, documented why the sidewalk width was reduced and the obstacle was not moved or corrected at that location and reported to the City.

   c. Sidewalks are constructed from Class "A" Portland cement concrete, 4 inches thick, except where 6-inch thickness is required in residential driveways, and 8-inch reinforced thickness is required in commercial driveways and 18 inches on either side of said area. The sidewalk shall be constructed such that panels are formed using control joints that shall extend to ¼ the depth of the sidewalk. If a grooving tool is used to form the control joint, the groove shall not be wider than ¼" and edged with a 1/8" radius. If the control joints are sawed, the groove shall not be less than 1/8" wide. Whichever method of grooving is used the control joints are to be cut such that

the resulting panel lengths are not less than 4 feet nor greater than 6 feet. Edges of the slab shall be edged with an edging tool that has a ¼" radius.

d. Surfaces of sidewalks and all parts of the pedestrian network must be stable, firm and slip-resistant. Changes in levels up to ¼ inch may be vertical and without edge treatment. Changes in levels between ¼ inch and ½ inch will be beveled with a slope no greater than 1V:2H (2:1). Level differences greater than ½ inch need to be removed or ramped.

e. Utility covers, such as for manholes, drainage or water meters, need to have a slip resistant top, as much as possible, and meet changes in level criteria. Lifting holes on covers need to be less than ½ inch in diameter or be satisfactorily plugged so a cane cannot get lodged in the hole. If grates are located in the sidewalk or other walkway paths, the grates will have spacing no greater than ½ inch wide in one direction. If grates have elongated openings, then the grates will be placed so that the long dimension is perpendicular to the dominant direction of travel.

f. The running slope of the sidewalk should be as level as possible allowing easy use by travelers. For pedestrian facilities the running grade will be a maximum of 5%. If this is technically infeasible, the sidewalk may be consistent with the running grade of the adjacent roadway. The rate of change in grade, the algebraic difference, measured over 2 foot intervals, is not to exceed 13%.

g. Sidewalks are to have a minimum 1.0% cross slope to allow for drainage and a maximum of 2.0%. Any cross slope over 2.0% is noncompliant and must be replaced.

h. A sidewalk plan must be prepared to show the sidewalk in plan, profile, and typical cross section. This plan may be included as part of the street plan.

i. For sidewalks to be constructed on unimproved streets, it is necessary to obtain sufficient field data to determine the probable future grade of the street curb and design the sidewalk accordingly. Additional right-of-way may have to be provided.

3. Expansion Joints. Bituminous preformed expansion joints, 3/4" thick and precut to the width of the sidewalk, shall be indicated on the plans 18" on each side of driveways, intersecting walks, curbs, and other locations as required. Expansion joints shall be placed at the locations specified on the plans or standard drawings. Expansion joints shall be placed between the sidewalk and all structures, such as light standards, traffic light standards, traffic poles, and columns, etc., which extend through the sidewalk. Refer to Standard Drawing ST-4 and ST-6 for additional information.

4. Ramps.

   a. General. All ramps shall be constructed to the least possible slope with a maximum allowable slope of 1:12 (8.33%) and a minimum slope of 1.0% for drainage. The maximum rise for any run shall be 30 inches. Refer to Standard Drawings ST-7.

   b. A minimum 5 foot by 5 foot level landing area of 0.02ft/ft. (2%) cross slope or less in any direction shall be constructed at the top and bottom of each ramp, ramp run, wherever two sidewalk cross or wherever a turn is required. Diagonal curb ramps require a 4 foot by 4 foot clear space at the bottom protected within the crosswalk markings.

   c. The minimum width of linear ramps shall be 5 feet, exclusive of flared sides. In an alteration, the width of the ramp shall match the adjoining sidewalk or a minimum of 4 feet.

   d. The minimum width of parallel curb ramps shall be 5 feet.

   e. The cross slope on all curb ramps shall be a minimum of 1.0%, and up to 2.0% maximum.

   f. Grade breaks at the top and bottom of perpendicular curb ramps shall be perpendicular to the direction of ramp run. Grade breaks shall not be permitted on the surfaces of curb ramps, blended transitions and landings within the pedestrian access route. Surface slopes that meet at grade breaks shall be flush.

   g. At raised islands and/or medians cut-through accessible routes level with the street with a 5 foot by 5 foot spacing space shall be utilized. Median cut through length is to be 4 feet minimum. Detectable warning will be provided at each entrance to the street.

   h. If a ramp is located where pedestrians must walk across the ramp, or where it is not protected by handrails or guardrails, it shall have flared sides with a maximum slope of 1:12 (8.33%). Curb ramps with returned curbs may be used where pedestrians would not normally walk across the ramp.

   i. No ramp shall be permitted to project beyond the curb into vehicular traffic. Curb ramps shall be located or protected to prevent their obstruction by parked vehicles.

   j. All ramps located at public streets and signalized intersections shall have a detectable warning panel installed manufactured by Armor-Tile Transit Systems model ADA-3024-CP or approved equal. Detectable warnings on walking surfaces are required to be truncated domes having a diameter of 0.9 inches, a height of 0.2 inches, and a center to center spacing of 1.65 inches to 2.35 inches in each direction. The

truncated dome panel is to contrast visually with adjoining surfaces, either light-on-dark or dark-on-light. The preferred color contrast is red for concrete and yellow for asphalt surfaces. The surface area for truncated domes is a minimum length of 2.0 feet covering the entire width of the ramp or curb opening, excluding the flare sides. The truncated domes are aligned on a square grid in the predominate direction of pedestrian travel to permit wheelchair wheels to roll between the domes. They are to be placed at the bottom of a ramp perpendicular to the path of travel, and parallel to the grade break, or 6-8 inches from the front of the curb depending on the type and location of the curb ramp. They are also provided at cut-thrus in islands and medians and shall extend the entire width of the opening at the face of the curbline. Where truncated domes are placed at the bottom of a ramp, the path between the domes shall be parallel to the path of travel on the ramp. At a blended transition or on a landing, the direction of the path between the domes may vary. Where a sidewalk crosses a railroad track, the detectable warning surface shall be located so that the edge nearest the rail crossing is 6 feet minimum and 15 feet maximum from the nearest rail. The rows of truncated domes in a detectable warning surface shall be aligned to be parallel with the direction of wheelchair travel.

k. Curb ramps shall be provided at all street intersections and at any marked midblock crossings or wherever a sidewalk crosses a curb. Transitions from ramps to walks, gutters, or streets shall be flush and free of abrupt changes (1/4" or greater change in elevation).

l. Curb ramps at marked crossings shall be wholly contained within the markings, excluding any flared sides. If diagonal (or corner type) curb ramps have returned curbs or other well-defined edges, such edges shall be parallel to the direction of pedestrian flow. The bottom diagonal curb ramps shall have 48 inches minimum clear space. If diagonal curb ramps are provided at marked crossings, the 48 inches clear space shall be within the markings. If diagonal curb ramps have flared sides, they shall also have at least a 24-inch long segment of straight curb located on each side of the curb ramp and within the marked crossing.

m. Curb ramp alignment should be perpendicular to the curb being crossed to provide a level cut for wheelchairs and directions sues for the visually impaired. For large radii, it is often not possible to both, place curb ramps perpendicular to the curb and in-line with the pedestrian crossing. Ramps may be set back from the curb to provide a grade break that is perpendicular to the ramps slope and a landing or blended transition will continue to the curb. If the bottom of the ramp is more than 5 feet from the curb, detectable warnings are placed at the back of the curbline.

5. Design Checklist for Sidewalks.

_____ Sidewalks shown in plan and profile on at least one side of residential streets and on both sides of collector and arterial streets.

_____ On unimproved streets sufficient field data is shown to determine probable future grade of street curb and sidewalk designed accordingly.

_____ Typical cross sections shown with plan and profile.

_____ Location and width of sidewalk is in accordance with Table VII-2. Sidewalk directly adjacent to a curb to be 5 foot in width.

_____ ¾" expansion joints are indicated on the plans.

_____ Sidewalk thickness of 4" (or 6" when sidewalk crosses a residential driveway or 8" reinforced when sidewalk crosses a commercial driveway or alleys).

_____ Sidewalk cross slope not greater than 0.02ft/ft. or 1:50 (2%).

_____ All ramp running slopes are less than 1:12.

_____ Maximum rise for any length of run is 30".

_____ Level landing areas provided at top and bottom of each run.

_____ Detectable warning system indicated on all appropriate ramp surfaces.

_____ Curb ramps provided wherever sidewalk crosses a curb.

_____ Minimum width of curb ramp – 60".

_____ Accessible crossing area indicated on any raised island crossing.

B. CURB AND GUTTER

1. General. Curb and gutter is required on all public improvement street projects.

2. Design. Curb and gutter is to be constructed from Class "A" Portland cement concrete. The width of the curb and gutter is to be 2 foot 6 inches. The curb height is to be 6 inches, and the gutter cross slope is to be 1 inch in 1 foot. The thickness of the gutter

shall be 6 inches for residential streets and 8 inches for collector and arterial streets. The street plan shall show the top of curb elevation in the profile. At driveway locations shown on the plans, the gutter is to be carried across the drive while the curb is depressed to match the driveway slope. If d shown on the plans, curbs cannot be depressed.

A 4 inch Type 5 aggregate base is to be placed beneath the curb and gutter. Refer to Standard Drawing ST-3

3. Expansion Joints. Bituminous preformed expansion joints, ¾ inch thick and precut to the exact cross section of the curb and gutter shall be placed at all driveway and intersection radii and at intervals of not more than 200 feet. Refer to Standard Drawing ST-4.

4. DESIGN CHECKLIST FOR CURB AND GUTTER

_____ Curb and gutter provided for on all improved streets.

_____ Street profile shows top of left and right curb elevations.

_____ Curb cross section shows curb height – 6" and width – 2' 6".

_____ Gutter thickness 6" local residential streets.

_____ Gutter thickness 8" non-residential local streets, collectors and arterial streets.

_____ Gutter cross slope is 1"/ft (except at ramp areas).

_____ Curb depressed to match driveway slopes.

_____ ¾" expansion joints indicated placed at all driveways and at intervals of not more than 200 feet.

C. DRIVEWAYS

1. General. Driveway approaches are located to serve the operation of vehicles from the street pavement to a garage, parking area, building entrance, structure, or other approved use located on the property.

2. Design. Residential driveway approaches shall be constructed using 6" thick Class "A" concrete. All driveway pavement shall be poured over 4" thick compacted Type 5 aggregate base. When a driveway approach intersects an existing 4-inch thick sidewalk, the area of the sidewalk within the driveway area including both sides of the sidewalk

transition sections to meet the drive elevation or 18 inches, whichever is greater, shall be removed and reconstructed with 6-inch thick concrete. The cross slope of the sidewalk area is not to exceed 0.02ft/ft. or 1:50 (2%). The grade of the driveway approach from the gutter line shall rise on a constant grade to the front edge (street side) of the sidewalk area. The slope of the driveway approach shall be at least 0.01ft/ft, or 1:100 (1.0%) and not to exceed 1:8 (12.5%).

a. Commercial/non-residential driveway approaches shall be constructed using 8" thick non-reinforced Class A Portland Cement Concrete. All driveway pavement shall be poured over 4" thick compacted Type 5 aggregate base. When a driveway approach intersects an existing 4-inch thick sidewalk, the area of the sidewalk within the driveway area, including both sides of the sidewalk transition sections to meet the drive elevation or 18 inches, whichever is greater, shall be removed and reconstructed with 8-inch non-reinforced thick concrete. The cross slope of the sidewalk area is not to exceed 0.02ft/ft. or 1:50 (2%). The grade of the driveway approach from the gutter line shall rise on a constant grade to the front edge (street side) of the sidewalk area. The slope of the driveway approach shall be at least 1:100 (1.0%) and not to exceed 1:20 (5.0%).

b. No driveway approach shall be permitted which will interfere with any existing parking meters, signs, traffic control devices, plantings, cables, poles, guys, water mains, gas mains, or other public utilities without approval from the Public Works Director. No part of any driveway approach may be located within 4 feet of a drop inlet or other drainage structure nor a pedestrian ramp without approval from the Public Works Director.

c. Joint driveway approaches shall be permitted only if there is a perpetual mutual access agreement approved by the City Attorney and filed of record in the St. Francois County Recorder's Office.

d. The width of residential driveway approaches shall not exceed thirty-three (33) feet without permission from Public Works Director and shall not be less than twelve (12) feet for new construction, and not less than the existing approach for reconstruction.

e. Residential entrances on existing City roads shall be located so the edges of the curb opening shall be a minimum of five (5) feet from the nearest edge of street inlets and ten (10) feet from the street corner radius point. The edges of the curb opening shall not project beyond the side property line extended normal to the pavement.

f. In the case of corner lots, no driveways shall be constructed within the sight triangle area bounded by the property lines of a corner lot and a line connecting two (2) points on the property lines each measured thirty (30) feet from the intersection of the two property lines at the intersection. Where applicable, easement lines shall be substituted for property lines.

g. The distance between adjacent residential entrances shall be a minimum of twenty (20) feet measured along the road right-of-way line. When residential development conditions necessitate reduction of the distance between adjacent residential entrances to ten (10) feet or less, the City may require a common entrance approach.

h. Commercial entrances shall not be less than twenty-four (25) feet wide or more than forty (40) feet wide at the right-of-way line. The radius used to increase the opening at the curb or pavement edge shall not be less than ten (10) feet nor more than forty (40) feet. Exception to the width and/or radius may be required, or allowed with special approval by the City, to insure adequate provisions for large vehicles and/or high traffic volume.

i. Commercial entrances shall be located in accordance with the site plan requirements and shall be designed so the edges of the curb opening shall be a minimum of five (5) feet from the nearest edge of street inlets and as far as possible from the street corner radius pint. The edges of the curb opening shall no project beyond the side property line extended normal to the pavement.

j. In the case of corner lots, no entrances, parking spaces or other obstacles shall be constructed or placed within the sight triangle area bounded by the property lines of a corner lot and a line connecting two (2) points on the property lines each measured (30) feet from the intersection of the two property lines at the intersection. Sign poles may be allowed if they are fifteen (15) inches or less in diameter and if the sign they support is not visually obstructing traffic at the intersection.

k. The edge or radius of the driveway approach shall not, in any case, extend beyond the projection of the adjacent property line, extended perpendicularly to the right-of-way line.

l. Refer to Standard Drawings ST-2 for residential driveways.

m. Entrance separation from existing street intersections shall be designed and submitted to the Public Works Director for approval. A traffic study may be required prior to approval.

3. Expansion Joints Where paved approach meets existing concrete pavement or sidewalk place 3/4" preformed bituminous fiber expansion joint, cut to template, through new concrete and 1' from junction with existing concrete, or along inside edge of sidewalk. Where paved approach meets existing bituminous construction, omit joint. For intersection with mainline concrete pavement use a doweled 3/4" expansion joint. Refer to Standard Drawing ST-4.

4. Sawcutting and Gutter

The curb and gutter section in front of a driveway (radius point to radius point) shall be sawcut full depth and removed before the driveway is poured. The entire curb and gutter section would then be replaced with Class A concrete with the depth as required for the driveway approach. Any curb and gutter broken or cracked outside the radius points during this removal shall also be removed and replaced accordingly.

a. Any damage to the existing street shall be the responsibility of the contractor or replace as per the General Conditions Technical Specifications for Public Improvements.

5. Design Checklist for Driveways

_____ Driveway locations indicated on plans.

_____ Driveway approaches do not interfere with any existing parking meters, signs, traffic control devices, plantings, cables, poles, guys, water mains, gas mains, or other public utilities.

_____ Copy of approved joint driveway approach agreement filed in the St. Francois County Recorder's Office.

_____ Width of residential driveway approach at right-of-way line is not less than 12 feet nor more than 33 feet.

_____ Width of commercial driveway approach at right-of-way line is not less than 25 feet nor more than 40 feet.

Minimum driveway approach clearances:

_____ Approach not within 5 feet of a drop inlet or other drainage structure or pedestrian ramp.

_____ If corner lot, nearest edge to nearest right-of-way of intersecting street – 30 feet.

_____ Nearest corner of sight triangle – 30 feet.

_____Edge or Radius of driveway approach not extended beyond the projection of the adjacent property line.

_____ Radius of driveway return is designed for the classification of street and type of vehicle use.

_____ Expansion joints indicated.

_____ Cross slope of sidewalk area within the driveway must not exceed 0.02ft/ft. or 1:50 (2%).

CHAPTER IX – CONCRETE STRUCTURES

A. RETAINING WALLS

1. General. All walls built within City maintained right-of-way shall be subject to the review of the Public Works Department. Additionally, the following walls shall also be subject to the Department's design criteria and review:

   a. Retaining walls supporting the roadway fill of a City maintained road, provided that the horizontal distance from the right-of-way line to the fill face of wall is less than 1.75 times the vertical grade difference between the ground elevation at the right-of-way line and the bottom of footing (not bottom of shear key) elevation

   b. Retaining walls supporting roadway cuts adjacent to City maintained roads, provided that the distance between the right-of-way line and face of the wall is less than the exposed wall height.

   All retaining walls built for the purpose of retaining roadway fill shall be constructed of cast-in-place reinforced concrete unless specifically authorized by the Director of Public Works. Retaining walls built in roadway cuts may be either cast-in-place reinforced concrete or mechanically stabilized earth (MSE).

2. Cast-In-Place Reinforced Concrete Walls.

   a. Geotechnical Information. All retaining wall designs submitted for review by City shall include a geotechnical report, which must contain the following information:

      1) The phi angle of the retained soil.

      2) The recommended equivalent fluid pressure to be used in the design of the wall. Walls that will accommodate traffic live load surcharge or dead load surcharge from buildings or other substantial structures shall be designed to MoDOT retaining wall criteria for Seismic Performance Category B. As such, the Mononabe-Okabe pseudo-static approach shall be used for determining the design earth pressure. The acceleration coefficient (a) is to be taken as 0.12. All other walls may be designed to the MoDOT requirements for Seismic Performance Category A, meaning the Rankine formula may be used to determine the design lateral earth pressure.

      3) The frictional resistance of the soil beneath the wall footing for use in sliding calculations.

      4) Recommendations as to the type and required compaction of the backfill material as well as to the type of backfill drainage that will be required.

      5) The allowable bearing pressure of the soil beneath the wall footing.

b. Design Calculations. Design calculations must be legible, signed and sealed by a Registered Professional Engineer in the State of Missouri and meet the following criteria:

1) The dimensions of the retaining wall shall be such that slope requirements are met at all locations, including the wrap-around slope at the end of the wall.

2) The factor of safety for overturning shall be 2.0 and the factor of safety for sliding shall be 1.5. Safety factors may not be reduced for seismic design loads.

3) The location of the design fill height for passive pressure shall be the wall toe, not the wall face. From this height, the top one-foot (1') shall be disregarded due to the possibility of erosion and poor compaction at these areas.

4) Minimum permissible wall thickness is ten inches (10"). Minimum permissible footing thickness is twelve inches (12"). Sidewalk type walls shall include a two-inch (2") wearing surface on the footing.

5) The minimum permissible 28-day concrete strength to be used shall be 3,000 psi.

6) All reinforcement shall be Grade 60 deformed bars. Minimum bar size used shall be No. 4.

7) Computer generated output submitted as design calculations must be:

a) Signed and sealed by a Registered Engineer in the State of Missouri on the cover sheet. The cover sheet must also indicate the total number of sheets in the design calculation package.

b) Have the full name of the person who determined the input data clearly listed.

c) Have the name of the software package clearly listed.

d) Have the name and business address of the software producer clearly listed.

c. Construction Details. As a minimum, construction plans for retaining walls shall contain the following information:

1) The beginning and ending stations of the wall.

2) Expansion and contraction joints.

3) Elevations at the top of the wall at all joint locations and at any break points.

4) Top of footing elevations at all joint locations and at any break points.

5) Curve data and/or offsets at all changes in horizontal alignment.

6) Wall sections representing the entire wall and showing all reinforcement and construction joint details.

7) All reinforcement shall be Grade 60 (Grade 420) epoxy coated in the exposed face for walls subject to spraying from adjacent roadways. For design purposes, all walls within twelve feet (12') of the curb line shall be considered as subject to spraying from adjacent roadway.

8) General notes shall be included outlining design loadings and material requirements.

9) For subdivision and permit projects, the "General Notes for Retaining Wall Construction" included at the end of this section shall be incorporated into the plans. Material requirements, class of concrete and minimum 28-day compressive strength shall also be indicated.

10) Drain details.

3. Modular Block and MSE Retaining Walls

a. Geotechnical Information. Shall be provided for all wall construction exceeding six (6) feet in height.

b. Design Calculations. Design calculations must be legible, signed and sealed by a Registered Professional Engineer in the State of Missouri and meet the following criteria:

1) The dimensions of the retaining wall shall be such that slope requirements are met at all locations, including the wrap-around slope at the end of the wall.

2) The factor of safety for overturning shall be 2.0, the factor of safety for sliding shall be 1.5, and the factor of safety for reinforced pullout shall be 1.5. Safety factors may not be reduced for seismic design loads.

3) The location of the design fill height for passive pressure shall be the wall toe, not the wall face. From this height, the top one-foot (1') shall be disregarded due to the possibility of erosion and poor compaction at these areas.

4) Minimum permissible wall thickness is five and a half inches (5.5"). Minimum permissible leveling pad thickness is twelve inches (12") of compacted Type 5 aggregate or six inches (6") of unreinforced concrete for modular walls and twelve inches (12") of unreinforced concrete for MSE walls.

5) Design calculations must be shown for all components of the wall.

6) Computer generated output submitted as design calculations must be:

a) Signed and sealed by a Registered Engineer in the State of Missouri on the cover sheet. The cover sheet must also indicate the total number of sheets in the design calculation package.

b) Have the full name of the person who determined the input data clearly listed.

c) Have the name of the software package clearly listed.

d) Accompanied by the name and business address of the software producer.

c. Construction Details. As a minimum, construction plans for modular block and MSE retaining walls shall contain the following information:

1) Beginning and ending stations of the wall.

2) Elevations at the top of the wall at 25-foot intervals and at any break points.

3) Elevations at the bottom of the wall at 25-foot intervals and at any break points.

4) Curve date and/or offsets at all changes in horizontal alignment. If battered wall systems are used on curved structures, show offsets at ten-foot (10') (max.) intervals from baseline.

5) Give the phi angle of the soil to be retained by the reinforced earth.

6) Note stating the phi angle of the selected granular backfill is greater than or equal to 34.

7) All concrete, except facing panels, shall be Class A1.

8) Wall sections representing the entire wall and showing typical soil reinforcements, select granular backfill, drain pipe and leveling pad.

9) Details of any architectural finishes.

10) For walls greater than ten feet (10') in height, the maximum vertical batter shall be 1.5 inches per foot.

11) General notes shall be included outlining design loadings and material requirements.

The above information, as well as any additional details and requirements normally provided by the wall manufacturer shall be submitted to the City for approval.

GENERAL NOTES FOR RETAINING WALL CONSTRUCTION

1) Class A Concrete shall be used for all retaining walls with an $f'c$ equal to 3,500 psi or higher.

2) All reinforcing steel shall conform to ASTM Specification A615, Grade 60.

3) Pouring retaining wall footings without formwork will not be permitted. Pouring retaining wall shear keys without formwork will be permitted unless noted otherwise on the plans.

4) Plastic protected bar supports are required wherever the concrete surface is exposed. Bar supports for reinforcement are to be of the earth-bearing base type. Bar supports used to support the upper mat of steel in the footing shall be full height, providing the proper clearances. STANDEES RESTING ON THE LOWER MAT OF BARS WILL NOT BE PERMITTED.

5) Splices in longitudinal reinforcement shall be a minimum of 24 bar diameters, unless noted otherwise on the plans. Bar splices will not be permitted on other bars unless explicitly shown on the plans.

6) Placing form oil or other release agent on the forms prior to placement of the reinforcing steel is required.

7) Triangular molding, having 0.75-inch width on each of the two (2) form sides, shall be used to bevel all exposed edges on the structure.

8) Curing of the concrete is required for 72 hours after placement of the concrete. Transparent membrane or wet burlap may be used to cure wall surfaces. For wall footings, polyethylene sheeting and white-pigmented membrane may also be used if the footing is not exposed. Polyethylene sheeting may also be used to cure the top of the wall while the forms are in place. If burlap is used, it is to be kept continuously wet for 72 hours. If forms are removed from wall surfaces prior to 72 hours, the tie holes are to be patched immediately, and curing using transparent membrane or wet burlap is to begin immediately after the tie hole patching is completed.

9) Where earth backfill is specified, it shall be placed in layers not to exceed eight inches (loose measurement) and shall be compacted to at least 95 percent of standard maximum density.

B. STRUCTURAL CONSTRUCTION PLANS

1. General. The items which follow are minimal requirements for the development of construction plans for culverts and culvert bridges and are not all inclusive. The design consultant shall supplement this list with additional material suitable to the specific project to achieve high quality plans. It is the responsibility of the design consultant to see that there are no errors or omissions and possibilities of misinterpretation by the contractor.

   The plans shall contain the following details and are to be ordered as follows:

   a. Plan and Elevation. The General Plan and Elevation shall essentially be the T, S & L sheet with the following items removed:

      1) Bridge exception.

      2) Cross-section, section thru abutment, pier sketch etc.

      3) Roadway data.

      4) Include all applicable general notes. Typical general notes are included at the end of this section.

      5) Show slope protection limits and pertinent construction details.

      6) Affix Professional Engineer's seal and signature (all sheets).

      7) Limits of temporary sheet piling indicating top and bottom elevations and lengths shall be shown in the plan. Add note stating that the information shown is estimated.

      8) Stage construction line, if any.

   b. Footing Layout, Stage Construction Details, Etc.

      1) For structures on curved alignment and other unusual situations, a footing layout should be shown.

      2) Sketches showing the stage removal and stage construction of the superstructure and limits of removal of the substructure should be shown. Generally show 4 elevations views (e.g. for two stage projects): Stage I Removal; Stage I Construction; Stage II Removal; Stage II Construction. Additional elevation views will be required for three stage projects.

      3) Show location of temporary concrete barrier.

4) Removal of Bridge and Removal of Bridge (Partial) shall be accounted for as Lump Sum items. Removal of Bridge (Partial) shall apply to deck replacements, deck widening's and replacement of prestressed concrete deck beams.

5) For rehabilitation projects, a plan view showing approximate location and anticipated quantity of half-sole and full-sole deck repairs shall be included. Details for the half-sole and full-sole patching shall be incorporated into the plans, including all special repair zones to protect negative moment reinforcement anchorage.

6) The required sequence of construction shall be outlined on this sheet.

c. Deck Elevations

1) A typical haunch detail is required.

2) All information such as theoretical haunching, theoretical dead load deflection and finished roadway grades shall be calculated at tenth points along the girder.

3) A table showing the plan finished roadway pavement grade above each theoretical haunch location is required.

4) A table showing the theoretical dead load deflection due to the weight of the concrete deck slab shall be included.

5) A table showing anticipated theoretical haunch heights shall be included to aid contractors in bidding.

d. Deck Details

1) Cross Section

a) Location of longitudinal construction joints, if any, shall be shown.

b) Cross-slopes, parabolic crown detail (if required), reinforcement clearances, slab thickness and the location of profile grade line must be shown on the cross section.

2) Plan

a) Top and bottom reinforcement are to be shown as lapped at different locations.

b) Minimum lap lengths shall be indicated on the plans.

3) Show deck pouring sequence. At least one optional sequence in addition to the basic sequence is required for federally funded projects.

4) Show deck drainage system and locations.

5) For stage construction, show detail for bar splices near joint.

e. Bridge Railing Details

1) For New Jersey Safety Barrier, show the following:

a) Cross section showing all dimensions and reinforcement and an elevation view showing all reinforcement.

b) Show barrier joint locations. Joints are required ten feet (10') from the centerline of an intermediate bent on both sides of the intermediate bent.

c) Show BEVEL DETAIL OF FILLED JOINT. This joint is a ½" filled joint sealed with a backer rod and Dow Corning 888 Silicone sealant or approved equal. Waterstops shall not be used in barrier joints.

d) Details shall be included for the barrier end section designed to accept a Bridge Anchor Section. Barrier end sections designed to accept the bridge anchor section shall be detailed as in the MoDOT Bridge Design Manual.

2) For Thrie Beam Bridge Railing, show the following:

a) An elevation view showing all post locations, thrie beam transition section and guardrail terminal section or other approved end treatment.

b) A cross-section view showing the rail, post and top channel as well as connection device details.

c) Verify that all relevant Standard Drawings are to be included in the plan set.

f. Framing Plan and Beam/Girder Details

1) A framing plan for steel layout must be shown.

a) Show beam/girder spacing and lengths.

b) Show diaphragm/cross frame locations for beam/girder structural requirements.

c) If curved structure, a table of layout dimensions is required.

d) A north arrow is required.

2) The Moment table and Reaction table should be shown. The tables should, in general, follow the examples provided at the end of this section.

3) Show weld size, flange transitions, shear stud requirements, notch toughness or fracture critical notations, diaphragm/cross frame details, splice design and locations.

4) A table of top of Web (or top of Beam for Wide-Flange) elevations must be provided. (Add note: "For Fabrication Use Only".)

5) A camber diagram for girders is required.

6) Show bearing stiffener details.

7) Show intermediate or longitudinal stiffeners, if any.

8) Show designation of Notch Toughness Requirements for beams, webs, plates and splice plates.

9) A framing plan for Precast Prestressed Concrete I-beams must be shown.

   a) Show beam spacing and lengths.

   b) A north arrow is required.

10) For precast prestressed concrete beams, the following details must be shown:

   a) Show beam cross section with all dimensions.

   b) Show strand layout, draping details, lifting loop details, drain connection insert details.

   c) Show bar list, bar details, notes and Bill of Material.

   d) Show required concrete strength at strand release and required 28-day concrete strength.

   e) Show intermediate diaphragm details.

   f) Show bearing details.

g. <u>Abutment Details</u>

1) Detailing shall be as per the MoDOT Bridge Design Manual.

2) Step heights must be greater or equal to ¾", otherwise shim plates need to be specified.

3) Steps 4" or larger shall be reinforced.

4) Show step and bottom of cap elevations. All elevations shall be shown to the

nearest 1/100 of a foot.

5) Show wingwall details.

6) Bridge approach slab shall be connected to the bridge deck slab by means of #5 Bars, 30" long at 18" spacing.

7) A table showing proposed pile sizes, estimated required lengths, design bearing, required hammer energy and note concerning practical refusal.

8) Details for drilled piers shall be indicated including dimensions, reinforcement and anticipated bottom elevation.

9) Quantity for structural excavation must be shown for each individual abutment.

10) All reinforcement protruding above or to be placed completely above the bearing seat elevation shall be epoxy coated.

h. Intermediate Bent Details

1) All intermediate bents shall be of the column and cap type and shall be detailed (including seismic detailing requirements) as outlined in the MoDOT Bridge Design Manual.

2) Step requirements are the same as for abutments.

3) Elevations for the footings, bottom of cap and steps must be shown to the nearest 1/100 of a foot.

4) Show details for cofferdams or seal course requirements in stream crossings or high water table situations (if necessary).

5) Pile information and drilled pier information is required as per abutments.

6) Structural excavation quantities for each individual intermediate bent are required.

i. Box Culvert Details

1) The following drawings are required for box culverts:

a) Section through box culvert showing all dimensions and reinforcement details. *

b) Half horizontal plan showing the top slab steel and all dimensions is a minimal requirement. A full horizontal plan view is preferable. *

c) Half horizontal section showing the bottom slab, wall steel and all dimensions is a minimal requirement. A full horizontal section is preferable.

d) An elevation of the box culvert showing the wall steel, should these details be unclear in the horizontal section view. *

e) A section through wingwalls and apron for each unique wingwall arrangement.

f) An elevation view of each unique wingwall.

g) A section through the upstream and downstream headwalls. (Note: These will not be the same)

h) A section through each unique toewall.

i) A plan view showing the layout of the proposed precast concrete box culvert sections. **

j) Plan, elevation and sectional views showing reinforcement and dimensions for skewed end sections or elbows in precast concrete box culverts. **

k) Details for connecting the precast culvert sections to cast-in-place work. **

* Not required for precast concrete box culverts.
** Not required for cast-in-place concrete box culverts.

CHAPTER X – TRAFFIC CONTROL

A. TEMPORARY TRAFFIC CONTROL

1. General. All detours / lane closures must be handled using traffic control devices conforming to the most current edition of the "Manual on Uniform Traffic Control Devices" (MUTCD), and must be approved by the City. The manual, produced by the U.S. Department of Transportation, Federal Highway Administration, may be viewed on their internet website and printed at no charge. The MUTCD internet website address is http://mutcd.fhwa.dot.gov/

B. PERMANENT SIGNING

1. Sign Construction. The City shall determine the required signing necessary to be installed on public rights-of-way. All signs must conform to current M.U.T.C.D. standards and shall be furnished by the contractor unless otherwise directed by the City.

   a. Sign post shall consist of two (2) inch by two (2) inch twelve (12) gauge perforated square steel posts. All sign post shall be constructed using a break-away anchor sleeve sized to the manufactures recommended specifications based on post size. All installation shall be in a plumb position.

   b. Refer to Table VII-4 for number of required post based on sign size.

TABLE X-1
POST SIZE REQUIREMENTS

SIGN AREA (SQ. FT.)	PERFORATED SQUARE STEEL POST
≤ 10	1 – 2", 12 ga. *
> 10 ≤ 16	2 - 2", 12 ga.
> 16 ≤ 24	3 - 2", 12 ga.

*Signs greater than 4 feet in width, except diamond shape signs, require 2 posts.

CHAPTER XI – LANDSCAPING

A. DRAWINGS

All trees, shrubs and plants designated to remain within the public right-of-way shall be shown and clearly noted on the plans. All other plantings shall be removed from the right-of-way. The plans shall require that the public right-of-way be left in a finished and neat appearing condition.

B. SITE RESTORATION

As part of publicly funded utility or street improvement projects, areas disturbed during construction shall be returned to a condition that is equal to or better than the original site conditions. The finish grading of disturbed areas shall match the general contours of the surrounding area. Seeding, fertilizing, and mulching or sodding shall be performed as described in the City of Farmington General Conditions and technical Specifications for Public Improvements to establish a suitable stand of grass.

C. STREET TREE PLANTING – PUBLIC IMPROVEMENTS

Whenever a publicly funded utility or street improvement is authorized, the designer shall provide tree plantings as part of the contract. If a project requires any tree removal, every effort should be made to plant two new trees for each tree removed. Where right-of-way is too narrow to support tree plantings or underground and overhead utilities interfere with potential tree plantings, the designer shall review and consider an off-site temporary planting easement area adjacent to the street improvement. The property owner agreeing to this temporary planting easement shall be advised they will be responsible for the wellbeing of the tree. Condemnation shall not be used to secure temporary planting easements.

The designer shall consult with the Director of Public Works on location, species, and size of trees to be included in the contract. All tree planting locations shall be approved by the Director of Public Works to ensure they do not interfere with sight distance of motorists or of any traffic control devices.