Standard Detail Drawing	Revisions
STR-01 LOCAL STREET - RESIDENTIAL	1. Changed name to RESIDENTIAL LOCAL STREET to align with naming nomenclature used in section 5200 (design guidelines).
	2. Changed the equivilant of MoDOT Type 5 rock to flyash subgrade stabilization from 4" thick to 6" thick.
	3. Clarified langauge in the notes.
STR-02 COLLECTOR STREET	1. Changed name to RESIDENTIAL COLLECTOR STREET to align with naming nomenclature used in section 5200 (design guidelines).
	2. Changed the equivilant of MoDOT Type 5 rock to flyash subgrade stabilization from 4" thick to 6" thick.
	3. Clarified langauge in the notes.
STR-03 COMMERCIAL STREET	1. Changed name to COMMERCIAL COLLECTOR STREET to align with naming nomenclature used in section 5200 (design guidelines).
	2. Changed the equivilant of MoDOT Type 5 rock to flyash subgrade stabilization from 4" thick to 8" thick.
	3. Clarified langauge in the notes.
STR-04 INDUSTRIAL STREET	1. Changed name to INDUSTRIAL COLLECTOR STREET to align with naming nomenclature used in section 5200 (design guidelines).
	2. Changed the equivilant of MoDOT Type 5 rock to flyash subgrade stabilization from 5" thick to 9" thick.
	3. Clarified langauge in the notes.
STR-05 ARTERIAL/THOROUGHFARE STREET	1. Changed name to MAJOR/MINOR ARTERIAL STREET to align with naming nomenclature used in section 5200 (design guidelines).
	2. Changed the equivilant of MoDOT Type 5 rock to flyash subgrade stabilization from 5" thick to 9" thick.
	3. Clarified langauge in the notes.
STR-06 INTERSECTION RIGHT OF WAY	1. Changed street classifications to align with naming nomenclature used in section 5200 (design guidelines).
STR-07 STREET CUT RESTORATION	1. Changed concrete used for base repairs from KCMMB to 4000 PSI.
	2. Clarified langauge in the notes.
STR-08 HORIZONTAL DIRECTIONAL DRILLING INSTALLATION	1. Fixed scrivner error.
STR-09 RIGHT OF WAY UTILITY LOCATIONS	No changes
STR-10 TYPICAL TRENCH/BORE PIT BACKFILL	No changes
STM-01 PRECAST CURB INLET	1. Clarified langauge in the notes.

STM-02 PRECAST JUNCTION BOX	1. Clarified langauge in the notes.
	2. Increased top slab thickness from 6" to 8" thick.
STM-03 PRECAST STANDARD AREA INLET	1. Clarified langauge in the notes.
STM-04 PRECAST STANDARD GRATE INLET	1. Clarified langauge in the notes.
STM-05 STORM SEWER RING & LID	1. Updated supplier list.
STM-06 STORM SEWER EMBEDMENT	1. Eliminated Aluminized CMP Pipe.
	2. Clarified langauge in the notes.
	3. Added APWA gradation table.
STM-07 CONCRETE PAVED DITCH	No changes
STM-08 TYPICAL TOE WALL	No changes
STM-09 PIPE OUTLET RIP-RAP	No changes
STM-10 TYPICAL RIP-RAP DITCH	1. Clarified langauge in the notes.
	2. Added that rip-rap shall be grouted.
STM-11 CREEK BANK STABILIZATION	1. Clarified langauge in the notes.
STM-12 GABION PLACEMENT	No changes
SAN-01 PRECAST SEWER MANHOLE	1. Modified reinforcing steel requirements in the base.
	2. Clarified langauge in the notes.
SAN-02 PRECAST DROP SEWER MANHOLE	No changes
SAN-03 PRECAST SHALLOW SEWER MANHOLE	1. Modified reinforcing steel requirements in the base.
	2. Removed reinforcing steel requirements from the top slab and referred to SAN-04 for the requirements.
SAN-04 SHALLOW MANHOLE TOP SLAB	1. Changed reinforcing steel requirements.
SAN-05 SANITARY SEWER RING & LID	1. Updated supplier list.
SAN-06 MANHOLE ABANDONMENT	No changes
SAN-07 SANITARY SEWER SERVICE	1. Added tracer wire with drawing update and adding all notes needed for this change.
	2. Added note requiring 4' tall marking stake painted green temporariliy placed at the end of sewer stub and next to tracer box.
	3. Added trench check to drawing and to the notes.
SAN-08 SEWER SERVICE DEMOLITION	No changes
SAN-09 AIR & VACUUM VALVE ASSEMBLY	No changes
SAN-10 MANHOLE AT EXISTING SANITARY SEWER	1. Changed notes to reflect desired adjusting rings.
	2. Fixed scrivner errors.
SAN-11 SANITARY SEWER EMBEDMENT	1. Added APWA gradation table

	2. Clarified langauge in the notes.
SAN-12 TYPICAL CONNECTION TO EXISTING MANHOLE	No changes
SAN-13 CONCRETE COLLAR	No changes
SAN-14 CONCRETE THRUST COLLAR	No changes
SAN-15 TYPE I AERIAL CROSSING	1. Changed ductile pipe to sewer rated ductile pipe.
SAN-16 TYPE II AERIAL CROSSING	No changes
SAN-17 FORCE MAIN TRACER WIRE	No changes
WAT-01 FIRE HYDRANT ASSEMBLY	1. Added note about need to use anchoring coupling.
	2. Deleted the requirement for using roofing felt or filter fabric.
	3. Added note stating no all-thread restraint allowed.
	4. Updated supplier list.
	5. Modified note to indicate that all ductile below grade gets poly wrapped.
	6. Clarified langauge in the notes.
WAT-02 PVC SHAFT VALVE BOX	1. Added note to poly wrap all valves.
	2. Modified detail to indicate that all valve stacks shall be schedule 40 PVC.
	3. Added note stating that valve stack will be adjusted flush with finish lawn grade before a Certificate of Occupancy will be issued.
WAT-03 VALVE BOX RING & LID	No changes
WAT-04 3/4" & 1" SERVICE METER WELL	1. Modified drawing for a more accurate representation.
	2. Updated supplier list.
	3. Added note stating that outside of the meter well, service line shall have 36" minimum cover.
	4. Modified notes to include langauge for multiple meters colocated in a single meter well.
WAT-05 METER WELL RING & LID	1. Updated supplier list.
WAT-06 LOCKING METER WELL RING & LID	No changes
WAT-07 1-1/2" & 2" SERVICE METER	1. Updated supplier list.
	2. Added note stating that meter setters with a lockable bypass are only allowed with permission from the Public Works Director.
WAT-08 SERVICE METER WELL DISCONNECTION	No changes

WAT-09 EXCAVATION FOR TAPPING	1. Added note about protecting the integrity of the tracer wire on plastic water mains.
WAT-10 2" - 6" SINGLE METERING PIT	1. Updated supplier list.
WAT-11 2" - 6" DOUBLE METERING PIT	1. Updated supplier list.
WAT-12 AIR & VACUUM VALVE ASSEMBLY	No changes
WAT-13 STAINLESS STEEL TAPPING SLEEVES	No changes
WAT-14 THRUST BLOCKS	1. Added note stating all ductile iron pipe and fittings shall be poly wrapped.
WAT-15 STRADDLE BLOCK	1. Called out underground clamp in the straddle block.
	2. Added note stating that within the straddle area, pipe shall be poly wrapped class 52 ductile iron.
WAT-16 WATERLINE EMBEDMENT	1. Clarified langauge in the notes.
	2. Added modified APWA gradation table (table was modified to exclude manufactured and river sand as acceptable embedment material).
WAT-17 PVC WATER MAIN TRACER WIRE	1. Clarified langauge in the notes.
	2. Fixed scrivner errors.
MIS-01 SIDEWALK SECTION	1. Changed expansion joint spacing from 250' to 150'.
	2. Changed to state that if the sidewalk is within 3' of the back of the curb, the thickness increase by 2" and the width increases by 1'.
	3. Changed to state that the first 8 lineal feet from the back of curb shall be 6" thick.
	4. Clarified langauge in the notes.
MIS-02 SIDEWALK FOOTING AT CURB INLET	1. Clarified langauge in the notes.
MIS-03 RESIDENTIAL DRIVEWAY	1. Clarified langauge in the notes.
MIS-04 CONCRETE SHARED USE PATH	1. New Detail replacing asphalt shared use path.
MIS-05 CONCRETE ENCASEMENT	1. Fixed scrivner errors.
MIS-06 GUARD POST	No changes
MIS-07 WOVEN WIRE FENCE	1. Added note to indicate only used with prior approval.

Blue Springs, Missouri
Public Works Department

SECTION 2100 – GRADING AND SITE PREPARATION

CITY OF BLUE SPRINGS, MISSOURI
CONSTRUCTION SPECIFICATIONS

The City of Blue Springs hereby adopts Section 2100 of the Kansas City Metropolitan Chapter of APWA Construction and Material Specifications, latest edition. The following additions, deletions and/or revisions are adopted as a part of Section 2100 for use within the City of Blue Springs. Text in bold italics indicates revisions or additions to the APWA standard.

Section 2102 Grading

2102.2 B Excavation (Incorporated into 2017 APWA Section 2102.2.B)
Add the following to the definition of Excavation: ***"... and includes trenching for pipe lines, utilities and structures."***

2102.2 C.2 Suitable Material (Moved from definition section into other applicable sections)
Add the following subparagraphs:

c. Trench Backfill in Proposed or Existing Paved Areas within Street or Alley Right of Way:

i. Standard Trench: Suitable Backfill Material for all trenches shall be either Type A flowable fill or granular material with a maximum particle size 1 – ½ inch rock, passing #40 sieve (PI ≤ 8) 15 to 50% and #200 sieve ≤ 35%. This material shall be used for all existing and proposed street crossings for main and lateral construction.

d. Suitable Backfill Material outside of paved areas within the Right-of-Way, and all areas outside the Right-of-Way, may be suitable material as specified for earth embankment in APWA Standard Specifications, Section 2102.2.C. Suitable Backfill Material may also be other trench backfill material (flowable fill or aggregate base) depending on site conditions, trench widths, or at the direction of the City's on-site Inspector.

e. Bedding Aggregate shall be granular material meeting the following requirements:

Max Particle Size: ¾ inch	***PI ≤ 10***
Passing #200 Sieve: ≤ 35%	***LL ≤ 40***

f. Flowable Fill (Type A): Controlled Low Strength Material (CLSM)

i. Description. This item shall govern the backfilling of structures, pipes, and all spaces excavated for, and not occupied by new structures. It may be used as backfill of concrete walls, as backfill to new culverts in lieu of soil backfill, as fill in abandoned structures, and for other uses as approved by the City Engineer.

The CLSM shall be composed of portland cement, fly ash (optional), fine aggregate, coarse aggregate (optional), water, and a shrinkage compensator, proportioned as hereinafter provided or an acceptable mix as approved by the City Engineer.

ii. Materials.

(a) Cement: The cement shall be either Type I or II portland cement.

(b) Fly Ash: Fly ash shall conform to the requirements of ASTM C 618 Class C.

(c) Air Entrainment: Admixture shall consist of organic compound(s) which, when added to the mix in accordance with the manufacturer's recommendation will result in air contents as prescribed by ASTM C 173 or C 231.

(d) Fine Aggregate: Fine aggregate shall be washed and consist of clean, hard, durable, and uncoated particles of natural or manufactured sand or a combination thereof, with or without a mineral filler. Aggregate shall be free from frozen materials or injurious amounts of salt, alkali, vegetable matter or other objectionable material.

Sieve Size	*Percent Passing*
¾ inch	*100*
No. 200	*0-10*

(e) Coarse Aggregate: With the City Engineer's approval, the CLSM backfill may be supplemented with sound, durable, clean rock or broken concrete (2" to 8" square) to minimize the quantity of CLSM material placed. The CLSM shall be placed to a depth of 2 feet. Clean aggregate may be added to the CLSM mixture until the top of the CLSM and the top of the aggregate are approximately equal. The process may be repeated as required until the fill is completed.

(f) Mixing Water: Mixing water shall be clean, and free from injurious amounts of sewage, oil, acid, alkali, salt, or organic matter. (Only potable water will be acceptable without testing).

iii. Mix Design. Unless otherwise shown on the Contract Drawings, the Contractor may furnish either mix design type A or B. The following is given as typical mix design for trial mixes. Adjustments of the proportions of fine aggregate and/or water may be made to achieve proper solid suspension and optimum flowability with the approval of the Engineer. The mix design shall contain a shrinkage compensator as approved by the City Engineer.

	CLSM MIX DESIGN TYPE A (REMOVABLE)
Strength	*50 to 100 PSI*

Cement Content	*144 lbs.*
Water	*396 lbs.*
Sand	*2,698 lbs.*
Air Entrainment	*13%*
Class C Fly Ash	*9 lbs.*

The shrinkage compensator shall be proportioned in accordance with the manufacturer's recommendations. The CLSM shall be transit mix. No blade mixing will be allowed.

2102.6 E Consolidated Rock Embankment

Delete the second paragraph and replace with the following:
(First and last sentence incorporated into the 2017 APWA Section 2102.6.E. The middle sentence is included in the 2018 Blue Springs Supplement Section 2102.6.E)
Rock embankment shall be capped with 3-feet of soil material on all sides. The upper layer of rock shall be filled with a 6-inch thick layer of 3/4-inch choker stone prior to placing soil material. The soil cap material shall not contain material having a maximum dimension greater than 3 inches.

2102.6 Embankment (Incorporated into 2017 APWA Section 2102.6.H)

Add the following:

H. Testing:

1. ***Laboratory compaction test and index property test results for each material used on site shall be submitted to the Inspector prior to placement. Any work by the Contractor prior to test submittals and subsequent City review and approval shall be work done at the Contractor's risk.***

2. ***In-Place Density/Moisture tests should be taken at the frequency of 4 per day per spread, with a minimum of one test per lift.***

3. ***The reports shall clearly indicate the location of all tests by street name, station and/or lot number, type of material, and elevation of test. The reports shall include the results of all tests (pass or fail) and all re-tests.***

4. ***All test reports should be submitted prior to receiving approval of the subgrade. Pavement, curb, other surface features or utilities placed prior to receiving embankment approval shall be placed at the Contractor's risk.***

2102.7 Finishing

Add the following language to Section B: (All except the last sentence incorporated into 2017 APWA Section 2102.7)

B. Except where other permit or utility work is in progress, the graded surface shall be made free of rock, concrete, and brick, or fragments thereof, or rubbish and shall be finished to the lines, grades, and cross-section indicated on the plans, including shoulder, berm and sidewalk spaces. ***All curb and gutter shall be backfilled prior to paving operations.***

Insert the following Section 2102.9 Excavation, Trenching and Backfill for Piping and Structures (Incorporated into the 2017 APWA Section 2102.4)

2102.9 EXCAVATION, TRENCHING AND BACKFILLING FOR PIPING AND STRUCTURES

A. Dewatering:

1. ***The Contractor shall maintain a dry and stable excavation, obtain necessary permits, and provide for the proper method of discharging water from the work site at all times until installation is complete.***

2. ***The Contractor shall not allow hydrostatic pressure flotation or other adverse effects to cause damage to the structure or pipeline.***

3. ***The Contractor shall remove any water that may accumulate or be found in the trenches and other excavations made as part of the Work.***

4. ***Proper dewatering techniques are solely the Contractor's responsibility. All work performed by the Contractor that is adversely affected by his/her failure to adequately dewater trenches will be subject to rejection by the Inspector. The Contractor shall repair and/or replace affected structures or pipelines.***

5. ***Grading shall be done to prevent surface water from flowing into trenches or other excavations, and to maintain the flow of water in natural watercourses on or adjacent to the site. Any water accumulating in trenches or other excavations shall be removed by pumping or by other approved methods***

B. Trenching for Piping:

1. ***The alignment, depth, and pipe subgrade of all gravity flow line trenches shall be determined by overhead grade lines parallel to the pipe invert.***

2. ***The Contractor shall not open more trench in advance of pipe laying than is necessary. Three hundred (300) feet will be the maximum length of open trench***

allowed on any line under construction. All open trenches shall be adequately protected.

3. *Trenching, boring, tunneling or other installation methods shall be completed with minimum inconvenience and disturbance to the general public.*

4. *The Contractor shall perform excavation of materials encountered, regardless of material type, to the depths indicated on the drawings or as otherwise specified herein. Suitable backfill material shall be sorted and piled in an orderly manner a sufficient distance from the trench walls to avoid overloading and to prevent slides or cave-ins. All excavated materials not required or not suitable for backfill shall be removed and disposed of off the site by the Contractor as part of the Work.*

5. *Areas where proposed pipe is at or above existing grade, embankment shall be placed and compacted prior to installing the pipe. Embankment shall be placed to finished grade, prior to trenching for pipe installation. For pipes deeper than 4 feet from finished grade, trenching may take place when the embankment is at least 4 feet above the proposed top of pipe elevation.*

6. *Trenches that are parallel to structures, pavements or walls shall be no closer than 18 inches from the closest edge of footings or pavement. Also, no parallel trench shall extend in depth below a plane having a downward slope of 1 horizontal to 2 vertical starting from a line 9 inches above the bottom edge of footings or pavement. The bottom of the pavement section shall be the lowest improved section of pavement section to include chemically stabilized subgrade or aggregate base layers.*

C. *Trench Depths:*
All trenches shall be excavated to depths required for proper pipe embedment. Over-excavation shall be required when the subgrade is unstable. Over-excavated areas shall be backfilled with granular pipe embedment material, or other material approved by the Design Engineer.

D. *Trench Widths:*
See applicable sections, details and manufacturers' recommendations for trench widths for water, sanitary and storm sewer installations.

E. *Preparation of Pipe Subgrade:*
Pipe subgrade shall be prepared to provide uniform and continuous support of pipe. The trench bottom shall be evenly graded. Areas that are too high shall be shaved as required. Any portions of the trench that are found to be too low shall be filled with suitable materials, thoroughly compacted, and brought to true grade, allowing for placement of bedding material as shown in the standard details.

F. *Trench Bottom in Rock Excavation:*

Where rock is encountered in excavation, the rock shall be removed to provide a minimum clearance of 6 inches below and 6 inches along each side of the pipe.

G. Replacement of Unsuitable Pipe Foundation Material:

1. *If unstable subgrade conditions are encountered and it is determined by the Design Engineer that the excavation bottom will not provide suitable support, the Contractor shall remove all unstable or unsuitable material over the entire width of the trench to the depth required by the Design Engineer to provide a stable foundation. Removal shall not be less than 6 inches.*

2. *Materials so removed shall be replaced with bedding aggregate material as specified in Section 2102.2.C.2.d. Bedding material shall be mechanically compacted over the entire width of the trench and shall be brought to proper grade, shape, and elevation for the installation of the pipe as shown on the Drawings.*

H. Trench Walls: Undercutting of trench walls is not permitted.

I. Pipe Embedment: All water, sanitary sewer, and storm sewer pipe shall be bedded in bedding aggregate as specified in paragraph 2102.2.C.2.d.

1. *Bedding shall cover the entire width of the trench.*

2. *The first layer of bedding placed on the bottom of excavation shall be at least four (4) inches in thickness.*

3. *Bedding shall be loose under the pipe located in the middle third and bottom of the trench.*

4. *After the pipe is placed, bedding material shall be placed in layers in accordance with the minimum city design details.*

5. *The second layer of bedding material shall be placed under the lower haunches of the pipe up to the springline (center of pipe). Material shall be spaded into place under the haunches and compacted at the springline elevation prior to placing additional bedding material.*

6. *The third layer of bedding material shall be placed to a depth of 6 inches over the top of pipe.*

7. *The Contractor shall take measures to prevent the pipe from floating during the placement of the bedding material so that the pipe maintains proper line and grade as shown on the plans.*

J. Trench Backfill:

1. *Backfill shall not be placed when material contains frost, is frozen, or a blanket of snow prevents proper compaction.*

2. *The Contractor shall remove from the project site all waste material, trees, organic material, rubbish, or other deleterious substances.*

3. *All trash and debris shall be removed from the pipeline excavation prior to backfilling.*

4. *Backfill material shall be carefully placed to avoid damage to or displacement of the pipe, other utilities or structures.*

5. *Unless otherwise specified, all trenches and excavations around structures shall be backfilled to the original ground surface.*

6. *Outside of right of way, the backfill material shall be placed in layers not exceeding 8 inches in loose thickness and be compacted to at least 90% of maximum density at optimum moisture ± 2% as determined by ASTM D 698*

7. *Each lift shall be compacted to the required density prior to the next lift being placed. When required, tests should be taken during each lift with a minimum of one test per lot per lift.*

8. *Trench Backfilling in Street or Alley R/W and under Pavement: Aggregate backfill material placed between lines one foot behind curbs, or edge of uncurbed pavement, shall be compacted to at least 95% of maximum density at optimum moisture content + 2% as determined by ASTM D698.*

9. *Testing should be performed by a qualified testing lab hired by the Contractor.*

10. *All fill areas within the street right of-way shall be compacted to ninety-five percent (95%) of standard maximum density. Layers shall be placed in depths not to exceed ten (10) inches loose material. All embankment materials and compaction methods shall be subject to approval of the City Engineer, or designee. In cut areas, the top of the subgrade under areas to be paved shall be scarified and compacted to a minimum depth of six (6) inches to not less than ninety-five percent (95%) of standard maximum density at optimum moisture. Maximum density shall be determined in accordance with requirements of the Standard Compaction Test, ASTM Designation D-698.*

11. *Additionally, all lanes shall be roll tested in their entire length. The subgrade will not be acceptable if rutting, pumping, or deformation of 1-inch or greater of the*

soil-fly ash mixture results from the roll test. This testing will be done by the Contractor, and will be in addition to the applicable moisture and density testing. Equipment for roll testing shall be a tandem dump truck (one front and two rear axles) carrying a twenty (20) ton load. The truck shall proceed slowly along each traffic lane, allowing the Engineer to walk alongside and observe the results. Areas failing the roll test will be reworked and retested prior to approval of the subgrade for paving. In addition to the requirements specified for density, the full depth of the material shown in the Standard Detail Drawings shall be compacted to the extent necessary to remain firm and stable under construction equipment. After each section is completed, tests will be made by the Engineer. If the material fails to meet the density requirements, it shall be reworked to meet these requirements. Throughout this entire operation, the shape of the course shall be maintained by blading, and the surface upon completion shall be smooth and shall conform with the typical section shown on the plans and to the established lines and grades. Should the material, due to any reason or cause, lose the required stability, density, and finish before the next course is placed or the work is accepted, it shall be recompacted and refinished at the sole expense of the Contractor.

12. *The Engineer shall approve the subgrade before any base course or surface is placed thereon. The subgrade shall be constructed so that it will be uniform in density throughout. Proctor testing shall be performed prior to construction. The entire width and length shall conform to line, grade, and typical cross-section shown on the plans or as established by the Engineer. If any settling or washing occurs, or where hauling results in ruts or other objectionable irregularities, the contractor shall reshape and reroll the subgrade before the base or surfacing is placed. Tolerance allowed on all line, grades, and cross-sections shall be plus or minus .04 feet. The contractor shall be responsible for the cost of all testing needed for approval of the subgrade.*

13. *The City of Blue Springs reserves the right to require additional testing as conditions warrant.*

K. *Flowable Fill / CLSM Installation:*

1. *The open ends of the area to be backfilled shall be plugged, and the void area filled without the use of a vibrator.*

2. *Care shall be taken to prevent the movement of any structure from the designated location or intrusion of flowable backfill into undesirable locations. If such movement or intrusion occurs, the engineer may require the affected structure to be excavated and replaced to the proper grade at the contractor's expense.*

3. *If flowable backfill is placed in more than one layer, the base layer shall be thoroughly roughened and all loose and foreign material removed before placing the next layer.*

4. *No flowable backfill shall be covered or accepted until a minimum compressive strength of 30 psi has been attained, as demonstrated by failure to deform or crush underfoot when a pressure of approximately 30 psi is applied. If the backfill does not harden to support the required load, the backfill shall be removed and replaced with an acceptable material at the contractor's expense.*

5. *Where CLSM is being placed over or adjacent to crushed stone backfill, a layer of filter fabric shall be installed between the two materials.*

6. *CLSM Testing:*
   a. *Bearing strength shall be determined using penetration testing in accordance with ASTM C 403.*
   b. *The flow of CLSM shall be tested in accordance with ASTM C 939.*
   c. *Unit weight and yield shall be tested in accordance with ASTM C 138.*
   d. *Air content shall be tested in accordance with ASTM C 231.*
   e. *Sample and remix sample shall be tested in accordance with ASTM C 172.*
   f. *Consistency: Flowable backfill will be tested by filling an open-ended 3-inch diameter, 6-inch high cylinder to the top with the mixture and immediately pulling the cylinder straight up. The correct consistency of the mixture shall produce an approximate 8-inch diameter circular-type spread with no segregation. Adjustments to the proportions of fine aggregate or water may be made to achieve proper solid suspension and optimum flowability with approval from the engineer, except the theoretical yield shall be maintained at one cubic yard for the given batch weights.*

L. *Trench checks*

1. *Install as specified in Section 3500 or where shown on the drawings.*

2. *The backfill above the trench check shall meet the specifications for backfill material.*

M. *Excavation by Tunneling or Boring: Where the depth of trench and soil conditions will allow it, tunneling may be required under the pavement, railroad tracks, or other surface structures. Tunnel sections shall provide adequate clearance for pipe and workers for proper lining, grading, and jointing the pipe installed therein.*

N. *Excavation and Backfilling for Structures:*

1. *All structure foundations shall be founded on stable, undisturbed subgrade. Excavation shall be sufficient to provide at least 12 inches clear between the outer surfaces of the structure (including formwork) and the embankment or timber that may be used to hold and protect the excavation.*

2. *Unsuitable or unstable foundation soil that will not properly support the structure, as determined by the Design Engineer, shall be removed to the depth required and the excavation backfilled to the proper grade with compacted bedding material.*

3. *All excavations for the structure shall be kept dry; no reinforcing steel shall be installed in water; and no water shall be permitted to inundate the reinforcing steel before concrete has been placed.*

4. *Backfill around Structures:*

   a. *No backfill shall be placed over or around any structure until the concrete or mortar has attained a minimum strength of 2,000 psi and can sufficiently support the loads imposed by the backfill and construction operations without damage.*

   b. *The Contractor shall use the utmost care to avoid any wedging action between the side of the excavation and the structure that would cause any movement of the structure. Any damage caused by premature or unbalanced backfill or by the use of equipment on or near a structure will be the responsibility of the Contractor.*

   c. *No rocks larger than the maximum dimension of 3 inches shall be placed within 1 foot of the exterior surface of any structure.*

   d. *No backfill material containing rock, or detritus from rock excavation, shall be placed in the upper 24 inches of the excavation.*

   e. *Large rock may be placed in the remainder of the backfill upon approval of the City Engineer. Approved rock material shall be placed so that it is well separated allowing proper compaction of soil backfill around the rock material.*

   f. *All excavation shall be backfilled to the lines and grades shown on the Drawings.*

   g. *After the required curing time, backfill shall be placed and compacted in layers. The contactor shall monitor impact of placement, vibration and related work so not to damage or disturb structures.*

   h. *Backfill shall be placed in compacted layers not exceeding 8 inches in loose thickness and be compacted to at least 95% of maximum density at optimum moisture ± 2% as determined by ASTM D 698. Each lift shall be compacted and tested to the required density prior to the next lift being placed.*

   i. *In no instance shall backfill be dumped, bulldozed, or otherwise deposited in bulk upon the newly constructed structure.*

O. Backfill of Drainage Course Crossings:

1. *Excavation in rock to a distance of 10-feet beyond each bank (measured perpendicularly to the stream flow) shall be backfilled with concrete to the existing rock elevation. The excavation above the rock elevation shall be backfilled with soil above that concrete encasement or as indicated on the drawings. The soil placed above the encasement shall be compacted to at least 95% of maximum density at optimum moisture ± 2 percent as determined by ASTM D 698.*

2. *Pipe placed within an excavation of soil shall be encased in concrete to a minimum of 1 foot above and below the pipe, and backfilled with soil above that concrete encasement or as indicated on the drawings. The soil placed above the encasement shall be compacted to at least 95% of maximum density at optimum moisture ± 2% as determined by ASTM D 698.*

P. Finishing:
Shall be in accordance with APWA Standard Specifications, Section 2102.7.

Q. Cleanup:
Shall be in accordance with APWA Standard Specifications, Section 2102.8.

Blue Springs, Missouri
Public Works Department

SECTION 2150 – EROSION AND SEDIMENT CONTROL

CITY OF BLUE SPRINGS, MISSOURI
CONSTRUCTION SPECIFICATIONS

The City of Blue Springs hereby adopts Section 2150 of the Kansas City Metropolitan Chapter of APWA Construction and Material Specifications, latest edition. The following additions, deletions and/or revisions are adopted as a part of Section 2150 for use within the City of Blue Springs. Text in bold italics indicates revisions or additions to the APWA standard.

Section 2154 Sediment Controls and Diversions

2154.5.B (Silt Fence) Construction Requirements: Delete items 2 and 3, and replace with the following: (Included in the 2018 Blue Springs Supplement 2154.5.A)

2. ***Silt fence shall not be used in swales, drainage-ways, channels and other conduits of concentrated storm water flow.***
3. ***Silt fence shall not be used to direct or divert water.***

2154.17 D Measurement and Payment (Accepted 2017 APWA inclusion)
Modify the sentence to read as follows:

"Stabilized Stone Pad" will be measured by ***square foot*** of stone placed and paid for at the contract unit price.

Section 2156 Measurements and Payments

2156.5 Measurements and Payment Summary Table (Accepted 2017 APWA inclusion)
Change the method of measurement on "Stabilized Stone Pad" from 0.1 ton to ***1 square foot***.

Blue Springs, Missouri
Public Works Department

SECTION 2200 – PAVING

CITY OF BLUE SPRINGS, MISSOURI
CONSTRUCTION SPECIFICATIONS

The City of Blue Springs hereby adopts Section 2200 of the Kansas City Metropolitan Chapter of APWA Construction and Material Specifications, latest edition. The following additions, deletions and/or revisions are adopted as a part of Section 2200 for use within the City of Blue Springs. Text in bold italics indicates revisions or additions to the APWA standard.

Section 2201 Subgrade Preparation:

2201.3 Construction: Modify the existing language in subsection 2201.3.B as follows: (Incorporated into the 2017 APWA 2201.4.B)
B. **Compacting the Subgrade:** The subgrade for pavements shall be compacted to 95% of the standard proctor maximum density for the material used as determined by ASTM D 698 and within a tolerance of plus 3% and minus 2% of the optimum moisture content. The tolerance applies only to the thickness of the subgrade as specified in the City of Blue Springs Standard Detail Drawings.

Add paragraph to subsection 2201.6 as follows:
(2201.6.A and 2201.6.B incorporated into the 2017 APWA Section 2203.3. 2201.6.C is included in the 2018 Blue Springs Supplement Section 2203.3)
2201.6 Subgrade Stabilization: When required, subgrade stabilization material shall be one of the following or as indicated on the plans.

- ***A. Fly ash stabilization as specified in the City of Blue Springs Standard Detail Drawings.***
- ***B. Lime stabilization as approved by the City Engineer.***
- ***C. Untreated Compacted Aggregate as specified in 2202.***

Section 2202 Untreated Compacted Aggregate

2202.2. Materials: Add the following sentence at the end: (Included in the 2018 Blue Springs Supplement Section 2203.3.A)
MoDOT Type 5 aggregate may be used for untreated aggregate layer in lieu of the material specified in this paragraph.

2202.4 Methods of Measurement (Accepted 2017 APWA inclusion Section 2203.5)
Remove the payment per ton option.

Section 2203 Drainable Base Course

2203.5 Plant Mix Bituminous Drainable Base Course: Delete paragraph G.2 and replace with the following: (Included in the 2018 Blue Springs Supplement Section 2203.4.C.6)

2. ***Handle, place and compact materials in accordance with the following.***
   a. ***Contamination of the finished base material that affects the drainage capability of the product shall not be permitted. Any areas determined to be contaminated shall be completely removed without disturbing the adjacent or underlying material and replaced at the contractor's expense.***
   b. ***Rutting or other displacement of the permeable base or the underlying base will not be permitted. If displacement occurs, the material shall be completely removed without disturbing the adjacent or underlying material and shall be replaced at the contractor's expense.***
   c. ***A minimum of three passes of a 5 to 10 ton steel wheel roller shall be made, compacting the material until no further displacement is noted. Compaction shall begin as soon after spreading the mixture as the mixture is able to bear the weight of the roller without undue displacement and shall be completed before the temperature of the mixture drops below 100 F. The compacted thickness of a single lift shall be a maximum of 4 inches.***

2203.8 Methods of Measurement: Remove the payment per ton option from subsection A, B, C, and E. (Accepted 2017 APWA inclusion Section 2203.5)

Section 2204 Prime and Tack Coat

2204.6 Preparation of Existing Surface: Modify subsection 2204.6 A as follows:
(Language removed from 2017 APWA under Section 2204.4.B)
The existing surface shall be free of all dust, loose material, grease or other foreign material at the time the tack is applied. Any excess surface oil on the roadway or bituminous joint material will be removed by ***the contractor*** before the tack is applied. ***Cost for this work shall be subsidiary to the bid items.***

Section 2205 Asphaltic Concrete Surface and Base

2205.3 Mixing and Proportioning: Modify subsection 2205.3.C.1 as follows:
(Incorporated into the 2017 APWA 2205.4.C.1)

1. General: Except as modified herein, Recycled Asphaltic Concrete (RAC) shall be equal to that produced as new material. Reclaimed Asphalt Pavement (RAP) and/or Reclaimed Aggregate Materials (RAM) shall represent no more than 30% of the composition for all surface mixtures and no more than 50% of the composition for all base mixtures except type 5-01 and 6-01 (no more than 30%). Only virgin materials shall be used in the surface course for new construction projects. Recycled or virgin materials may be used on restoration projects. Recycled Asphaltic Concrete may contain combinations of RAP, RAM, coarse aggregate, fine aggregate, mineral filler, asphalt cement, recycling agent, anti-stripping agent and approved additives to produce an acceptable mixture. Recycled Asphaltic Concretes shall be designated by prefacing the type with "RC," such as "RCType 1-01". ***Recycled asphalt shingles (RAS) are not allowed.***

2205.8 Construction Requirements: Revise subparagraph 2205.8.C.1.g as follows:
(Incorporated into the 2017 APWA 2205.9.C.2)
Transverse joints in succeeding courses shall be offset at least 2 feet (0.6m). Longitudinal Joints shall be offset at least 6 inches (150 mm). The longitudinal joints shall be laid out so that the surface joint is ***offset 6 inches from the permanent pavement markings***.

2205.8 Construction Requirements: Modify subsection 2205.8.E as follows:
(Incorporated into the 2017 APWA 2205.9.E)
The completed asphalt concrete paving shall have a density equal to or greater than 95% for Type 1-01 and 5-01 Asphalt Concrete Base and 96% for Types 2-01, 3-01, 4-01, 5-01 and 6-01 Asphalt Concrete Surface. Density is based on laboratory specimens prepared as specified in Section 2205.3B entitled "Mix Design Criteria" and made from plant mix conforming to the job mix formula. Density testing shall conform to ASTM D 2950 or ASTM D 2726 or D 1188.

If cores are used to determine density, one or more tests (one test equals three cores) will be taken for each tonnage lot and averaged to determine acceptance. Two cores will be taken from the lane being paved, and one core centered on the longitudinal joint with the adjoining lane. The Engineer will mark the locations of all cores. The compacted surface shall be 0-1/4 in. (0-6 mm) above the edge of curb. All unsatisfactory work shall be repaired, replaced or corrected. The surface of the final course shall be of a uniform texture and conform to line and grade shown on the plans.

The compacted surface shall be 0-1/4 in. (0-6 mm) above the edge of curb ***except where it abuts an ADA ramp in which case the surface shall be even with the curb – no exceptions***. All unsatisfactory work shall be repaired, replaced or corrected. The surface of the final course shall be of a uniform texture and conform to line and grade shown on the plans.

The field control density will be based on the density of plant produced mix compacted in a laboratory in accordance with Section 2205.3 (C).

Section 2206 Asphalt Crack Sealing, Asphalt Crack Filling, Chip Sealing, Slurry Sealing, and Microsurfacing

2206.3 Improved Street Chip Seal: Modify subsection 2206.3.3.C as follows:
. (Accepted 2017 APWA inclusion Section 2206.4.C)
Spot Patching: Areas where base failure of the roadway has occurred, or where the surface is broken out shall be repaired prior to the sealing operation. The failed sections will be marked by the engineer, and shall be removed by ***milling or*** sawing a neat rectangular hole into the pavement. The failed material shall be removed without damage to the adjacent pavement. Where base failures have occurred, the pavement shall be removed to the subgrade which shall be corrected to the satisfaction of the engineer prior to patching. Unstable material shall be over excavated and replaced with base materials meeting the requirements of Section 2202. All surfaces shall be properly primed and tacked in accordance to Section 2204.

The prepared hole shall be patched with hot-mix asphaltic patching material by placing in layers not to exceed 2 inches (5.08 cm); each layer being thoroughly compacted before the next layer is placed. After the patching material is placed and raked to a uniform surface, it shall be thoroughly compacted by rolling with a roller meeting the requirements of Section 2205.7. The edges shall be well bonded with the old surface. The completed patch shall be in the same plane as the existing pavement.

The asphaltic concrete used for patching at the different locations shall be as directed by the Engineer and shall conform to one of the mixes as set out-in Section 2205.3.

Section 2207 Cold Milling

2207.2 Equipment: Modify subsection 2207.2.A as follows:
(Included in the 2018 Blue Springs Supplement Section 2207.2.A)
Machine: The cold milling machine shall be self-propelled and shall have in combination the means of milling and cutting, without softening the old surface and blading the cuttings into a single windrow, or depositing them directly into a truck. ***Only a track type milling machine shall be used (no rubber tired milling machines are allowed).***

2207.3 Construction Details: Modify subsection 2207.3.C as follows:
(Included in the 2018 Blue Springs Supplement Section 2207.3.C)
Cleanup: All loose asphalt and debris shall be removed from the street surface and curb and gutter ***on the same day that milling operations occur***. Any material and debris that adheres to the curb and gutter shall be removed.

Section 2208 Portland Cement Concrete Pavement

Referenced Standards: Add the following:
(Incorporated into the 2017 APWA Section 2208.2)
Kansas City Metropolitan Materials Board (KCMMB). KCMMB material specifications approved suppliers, approved aggregates, and approved mixes are available on the website www.kcmmb.org.

2208.2 Materials: Delete paragraphs 2208.2.A and B and replace with the following.
(Incorporated into the 2017 APWA Sections 2208.3.A and 2205.3.A.5)

A. The current edition of the standard specifications issued by the KCMMB are made a part hereof by reference. When APWA specifications differ from KCMMB specifications, the KCMMB specifications shall govern.

B. All concrete materials shall conform to the KCMMB specifications Mix design submittals required for the work shall be submitted to the Engineer at least 2 weeks in advance of the anticipated use, and no work shall proceed until the submittals have been approved.

Add the following sentence at the end of the paragraph for subsection 2208.2.F:

(Incorporated into the 2017 APWA Section 2208.3.E)
Liquid curing membrane shall be pigmented white.

2208.5 Placing, Finishing, Curing, and Protection: Modify the first paragraph as follows:
(Incorporated into the 2017 APWA Section 2208.4)
Concrete shall be furnished in quantities required for immediate use and shall be placed in accordance with the requirements of ***Kansas City Metropolitan Materials Board (KCMMB)***. Prior to commencing construction, the contractor shall furnish a concrete delivery plan which includes at a minimum the number of trucks which will be dedicated to the project, the location of the concrete plant, the route and distance from the plant to the job site, and the anticipated rate of concrete usage. It is essential that concrete be delivered in sufficient quantities to prevent stoppage of the paving operation.

Section 2209 Curbing

Reference Standards: Add the following:
(Included in the 2018 Blue Springs Supplement)
Kansas City Metropolitan Materials Board (KCMMB). KCMMB material specifications approved suppliers, approved aggregates, and approved mixes are available on the website www.kcmmb.org.

2209. Materials: Modify the existing sentence to read as follows:
(Incorporated into the 2017 APWA Section 2209.3)
All materials shall conform to Section 2208.2, ***as modified herein.***

2209.3 Construction Details: Revise paragraph D to read as follows:
(Incorporated into the 2017 APWA Section 2209.4.D. Reference for >100' has been eliminated)

D. Curb Machine: ***A slip-form curb machine shall be used to place any section of curb greater than 100 feet in length.*** The machine must be equipped with mechanical internal vibrators and capable of placing curb to the correct cross section, line and grade within the allowable tolerances.

2209.4 Joints: Delete the first sentence of paragraph B. Contraction Joints, and replace with the following:
(Incorporated into the 2017 APWA Section 2209.4.E)
Curbing shall have contraction joints at intervals of not more than 10 feet.

2209.5.C Curing: Modify the existing sentence to read as follows:
(Incorporated into the 2017 APWA Section 2209.4.F.3)
As soon as practical after the concrete is finished it shall be cured with a ***white*** liquid curing membrane meeting the requirements of Section 2208.2 ***as modified herein***, applied according to the manufacturer's directions.

Blue Springs, Missouri
Public Works Department

SECTION 2300 – INCIDENTAL CONSTRUCTION

CITY OF BLUE SPRINGS, MISSOURI
CONSTRUCTION SPECIFICATIONS

The City of Blue Springs hereby adopts Section 2300 of the Kansas City Metropolitan Chapter of APWA Construction and Material Specifications, latest edition. The following additions, deletions and/or revisions are adopted as a part of Section 2300 for use within the City of Blue Springs. Text in bold italics indicates revisions or additions to the APWA standard.

Section 2301 Standard Sidewalks, Sidewalk Ramps, Driveways, and Bicycle/Pedestrian Paths

2301.1 Referenced Standards (Incorporated under 2301.2 in 2017 APWA)
Add the following:
Kansas City Metropolitan Materials Board (KCMMB). KCMMB material specifications approved suppliers, approved aggregates, and approved mixes are available on the website www.kcmmb.org.

2301.3 A Materials

A. Concrete Mix: Delete the existing sentence and replace with the following:
(Incorporated into 2017 APWA 2301.A.1 and 2301.A.5)
All concrete materials shall conform to the KCMMB specifications. Mix design submittals required for the work shall be submitted to the Engineer at least 2 weeks in advance of the anticipated use, and no work shall proceed until the submittals have been approved.

2301.9 Detectable Warnings
Delete Paragraph C and replace with the following: (Included in the 2018 Blue Springs Supplement)

C. ***Material: The material used to provide contrast shall be an integral part of the walking surface. The material for detectable surface shall consist of:***

1. ***Cast-in-Place Tiles: Armor Tile's Cast In Place or ADA Solutions Cast In Place Systems or approved equal.***

2. ***Color for all surfaces options shall be 'brick red' unless color does not contract with existing surfaces. Surface applied retrofit tiles shall not be allowed.***

Section 2302 Asphalt Sidewalks, Driveways, and Bicycle/Pedestrian Paths (No longer allowed and this is included in the 2018 Blue Springs Supplement)

2302.5 Method of Measurement (Accept 2017 APWA inclusion)
Remove the payment per ton option from Temporary Sidewalks, Driveways, and Bicycle Pedestrian Paths.

Section 2303 Rock Blanket

2303.3 Construction Requirements
Modify the paragraph to read as follows: (Incorporated into 2017 APWA 2303.3 with language modified from below)

A trench at the toe of the slope shall be excavated to the elevation as shown on the plans or to a minimum of 2 feet (600 mm) when not shown. The slopes shall conform to the proper cross section and be compacted to a uniform density as required for adjacent material. The rock or broken concrete shall be placed on the slope, to the prescribed thickness, elevation and extent, and shall be manipulated so that the flat sides are in contact, thereby eliminating large voids. The outside of the blanket shall present an appearance free from segregation and with a proportionate amount of the larger pieces showing. ***Filter fabric shall be installed under all rock. Rock shall be placed in such a manner as to not tear, puncture, or shift the fabric. Rock shall not be dropped more than 3 feet when being placed directly on the fabric. Tears or rips in the fabric shall be repaired with fabric lapped a minimum of 12 inches in all directions. All rock shall be grouted per the requirements of Section 2605.***

2303.4 Method of Measurement (Accept 2017 APWA inclusion)
Remove the payment per ton option.

Section 2305 Maintenance of Traffic: Delete section and replace with the following: (Included in the 2018 Blue Springs Supplement, deleting Section 2305 and referring readers to Section 3000)

Section 2305 Colored Concrete: (Included in the 2018 Blue Springs Supplement, Section 2309)

a. ***Description – This work shall consist of constructing stamped concrete streetscapes in accordance with Standard Plan R-29 (Series) and the Missouri Department of Transportation Standard Specifications for Construction, except as modified herein.***

b. ***Materials – The materials shall meet the following requirements.***

Sound Earth……205
Granular Materials Class II……....902
Joint Fillers……914

1. ***Concrete – Concrete shall be a 4,000 psi mix design, maximum aggregate 3/8". Submit two (2) copies of quarried limestone gradation as specified in Section 902 of the Standard Specifications for Construction.***

   All course or fine aggregate used in the concrete mixture shall be from the same MoDOT approved source.

   The mix shall conform to Lafarge "ultrastamp" mix no. RMXUS40LFW or approved equal.

2. *Concrete Admixtures – All shall meet the requirements of Section 903 Standard Specifications for Construction. Admixtures containing calcium chloride are not permitted.*

3. *Integral Color – Integral coloring shall be P1840 Red Barn, manufactured by Prism Pigments, or approved equal. All integral color shall meet ASTM C979 for color steadfastness. Independent laboratory testing shall be submitted if requested.*

4. *Color Hardener – Dry-shake color hardener shall be, manufactured by Matcrete, or approved equal. Recommended coverage is 60 lbs./100ft^2.*

5. *Release Agent – Dry-shake powder is facilitating release of imprinting tools shall be liquid, manufactured by Matcrete, or approved equal.*

6. *Acidic Based Stain – Pre-packaged acidic based stain containing color fast metallic salts. Color shall be N/A, manufactured by Cimarron Wholesale – Sedona Acid Stain, or approved equal.*

7. *Surface Sealer – The final surface seal shall be two coats of solvent based, non-yellowing, crystal clear, Class A standards or better, with non-skid additive or approved equal.*

   A. *TK Products:*

      1. *TK-AK2 Achro Kure 1315 (curing compound – day of pour)*
      2. *TK Bright Glaze (High Gloss Final Seal 7-10 days later)*
      3. *Or TK Bright Kure N Seal (Less Gloss Final Seal 7-10 min days later)*

c. *Equipment – The concrete surface shall be patterned as shown on plans. Acceptable manufacturers and styles of imprinting tools are as follows:*

Pattern:	*12" sandstone Tile Proline*
Pattern Manufacturer Source:	*Matcrete (800) 777-7063* *Proline Concrete Tools – Local Distributor* *Decorative Concrete Supply (913) 422-4443*

d. ***<u>Construction Methods</u>***

1. *Preparation of Base – Excavation shall be made to the required depth and to a width that will permit forming. All unsuitable material shall be removed below the required depth and replaced with sound earth. The prepared base shall be compacted to 95% of its maximum unit weight in accordance with Section 205 of the Standard Specifications for Construction. Granular material base shall be placed and*

compacted on the sound earth, as directed by the Engineer. A vapor barrier shall not be used.

2. *Forms – Forms and forming shall meet the requirements of Subsection 803.03.B of the Standard Specifications for Construction.*

3. *Stamped Mock-ups - Provide (2) when possible. (1) could be used for repairs. 4' x 4' stamped and colored mock-ups shall be constructed from approval by the Engineer and Owner prior to construction. Mock-ups shall include integral coloring, color hardener, release agent, and two coats of sealer.*

4. *Concrete Coloring – The coloring pigment must be added at the batch plant. The truck mixer drum shall be rotated a minimum of 50 revolutions at mixing speed after adding the coloring pigment. The amount of coloring pigment to be added shall be as specified by the pigment manufacturer.*

5. *Protection of Surrounding Surfaces – All surrounding surfaces, including, but not limited to walls, store fronts, should be protected to prevent discoloration from the concrete. All clean-up and reports shall be the responsibility of the contractor.*

6. *Placing Concrete – Concrete placement shall meet the requirements of Subsection 803.03.C of the Standard Specifications for Construction, and as described herein.*

   The surface shall be struck off and floated to produce a smooth even surface with a maximum surface variance of plus or minus 1/8-inch in 10 feet in any direction. All edges and joints shall be rounded to the specified radius with an approved finishing tool.

   Controls shall be laid out prior to stamping the concrete with any necessary strings and stakes for lining up the stamping tools. Unless otherwise specified, ungrouted installations shall be stamped 5/16-inch. The concrete is ready to be stamped when a 2-inch deep impression made with the finger does not fill with water and the concrete maintains its shape.

   The stamps must be clean of foreign matter prior to the stamping operation. It is generally recommended to clean stamps and reapply powdered or clear liquid release to all contact surfaces approximately every 25-30 square yards.

   The freshly placed concrete surface shall be barricaded against access for at least 24 hours after the release powder has been applied. The concrete shall not be opened to pedestrian traffic until the release powder has been washed off.

   Avoid the use of jitterbug for placements.

   (In Freeze-thaw areas 7% +/= 1.5 air entrainment needs to be part of the mix design.)

7. *Joints – The control joints shall be sawed as soon as the concrete has hardened such that no raveling or spalling occurs, but before any random uncontrolled cracking develops. Joint depths shall be maintained at ¼ of the slab(s) thickness. Layout control joints to follow stamping pattern as closely as possible.*

   Joints shall be sawed with their faces perpendicular to the surface of the sidewalk and shall not vary more than 3/16-inch from their designated position. Transverse joints shall be constructed at right angles to the centerline of the sidewalk and longitudinal joints parallel to the centerline. Locations for longitudinal and transverse joints shall be as directed by the Engineer.

   When the sidewalk is constructed adjacent to a previously placed slab, transverse joints in the succeeding slab shall be aligned with like joints in the adjacent slab.

   Expansion joint filler shall extend to the full depth of the joint with its top surface ¼ - ½-inch below the finished surface.

8. *Acid Washing – Apply a one (1) part muriatic acid to 10 parts water to the surface and agitate the concrete with the side of a straw broom a minimum of 36 hours after placement. Wash surface until proper color has been achieved and then flush thoroughly. The contractor shall attempt to remove 80% or more of the color release prior to sealing.*

9. *Detailing – If squeeze joints are present, a grinder or chisel shall be used to remove. Ground areas shall be burnished with dry release agent using a camel back sponge or 1 – 2-inch wide brush with bristles cut down to ½-inch. Blow away excess release with a high velocity blower.*

10. *Acid Staining – Provide mock-ups when possible. Stain shall be applied per manufacturer's direction on a clean concrete surface that is a minimum of 28 days old. Staining shall be done on random individual bricks so that there is a minimum of 20-inches of the decorative area stained.*

11. *Sealing Decorative Surface – The surface must also be allowed to completely dry prior to sealing. Surface sealer shall be applied within 24 hours of acid washing.*

    The surface temperature of the concrete shall not exceed 80-degrees F or be below 40-degrees F at the time the sealer is applied. Two (2) uniform thin coats shall be applied to the concrete at the manufacturer's recommendation rate. The concrete surface shall be barricaded against access from the time of the casting to at least 24 hours after the sealer is applied.

12. *Maintaining Traffic. – The concrete shall not be opened to pedestrian traffic until at least 24 hours after the sealer has been applied. During such period, entrance to all*

residents and businesses shall be maintained at all times. Construction should be staged to allow for such access.

e. ***Measurement and Payment – The completed work as measured for Stamped and Colored Concrete, will be paid for at the contract unit price for the following contract item (pay item).***

Contract Item (Pay Item)	***Pay Unit***
Stamped and Colored Concrete, ……..……..	***Square Foot***

Stamped and Colored Concrete, will be measured in place by area in square feet. Payment for Stamped and Colored Concrete, shall include all labor, material and equipment required to perform all work in accordance with this special provision and as shown on the plans, including but not limited to providing the Engineer and the City of Blue Springs with the final documentation of the concrete mix design and a unit of each stamping tool used to complete the project.

The contractor is responsible for all costs associated with construction and disposal of mock-up slabs, with no additional compensation permitted.

Section 2306 Pavement Markings: Delete section in its entirety and refer to Section 3500 of the City of Blue Springs Design and Construction Manual. (Using 2017 APWA Standards Section 2306 with the exception of 2306.4 which is included in the 2018 Blue Springs Supplement)
Section 2309 Measurements and Payment

2309.4 Measurement and Payment Summary Table (Accept 2017 APWA inclusion)
Remove the measurement and payment summary table:

Measurement and payment will be specified in the contract documents.

Blue Springs, Missouri
Public Works Department

SECTION 2400 – SEEDING AND SODDING

CITY OF BLUE SPRINGS, MISSOURI
CONSTRUCTION SPECIFICATIONS

The City of Blue Springs hereby adopts Section 2400 of the Kansas City Metropolitan Chapter of APWA Construction and Material Specifications, latest edition. The following additions, deletions and/or revisions are adopted as a part of Section 2400 for use within the City of Blue Springs. Text in bold italics indicates revisions or additions to the APWA standard. (Adopted Section 2400 in its entirety)

Section 2401 Seeding

2401.3 Construction Details
Insert the following section A: (Incorporated into 2017 APWA Sections 2401.3.A and 2401.3.B)

A. Topsoil

a. All areas to be seeded that are disturbed during construction which are not covered with pavement, concrete, or base course, shall be graded to a neat, uniform grade line and appearance, as determined by the City, and covered with a neat uniform, three-inch minimum thickness of topsoil.

b. The topsoil shall be evenly spread on the designated areas to a depth, which after settlement and compaction, shall be three inches unless otherwise directed by the City. Spreading shall not be done when the ground or topsoil is frozen, excessively wet, or otherwise in a condition detrimental to the work, as determined by the City. Roadway surfaces shall be kept clean during hauling and spreading operations.

c. After spreading has been completed, large clods, stones larger than one half-inch in any dimension, roots stumps, and other litter shall be raked up and removed.

d. The final grading of the topsoil prior to seeding shall be to a tolerance that will not permit ponding of water in excess of one half-inch in depth.

Section 2402 Sodding

2402.2 A Sod (Incorporated into 2017 APWA Section 2402.2.A)
Modify the first sentence as follows:
The sod shall be densely rooted nursery grown Kentucky Blue Grass ***or other seed mix as outlined in contract documents***.

2402.3 Construction Details (Modified our Standard and are now in agreement with 2017 APWA)
Insert the following section A:

A. Topsoil

1. All areas to be sodded that are disturbed during construction, which are not covered with pavement, concrete, or base course, shall be graded to a neat,

uniform grade line and appearance, as determined by the City, and covered with a neat uniform, three-inch minimum thickness of topsoil.

2. ***The topsoil shall be evenly spread on the designated areas to a depth, which after settlement and compaction shall be three inches, unless otherwise directed by the City. Spreading shall not be done when the ground or topsoil is frozen, excessively wet, or otherwise in a condition detrimental to the work, as determined by the City. Roadway surfaces shall be kept clean during hauling and spreading operations.***
3. ***After spreading has been completed, large clods, stones larger than one half-inch in any dimension, roots stumps, and other litter shall be raked up and removed.***
4. ***The final grading of the topsoil prior to sodding shall be to a tolerance that will not permit ponding of water in excess of one half-inch in depth.***

Modify section C as follows:

C. Placing Sod: Sod shall not be placed during a drought or during the period from June 1 to September 1, unless authorized by the ***City*** Engineer, and shall not be placed on frozen ground. Sod shall be moist when it is placed. Sod strips shall be laid along contour lines, commencing at the lowest point of the area and working upward. The transverse joints of sod strips shall be staggered and the sod carefully placed to produce tight joints. ***The finished sub-grade next to curbs, sidewalk, drive approaches, and existing ground surfaces shall allow for the sod to be placed level with the improvement. The sub-grade shall be finished level with the improvement and existing ground surfaces for sodding.*** The sod shall be firmed and watered immediately after it is placed. The "firming" shall be accomplished by application of a roller weighing not less than 60 nor more than 90 pounds per lineal foot (89.29 to 133.9 kg per meter) of roller.

1. Anchoring Sod: On 2 to 1 slopes, or steeper, the sod shall be anchored with ½-inch (1.27 cm) square by 8-inch (20.32 cm) long wooden pegs driven into the ground 3 pegs to the square yard (square meter) or other approved methods. Pegging shall be done immediately after sod is firmed. The area shall then be cleared of loose sod, excess or broken anchors, excessive soil, or other foreign materials.
2. Maintenance: The sodded area shall be thoroughly watered daily for a period of ***twenty-one*** days after placing, except when thoroughly wetted by ***½ inch of*** rain ***on any given day***. Any portion of the sod that is not in good growing condition following the first full growing season (spring to fall) shall be replaced with fresh live sod.

Section 2403.4 Methods of Measurement (Changed to Section 2406 in 2017 APWA and we accept its inclusion)

Remove the Sanitary Sewer Construction option from both Seeding and Sodding.

Blue Springs, Missouri
Public Works Department

SECTION 2600 – STORM SEWERS

CITY OF BLUE SPRINGS, MISSOURI
CONSTRUCTION SPECIFICATIONS

The City of Blue Springs hereby adopts Section 2600 of the Kansas City Metropolitan Chapter of APWA Construction and Material Specifications, latest edition. The following additions, deletions and/or revisions are adopted as a part of Section 2600 for use within the City of Blue Springs. Text in bold italics indicates revisions or additions to the APWA standard.

Section 2602 Pipe Sewer Construction

2602.2 A.2.b (This was removed from the 2017 APWA Standards)
Remove section b, Mortar.

2602.2 Materials
Delete Paragraph B (excluding tables) and replace with the following: This is addressed in the 2018 Blue Springs Supplement and it states that this material is only allowed on private property)

B. Aluminized Corrugated Metal Pipe (CMP) – For special situations as approved by the City Engineer.
1. ***Sheet steel for aluminized CMP shall conform to AASHTO M 274.***
2. ***Pipe manufacture shall conform to AASHTO M 36.***
3. ***Minimum wall thickness shall be 0.079 inches (14 gauge) for circular pipe 30 inches in diameter and smaller as well as for equivalent arch pipe. Larger pipe sizes shall conform to the table.***
4. ***Joints shall be made with a bolted aluminized steel band assembly.***
5. ***End sections shall be flared and shall have a rolled top edge.***
6. ***All fittings shall be fabricated from the same materials as the pipe.***

Delete Paragraphs D. Vitrified Clay Pipe, and E. Ductile Iron Pipe, and substitute the following as Paragraph D. (Incorporated into the 2017 APWA Standards 2602.2.D)

D. High Density Polyethylene (HDPE) Pipe
1. ***High density polyethylene pipe shall conform to AASHTO M294, type S (non-perforated circular cross section with corrugated outer surface and a smooth inner surface) for pipe diameters of 15 inches to 60 inches, inclusive.***
2. ***Joints shall be bell & spigot gasketed joints. Joint integrity shall conform to the performance requirements of AASHTO M294.***

2602.2 H.3 Mix Design (Incorporated into the 2017 APWA Standards Section 2602.2.F)
Revise first sentence to read: ***All flowable fill shall be mix design type A unless approved by the City Engineer.***

2602.3 Construction Details (Incorporated into 2017 APWA Standards Section 2602.3.A)
Delete Paragraph A and Subparagraphs 1 through 7 entirely. See Section 2100 for trenching and backfill specifications.

2602.3 B.4 Bedding (Incorporated into 2017 APWA Standards Section 2602.3.B.4)
Revise first sentence to read as follows:
The class of bedding required shall be as indicated on the Contract Drawings or standard details, except that as a minimum the bedding shall be ***bedding aggregate as specified in Section 2100 placed to a minimum depth of 4 inches below the pipe to 6 inches above the pipe.***

2602.3 B.5.a (Incorporated into 2017 APWA Standards Section 2602.3.B.5.a)
Remove section 2, Mortar.

2602.3 B.5.b Corrugated Steel Pipe (Included in 2018 Blue Springs Supplement as not allowed Section 2602.2.B)
Replace corrugated steel pipe with aluminized corrugated steel pipe.

2602.3 B.5.c Structure Connections (Included in 2018 Blue Springs Supplement Section 2602.3.B.5.d)

Modify the section such that on rectangular or square curb inlets or junction boxes the incoming and outgoing pipes shall extend past the inside wall face by 3 inches, grout or concrete is to be applied to the area around the pipe and the wall to create a smooth, rounded appearance.

2602.3 B Laying and Jointing (Incorporated into 2017 APWA Standards Section 2602.3.B.5.c)

Add the following as Paragraph 6:

6. ***HDPE pipe shall be installed in accordance with ASTM Recommended Practice D2321.***

2602.3. C Backfill (Included in 2018 Blue Springs Supplement Section 2602.3.C)

Delete figures 1, 2, and 3 and replace with the following:

For backfill requirements refer to City of Blue Springs Standard Detail Plan STM-14.

Section 2604 Structures

2604.2. A Concrete Mixes (Incorporated into 2017 APWA Standards Section 2604.2.A)

Revise to read as follows:

Concrete shall be MCIB Mix Number A-558-1-2, except concrete used for soil stabilization, pipe cradles, filling, leveling courses and other similar purposes may be MCIB Mix Number WA-585-3/4-2-0.410.

2604.2 F Brick (This was removed from the 2017 APWA Standards)
Delete Paragraph entirely.

2604.2 H Metal Castings (Included in 2018 Blue Springs Supplement Section 2604.2.F.3)
In first sentence, revise Class 35B to minimum of ***Class 30***.
In the second sentence, revise Contract Drawings to ***City of Blue Springs Design and Construction Manual, latest edition.***

2604.2 I Steel End Sections (Incorporated into 2017 APWA Standards Section 2604.2.G)

Revise first sentence to read as follows:
Steel end sections shall be fabricated from ***aluminized*** base metal as specified in Section 2602.

2604.2 J Toe Walls (Included in 2018 Blue Springs Supplement Section 2604.2.H)
Revise to read as follows:
Flared end sections for concrete and steel pipe shall be set on a concrete toe wall centered on the end of the section. ***See the City of Blue Springs standard details for toe wall dimensions.***

2604.3 A.1 Precast Structures (This was addressed in the approved 2015 Blue Springs Design and Construction Manual)
Add the following:
All precast square or rectangular structures shall meet the requirements of ASTM C 913. When installed, all gaps and openings intended to be closed, shall be sealed with grout, concrete or other approved material.
If an adjustment is required for the top slab which is less than 3 inches it shall be grouted, greater than 3 and less than or equal to 5 inches, the adjustment shall be made with brick and mortar with a coating of cement on both faces, if the adjustment is greater than 5 inches, the adjustment shall be made with dowelled concrete.
Dowels shall be bars embedded 6 inches into the walls. All reinforcement shall be the same size and spacing as the wall steel.

Section 2605 Open Channels

2605.2 C.1 Granular Filter (Accepted its inclusion in the 2017 APWA Standards)
Delete granular filter section.

2605.2 F Sod (Incorporated into 2017 APWA Standards Section 2400)

Modify the first sentence as follows:
Sod shall conform to the requirements of Section 2402 for Kentucky Blue Grass Sod ***or other seed mix as outlined in contract documents.***

2605.2 G.1 Granular Filter (Incorporated into 2017 APWA Standards Section 2605.3.C.1)

Delete granular filter section.

Blue Springs, Missouri
Public Works Department

SECTION 2700 - STRUCTURES

CITY OF BLUE SPRINGS, MISSOURI
CONSTRUCTION SPECIFICATIONS

The City of Blue Springs hereby adopts Section 2700 of the Kansas City Metropolitan Chapter of APWA Construction and Material Specifications, latest edition. The following additions, deletions and/or revisions are adopted as a part of Section 2700 for use within the City of Blue Springs. Text in bold italics indicates revisions or additions to the APWA standard. (Adopted in its entirety in 2018)

2702 Specifications
Add the following section: (Included in the 2018 Blue Springs Supplement Sections 2604.3.A.1 and 2604.3.D)

2702.3 Reinforced Box Culverts: Either precast or cast in place shall have a minimum 3-inch thick grade slab cast under the bottom slab. The grade slab shall be at least as wide as the structure and shall stop short of the toe walls. Commercial grade concrete may be used with minimum 2500 psi compressive strength. The slab should be set with good grade control to match the elevations required for the culvert.

Blue Springs, Missouri
Public Works Department

SECTION 2800 – STREET LIGHTING

CITY OF BLUE SPRINGS, MISSOURI
CONSTRUCION SPECIFICATIONS

(Standard rewritten to reflect current, 2018, City of Blue Springs and KCP&L policy)

Street Lighting

Street lighting is intended to create an environment at nighttime in which people can see comfortably and can quickly react to conflicts between motorists and pedestrians. Street lighting is not designed to provide security lighting for homes or businesses. Street lighting can improve, safeguard, facilitate, and encourage vehicular and pedestrian traffic.

Subdivisions

Subdivision street lights are owned and maintained by Kansas City Power and Light (KCP&L). Standard practice: a street light shall be provided at each public street intersection and at the end of cul-de-sacs longer than 300-feet in length. The standard city light is a 13,500 lumens (or LED equivalent as specified), 150 watt sodium vapor bulb, enclosed fixture on a steel pole, and all electric lines shall be buried underground.

For new subdivisions, the developer or his/her engineer shall contact KCP&L for installation requirements of new streetlights. The final layout shall be reviewed by the engineering division of the city for conflicts and location within easements. Any additional easements shall be acquired and recorded by the developer per KCP&L requirements.

Non-Arterial Streets

Street lighting for non-arterial streets should be designed using the most recent edition of the recommended IES, and KCPL standards and guidelines. Wooden street light poles are prohibited.

Arterial Street Lighting

KCPL has established design standards for street lighting. Existing street light systems may be required to meet the design criteria and new street light systems shall be designed to them. To maintain reliability and maintenance only fixtures approved by KCPL and the City of Blue Springs will be acceptable. Wooden Poles shall be prohibited.

Pedestrian Lighting

Pedestrian lighting illuminates the pedestrian walkway and is typically mounted 12-14 feet above the sidewalk. This lighting should be considered when calculating the foot candles and uniformity of the roadway lighting. Pedestrian ways not adjacent to the roadway may require lighting as determined by the traffic engineer. Good outdoor lighting can create and encourage a pedestrian friendly environment, which is especially beneficial to neighborhood business districts. Pedestrian lighting improves walkway illumination for pedestrian traffic and enhances community safety and business exposure. Lighting for pedestrians is especially important along Main Streets, Mixed Use Streets and Local Connectors, and in other locations where the land use supports large volumes of pedestrians and vehicles.

Streetlight Upgrade

For developers or Home Owners Associations (HOA) who choose to improve and beautify their neighborhoods with upgraded streetlights, decorative street lighting is only allowable when purchased and maintained in perpetuity by the HOA. If the developer/HOA decides to utilize decorative street lighting, which it purchases and maintains, the city will reimburse the HOA for the standard street lighting costs associated with the subdivision if the subdivision enters into and follows the specifications outlined in the decorative street lighting agreement.

Blue Springs, Missouri
Public Works Department

SECTION 2900 – TRAFFIC SIGNALS

CITY OF BLUE SPRINGS, MISSOURI
CONSTRUCTION SPECIFICATIONS

(Updated in 2018 to reflect current standards and practices. Changed Section number to 2850 as Section 2900 is now the Section used for waterlines)

The City of Blue Springs hereby adopts Sections 902, 1050, 1062, 1092 of the Missouri Department of Transportation's (MoDOT) 2011 Specification Book for Highway Construction, latest edition. The following additions, deletions and/or revisions are adopted as a part of Section 902, 1050, 1062, 1092 for use within the City of Blue Springs. Text in bold italics indicates revisions or additions to the MoDOT standard.

Throughout Section 902, 1050, 1062, 1092

Replace engineer with ***City Engineer***

Replace commission with ***City of Blue Springs Public Works Department***

Section 902.2 General
Add the following paragraphs prior to Section 902.2:

902.2.a These Specifications may be modified or deleted by appropriate items in the Project Special Provisions or by written authorization by the City Engineer.

902.2.b Work incidental to traffic signal installation that is not covered in these Specifications shall be performed in accordance with the City of Blue Springs specifications and standards. All incidental parts, which are not shown on the Plans or specified in the Specifications and which are necessary to complete the traffic signal installation, shall be supplied and installed by the Contractor to the satisfaction of the City Engineer. No additional payments will be made for incidental work or parts. All systems shall be complete and in operation to the satisfaction of the City Engineer at the time of acceptance.

902.2.c All appurtenances shall be installed as shown on the Plans, or as specified in the Project Special Provisions. Any deviations must be established by the Contractor and authorized by the City Engineer.

902.2.d The Contractor shall contact the Public Works Department before any project work begins to notify the City Engineer of the construction schedule and to request project inspections. The Contractor is responsible for obtaining all necessary permits from the City, and is responsible for all associated costs, before any work can begin.

902.2.e The Contractor is responsible for obtaining a sealed letter from a licensed engineer in the State of Missouri stating that the traffic signal is ready and safe to be energized. The City

Inspector will obtain an address for the power supply, which the Contractor shall use when dealing with the electrical utility company.

902.2.f The Contractor is responsible for contacting the electrical utility company (KCPL 816-471-KCPL) in advance to schedule the installation of the power cables to the power supply. The contractor shall provide a sealed letter confirming the traffic signals are ready to be energized per KCPL standards. The Contractor shall be billed for all electrical utility service charges until the test period is successfully completed, at which time service can be transferred to the City.

Section 902.16 Conduit Systems
Add the following section:

902.16.3.a Conduit may be installed by plowing in unpaved areas. The equipment used for plowing conduit is designed specifically for that purpose with the power and versatility to easily and accurately bury the various sizes of conduit under all normal soil conditions. This equipment places the conduit without twisting, kinking, or damaging the material in any way. The vibrating unit shall be attached to a tractor unit in such a manner that the tractor does not dampen the vibration. The cable way and guides shall be smooth, free of obstructions and sharp edges and shall not cause bending of the conduit at shorter than the minimum bending radius recommended by the manufacturer, nor cause excessive strain to the conduit. Conduit reels may be mounted on the tractor or conduit unreeled along the proposed route before plowing in such a manner to allow as direct a line as possible to the trench to avoid unnecessary bending of the conduit or rubbing of the conduit against the reel. The plow shall not be backed onto the conduit. If an underground obstruction is encountered, the plow shall be lifted out of the ground and the obstruction removed. Conduit may be installed utilizing the pull plow method if approved by the City Engineer. After installation of conduit by plowing, the disturbed earth shall be leveled and, if necessary, compacted by a device approved by the City Engineer. Ends of conduit shall be capped immediately after cutting to prevent moisture and debris from entering the conduit. Red burial tape imprinted with "CAUTION - BURIED CABLE BELOW" shall be installed in all trenches at approximately 1/3 to 1/2 of the depth of the trench. All disturbed areas shall be restored to the satisfaction of the City Inspector.

902.21 Test Period
Modify the first paragraph as follows:

After the project is open to normal traffic, the Contractor shall notify the ***City Engineer*** in writing the date the signal or signal system will be ready for testing. Upon concurrence from the ***City Engineer***, the Contractor shall place the signal or signal system in operation for a 15 consecutive day test period. ***The signal turn-on shall be performed by the Contractor, City personnel shall be present at the activation. The signal turn-on shall not occur on Fridays, holidays or weekends and shall be completed between the hours of 9:00 a.m. and 2:00 p.m., unless otherwise noted in the Plans or directed by the City Engineer. At locations without previous traffic signal control, the new traffic signal shall flash for a period of three business days prior to full signal system turn-on.*** A signal operated independently of other signals or signal systems shall be tested as a single installation. A signal operated as part of a system shall not be tested until all signals in the system are ready to be tested. A system shall be tested as

a unit. Any failure or malfunction of equipment during the test period shall be corrected at the Contractor's expense, and the signal or signal system tested for an additional 15 consecutive day period. This procedure shall be repeated until the signal equipment has operated to the ***City Engineer's*** satisfaction for 15 consecutive days. The Contractor shall, in the presence of the ***City Engineer*** or designee, demonstrate the proper action of the controller's monitor as part of the testing system, if applicable.

902.22 Maintenance Information
Modify the last sentence as follows:

If this option is invoked, the entire cost of the work performed by ***City personnel or the third party will be computed and deducted from the payments due the Contractor.***

Add the following section:

902.22.a As-Built Drawings (also known as Record Drawings) marked up to reflect changes to public infrastructure during the construction process shall be prepared and submitted to the Public Works Department in both electronic and hard copy versions. Prior to acceptance of the work, the Contractor shall submit marked-up plans showing in detail all construction changes, especially the location and depth of conduit.

902.23 Final Clean Up
Replace the existing language with the following:

Before final acceptance, the Contractor shall restore to a condition equal to or better than that existing prior to construction, for all property, both public and private, within, adjacent to and beyond the limits of construction that have been disturbed or damaged while executing the work. This includes, but not limited to, existing curb and gutter, sidewalk, pavement, drainage structures, irrigation systems, street lighting and traffic signal equipment. All unpaved areas damaged during construction shall be restored to the original condition. Unless otherwise directed, grassy areas which were originally sodded shall be re-sodded. Restoration work shall be at the Contractor's expense. All restoration work shall be acceptable to the City Inspector.

Section 1050.4.1 Electric Substation and Service Poles
Replace the existing language with the following:

For temporary traffic signals, the configuration and installation of equipment mounted on substation and service poles shall be in accordance with the requirements of the utility company furnishing electrical power.

Section 1050.6 Timber Preservatives
Replace the existing language with the following:

1050.6.a Pentachlorophenol: Pentachlorophenol shall be in accordance with AWPA P8 in a hydrocarbon solvent meeting the requirements of AWPA P9, Type A.

1050.6.b Ammoniacal Copper Arsenate (ACA) or Chromated Copper Arsenate (CCA): Ammoniacal Copper Arsenate and Chromated Copper Arsenate shall be in accordance with AWPA P5.

1050.6.c Copper Naphthenate For Repair: Copper Naphthenate shall be prepared with a solvent in accordance with AWPA Standard P9. The preservative concentration shall contain a minimum of 2 percent copper metal.

1050.6.d Responsibility for Quality: The Contractor shall use preservatives that meet these specifications or the treated material will be subject to rejection, or to approved retreatment with an approved preservative.

1050.6.e Final Steaming: All substation, service and span wire poles; except material treated with ACQ or CCA, shall be cleaned by a final steam bath in accordance with AWPA C2, C4 or C5, as applicable. In lieu of steam cleaning, sign poles may be strip stacked and air-dried for a minimum of 60 days after treatment.

1050.7 Care After Treatment
Replace the last sentence with the following:

If damaged material is permitted for use by the City Engineer, or framing at site is required, such injuries, cuts or holes shall be liberally field-treated with the preservative of the same type used for the original treatment, or of copper napthenate. A second coat shall not be applied until after the first coat has been absorbed. Holes shall be treated by plugging one end and filling with preservative.

Section 1062.2 Pull Boxes
Replace the existing language in Section 1062.2.1 with the following:

Cast-in-place concrete pull boxes shall be constructed using a KCMMB 4k psi, or higher, approved concrete mix. Concrete construction shall be in accordance with ACI 301 Standard Specifications for Structural Concrete. Pull boxes shall be cast in a neat and workmanlike manner. Forms will be required for the inside surfaces of the pull box walls; and if the excavation is irregular, forms will also be required for the outside surfaces of the walls. An outside form shall be installed across all trenches leading into the pull box excavation. The ends of all conduits through the walls shall fit tightly against the form.

Section 1062.3 Pull Box Covers
Replace the last 2 sentences in the section with the following:

Covers for pull boxes to be used for traffic signals, or a combination of traffic signals and street lighting, shall be embossed with "TRAFFIC SIGNALS". Covers for pull boxes to be used for fiber optics shall be embossed with "FIBER OPTICS".

1092.2 Posts and Mast Arms

Add the following section:

1092.2.4.5 Traffic Signal Post Painting
1092.2.4.5.1 Description: This work shall consist of painting new or existing traffic signal posts, mast arms, luminaire arms, pedestals and pedestal bases at locations shown on the plans and as described below.

The painting system shall be a top coating of a hot dip galvanized surface with either a high density urethane or triglycidyt isocyanurate (TGIC) polyester powder or a special polyester powder primer over coated with an allphatic polyurethane liquid to obtain both the synergistic effect of the combined coatings as well as the beautifying effect of a colored top coat. The coating shall provide for the cathodic protection of a steel substrate under the specified performance characteristics when subjected to variable outdoor environmental conditions.

On new steel surfaces prior to application of the hot dip galvanized (zinc) coating, the steel substrate shall be properly cleaned and prepared by removal of excessive mill scale, where required, by shot blasting; degreased by immersion in a heated caustic solution; pickled by immersion in a heated sulfuric acid solution; rinsed clean from residual caustic and/or acid ammonium chloride solution. The hot dip galvanizing coating shall meet ASTMK standards and shall be applied by immersion in a molten bath of prime western grade zinc, coating both internal and external surfaces to a minimum thickness of 2.5 mils. Flux ash shall be skimmed from the molten zinc bath prior to product extraction to assure a debris free zinc coating. On poles with an existing galvanized surface, brushblast to a uniform dull appearance free of an shine and preheat, prior to prime painting. All cleaned assemblies shall be protected from moisture and other foreign materials prior to prime painting. Moisture, oil, grease, loose paint or other foreign material shall be removed prior to painting using a clean rag saturated with thinner or solvent.

The polyester powder top coat or powder primer is to be electrostatically sprayed on all visually exposed exterior zinc coated surfaces and heat cured to a minimum dry film thickness of 2/9 mils. The electrostatic application process assures a uniform, monolithic coating. An additional liquid coat of an aliphatic polyurethane is to be electrostatically sprayed over the powder primer and heat cured to a minimum dry film thickness of 1.5 mils. Prior to applying the additional liquid coat, repair any surface imperfections such as sags or runs by light sanding to obtain a uniform surface. Also, reapply prime paint, as necessary, to any voids or areas having less than the required thickness. Application is to be with airless spray equipment.

The powder top coat and powder primer are to be thermosetting polyester materials. The powders shall be low molecular weight solid resins that, when subjected to elevated temperature up to 400°F, melt, flow and chemically cross-link within themselves (or with other reactive components) to form a higher molecular weight reaction product. The resulting coating is to have a different chemical structure than the basic resin, be heat stable and not regress to either a powder or liquid on further exposure to heat. Powder top coat and primers are to be the latest state-of-the-art, high density, variable gloss, polyester thermosetting resins

available.
Either the powder top coat or the liquid overcoat shall provide the current ultimate in ultraviolet durability, gloss and color retention, chemical and abrasion resistance and overall weatherability. The liquid overcoat is to be a two (2) component, high solids, aliphatic polyurethane capable of being accelerated cured ant elevated temperatures up to 225°F.

All new or existing traffic signal posts, mast arms, luminaire arms, pedestals and pedestal bases painted under this specification shall provide a ten (10) year limited warranty on products factory coated with the system, subject to the following:

The factory applied coatings will not fail to provide corrosion (electro-chemical reaction) protection of the steel substrate for a period of ten (10) years from the date of shipment (the "Warranty Period"). If during the Warranty Period, the steel substrate exhibits any visual and/or physical evidence of corrosion due to coating failure from normal atmospheric environmental conditions, the coating will be repaired or replaced at the discretion of the manufacturer and at no charge and/or cost to the City if the City notifies the manufacturer in writing and provides proof of purchase with 90 days of such failure becoming evident. Failure of the coating to provide the above described corrosion protection shall specifically exclude failure resulting from damage due to acts of God, act of war, civil disturbances, (falling objects, fire, explosion, external forces, radiation, riots, improper storage (includes failure to remove protective shipping packaging and failure to provide good drainage/ventilation during storage), improper handling/erection, misuse or abuse in application or any other occurrences beyond manufacturer's control. The liability of the manufacturer under this warranty, or for any loss or damage arising out of, or connected with, the design, application, sale or use of the coating, whether the claim is based on contract or negligence, shall not exceed the price allocable to the value of the original factory applied coating which gives rise to the claim and upon expiration of the Warranty Period all such liability shall terminate. Manufacturer will not be liable for any special or consequential damages including, but not limited to, cost of temporary substitute product or labor costs to repair or reinstall the product with failed coating or any product transportation cost to and from manufacturer's process plant if factory replacement of the effective coating is deemed necessary. This warranty is exclusive and in lieu of all other warranties whether express, implied, and/or written. This warranty constitutes the exclusive and sole remedy of the City and liability of manufacturer.

1092.2.4.5.2 Materials:

Primer
Valmont Part No. 347277
Color: Gray
Manufactorer and #: Tnemec Series N69-A3977
Total Thickness (DFT): 2 mils
Thinner: Tnemec #4; Valmont Part No. TR#159047
Cure Temperature: 150°F

Liquid Overcoat (top coat)
All new pedestrian and traffic signal posts located along the Woods Chapel Road corridor shall have a top coat as follows:
Valmont Part No. 347243; Tnemec Series 1074-35GR
Color: Gloss Black
Total Thickness (DFT): 3 mils
Curing Time to Handle: 6 hours; Curing Time to Recoat: 8 Hours
Thinner: Tnemec #42; Valmont Part No. TR#X159120

All new pedestrian and traffic signal posts located along the Adams Dairy Road corridor or within the Adams Dairy Parkway Overlay District shall have a top coat as follows:

Color: Sherwin Williams Custom Manual Match

BAC COLORANT	*02*	*32*	*64*	*128*
G2 – New Green	*12*	*25*	*-*	*-*
R2 – Maroon	*-*	*9*	*1*	*1*
Y3 – Deep Gold	*-*	*29*	*-*	*-*
W1 - White	*-*	*8*	*-*	*-*

1092.2.4.5.3 Method of Measurement: No direct measurement will be made for "Traffic Signal Post or Mast Arm Painting", completed in place in accordance with the plans and specifications and as accepted by the Public Works Department.

1092.2.4.5.4 Basis of Payment: No direct payment will be made for "Traffic signal Post Painting". Payment for "Traffic Signal Post Painting" shall be subsidiary to other traffic signal bid items, and shall be full compensation for the furnishing of all materials, labor, equipment, tools and incidentals necessary to complete the work.

1092.4.1.1 Controller Cabinets
Add the following section (g)

(g) All NEMA traffic signals controller shall be the Econolite Model ASC/3-1000 or latest model. All system master controllers shall be the Econolite Model ASC/2M-1000 or latest model. Each controller shall have fiber interface, including the following equipment and quantities:

1 – Fiberoptic patch panel/distribution box (12-port, single mode
1 – Ethernet swith (Cisco IE-3000 switch and power supply)
2 – GBIC models (Cisco GLC-LH-SM and associated patch cords)
1 – Underground splice enclosure (for splicing cable in adjacent pull box)

In addition to the equipment listed, the contractor shall supply and install all additional necessary items to make the fiber optic interconnect operational between the intersections.

The cabinet shall be Econolite type Super P-44 with Opticom interface panel. Install on Type EV Base, modified to accommodate additional width for integrated uninterruptible power supply (UPS) compartment. UPS to be Techpower M-E XL 1000 with batteries and auxiliary equipment necessary to provide backup capability of normal signal operation for at least 2 hours with 4-6 hours of flash time. No separate payment shall be made.

1092.4.3.1 Pre-Emption Interface
Add the following section:

1092.4.3.1.a Emergency vehicle preemption shall be Global Traffic Technologies equipment with I.D. capability, including detection units (Model 721), communication cable (Model 138), and Phase Selector card (Model 754 or latest model). These items shall be paid for as one (1) emergency vehicle detection system.

1092.4.7.2 Pedestrian Push Button
Add the following section:

1092.4.7.2.a Pedestrian push button detectors shall be Campbell Model A912 or latest model, equipped with computer cable to connect button to corresponding pedestrian indication.

1092.4.7.7 Video Detection System
Add the following section:

1092.4.7.7.1.5 The Autoscope Sola Terra/Encore System or latest model shall be used for video detection. The system shall be complete including color cameras, processor, color monitor, mounting hardware, and camera cable per manufacturer's specifications. The processor and cameras shall be preprogrammed for traffic data measurement. These items shall be paid for as one (1) video detection system.

Add Section 1092.7 CCTV Camera Assembly, Installed
1092.7.1 This work shall consist of providing and installing a CCTV Camera Assembly at the signalized intersections shown in the plans. This equipment consists of an AXIS Q6032-R PTZ Dome Network camera or latest model with remotely controlled pan-tilt-zoom (PTZ), and the ability to acquire video images of the various sections of the roadway. Also included are the Ethernet video encoders and equipment necessary to transmit the video signal from the camera location using the designated fiber optic cable.

1092.7.2 All materials shall be in accordance with the AXIS Camera's manufacturer's specifications.

1092.7.3 Installed CCTV Camera Assemblies shall be measured per each.

1092.7.4 Accepted CCTV Camera Assemblies will be paid for at the contract unit price bid for the item specified in the contract documents, CCTV Camera Assembly, Installed. Such payment shall constitute full compensation for all materials, labor, tools, and equipment necessary to complete the construction item. No direct payment will be made for any incidental items necessary to complete the work unless specifically provided as a pay item in the contract.

Blue Springs, Missouri
Public Works Department

SECTION 3000 – TRAFFIC CONTROL

CITY OF BLUE SPRINGS, MISSOURI
CONSTRUCTION SPECIFICATIONS

3000 SIGNING GENERAL 4
3000.1 Scope 4
3000.2 Codes and Standards 4
3000.3 Modification of Specifications 4
3000.4 Incidental Work and Parts 4
3000.5 Existing Signing 4
3000.6 Permits and Inspections 4
3000.7 Maintenance Work 5
3001 SIGNING MATERIALS AND EQUIPMENT 5
3001.1 Scope 5
3001.2 Sign Blanks 5
3001.3 Sign Sheeting 5
3001.4 Sign Posts 5
3001.4.1 Square Steel Posts 5
3001.4.2 Decorative Sign Posts 6
3001.5 Sign Mounting Hardware 6
3002 SIGNING CONSTRUCTION REQUIREMENTS 6
3002.1 Scope 6
3002.2 Sign Post Installation 6
3002.3 Storage of Signs 7
3002.4 Sign Installation 7
3002.5 Removal and Reinstallation of Existing Signs 7
3002.6 Final Clean Up 7
3003 SIGNING MEASUREMENT AND PAYMENT 8
3004 PAVEMENT MARKING GENERAL 8
3004.1 Scope 8
3004.2 Codes and Standards 8
3004.3 Modification of Specifications 8
3004.4 Incidental Work and Parts 8

3004.5 Integrity of Design and Installation Standards 8
3004.6 Permits and Inspections 8
3004.7 Warranty 9
3005 PAVEMENT MARKING MATERIALS AND EQUIPMENT 9
3005.1 Scope 9
3005.2 Material Selection 9
3005.3 Grooving for Pavement Marking~~Inlaid Pavement Marking~~ 10
3005.4 High-Build Paint 10
3005.5 Pre-Formed Thermoplastic 10
3005.6 Thermoplastic 11
3005.7 Urethane 11
3005.8 Drop-On Glass Beads 13
3006 PAVEMENT MARKING CONSTRUCTION REQUIREMENTS 13
3006.1 Scope 13
3006.2 Surface Preparation 13
3006.3 Weather Limitations 14
3006.4 High-Build Paint Application 14
3006.5 Pre-Formed Thermoplastic Application 14
3006.6 Thermoplastic Application 15
3006.7 Urethane Application 16
3006.8 Pavement Marking Removal 16
3006.9 Deficiencies 16
3006.10 Final Clean Up 17
3007 PAVEMENT MARKING MEASUREMENT AND PAYMENT 17
3008 TEMPORARY TRAFFIC CONTROL GENERAL 17
3008.1 Scope 17
3008.2 Codes and Standards 17
3008.3 Modification of Specifications 17
3008.4 Traffic Control Plans 17
3008.5 Minimum Requirements 18
3008.6 Incidental Work and Parts 18
3008.7 Permits and Inspections 18

3009 TEMPORARY TRAFFIC CONTROL MATERIALS AND EQUIPMENT 18
3009.1 Scope 18
3009.2 Construction Signs 19
3009.3 Channelizers 19
3009.4 Barricades 19
3009.5 Arrow Panels 19
3009.6 Warning lights 19
3009.7 Temporary Pavement Markings 19
3009.8 Portable Changeable Message Boards 20
3009.9 Temporary Concrete Traffic Barrier 20
3010 TEMPORARY TRAFFIC CONTROL CONSTRUCTION REQUIREMENTS 20
3010.1 Scope 20
3010.2 Sign Installation 20
3010.3 Temporary Pavement Marking Installation 20
3010.4 Placement of Channelizers 21
3010.5 Lane Closures 21
3010.6 Flaggers 22
3010.7 Street or Sidewalk Closures 22
3010.8 Detours 22
3010.9 Excavations, Embankments, and Obstructions 22
3010.10 Additional Traffic Control 23
3010.11 Maintenance Work 23
3010.12 Deficiencies 23
3010.13 Final Clean Up 24
3011 TEMPORARY TRAFFIC CONTROL MEASUREMENT AND PAYMENT 24

3000 SIGNING GENERAL

3000.1 Scope

This work shall consist of furnishing of all material, equipment, and labor for the complete installation of permanent signs. Temporary signing shall conform to the temporary traffic control requirements in Section 3010.

3000.2 Codes and Standards

All work and material shall be in accordance with the latest requirements of the Manual on Uniform Traffic Control Devices (MUTCD), Standard Highway Signs (SHS), and all applicable local ordinances.

3000.3 Modification of Specifications

These Specifications may be modified or deleted by appropriate items in the Project Special Provisions or by written authorization by the City Engineer.

3000.4 Incidental Work and Parts

Work incidental to permanent signage that is not covered in these Specifications shall be performed in accordance with the City of Blue Springs specifications and standards. All incidental parts, which are not shown on the Plans or specified in the Specifications and which are necessary to complete the installation of signage, shall be supplied and installed by the Contractor to the satisfaction of the City's Engineering Department. No additional payments will be made for incidental work or parts.

3000.5 Existing Signing

The Contractor shall maintain all existing signs not shown on the Plans as to be removed. At the onset of the project, the Contractor should verify and document the condition of each sign that is to be reused. The Contractor shall be responsible for the appropriate care of all existing signs that are to be reused. Any signs that are damaged, lost or stolen shall be replaced by the Contractor at the Contractor's expense.

All Stop, Yield, or street name signs shall be maintained in a conspicuous location for the driving public. All Stop and Yield signs removed for construction purposes can be temporarily erected in reflectorized drums (no less than 7 feet above the pavement surface) until they can be reinstalled. Any temporary Stop or Yield sign installation to be left in place overnight will require prior approval from the City Inspector.

3000.6 Permits and Inspections

The Contractor shall contact the Public Works Engineering Department before any project work begins to notify the City Engineer, or assigned designee of the construction schedule and to request project inspections. The Contractor is responsible for obtaining all necessary permits from the City, and is responsible for all associated costs, before any work can begin.

3000.7 Maintenance Work

The Contractor is responsible for making all repairs and replacements, including downed or damaged signs, regardless of the cause or responsible party, until the work is completed, inspected, and accepted by the City.

3001 SIGNING MATERIALS AND EQUIPMENT

3001.1 Scope

This section governs the furnishing of all signs, posts, and other material and equipment supplied by the Contractor, as required to complete the installation of permanent signs as shown on the Plans, the Standard Drawings, and as specified in the Project Special Provisions. All signing material and equipment shall be of new stock unless the contract provides for relocation of existing units or use of units furnished by others. New material and equipment shall be of the best grade, and shall meet the approval of the City Engineer.

3001.2 Sign Blanks (Fixed scrivener error in 2018 Blue Springs Supplement)

Sign blanks shall be of aluminum, 6061-T6 alloy. Sign blanks shall be degreased and coated with an alodized(anodized) finish to ensure that sign sheeting adheres to the surface. Sign blank thickness shall be 0.125 inches for signs with an area greater than nine square feet (9 sq. ft.). Sign blanks for overhead street name signs shall also have a thickness of 0.125 inches. Sign blanks for signs with an area less than or equal to 9 sq. ft. shall be 0.080 inches thick. Sign blanks shall have corner radii and holes punched according the Federal Highway Administration's Standard Highway Signs, or as specified in the Plans.

3001.3 Sign Sheeting (Fixed scrivener error in 2018 Blue Springs Supplement)

Sign blanks shall be covered with retroreflective, high intensity prismatic sign sheeting, meeting the requirements of ASTM D4956-04 Spec. Type III. Screen-printed signs are no longer acceptable and shall not be used. Signs containing blue, red or green lettering and/or symbols shall be made with acrylic verlay(overlay) film manufactured by 3M, or approved equal. Signs containing black lettering and/or symbols shall be made of black vinyl. All sign sheeting shall be applied without splices, and shall be free from air bubbles, wrinkles or other blemishes.

3001.4 Sign Posts

The type of sign post shall be supplied as shown on the Plans or as specified in the Project Special Provisions.

3001.4.1 Square Steel Posts (Changed supplier reference to a manufacturer product reference)

The sign posts, post anchors, and post anchor sleeves shall conform to (1) hot rolled carbon steel ASTM A-570 grade 33 or ASTM structural quality C 1021 with a hot-dipped galvanizing conforming to AASHTO M-120 with an inline system followed by a chromate conversion and a cross-linked polyurethane acrylic exterior coating or (2) a galvanized finish cold rolled carbon steel ASTM A-446 grade A with a galvanizing conforming to ASTM A-525, designation G-90.

All square steel sign posts shall be 2" x 2", 14 gauge galvanized steel, square tubular posts, with 7/16 - inch diameter holes or 7/16 – inch diameter embossed ring (die-cut knockouts) at one inch (1") spacing on all sides for the total length of the post. All holes shall be drilled or punched and all welds, cuts, burrs, and sharp edges are to be smoothed off before application of the finish. Square steel posts shall be galvanized according to ASTM A653. All square steel posts shall be furnished with a two-piece breakaway anchor unless the sign is to be located in concrete or asphalt in which case the breakaway anchor shall be a heavy duty model furnished by J & A Traffic Products, product HDA200-30-G, or equivalent. All components of the break-away anchor shall be galvanized. The post anchor and post anchor sleeve may be furnished without the bolt holes on all four sides with the exception of the holes immediately above the ground line.

3001.4.2 Decorative Sign Posts

For subdivisions who choose to improve and beautify their neighborhoods with decorative sign posts, the City of Blue Springs has developed an Ornamental Street Sign Support Agreement that must be approved by ordinance by the City Council.

3001.5 Sign Mounting Hardware

All sign mounting hardware shall consist of the following:

Grade 2 zinc plated 5/16" bolt, flat washer, nylon washer, sign, lock washer and nut.

3002 SIGNING CONSTRUCTION REQUIREMENTS

3002.1 Scope

This section governs the installation of permanent signs as shown on the Plans, the Standard Drawings, and as specified in the Project Special Provisions.

3002.2 Sign Post Installation

The Contractor shall stake the location for all proposed sign posts. The City Inspector shall inspect the staking before installation begins. Minor relocations to avoid conflicts may be allowed by the City Engineer.

Sign posts shall be located per guidance provided in the latest version of the MUTCD.

The Contractor shall be responsible for determining post lengths to ensure that all signs mounted on a post have the required clearance provided in the latest version of the MUTCD. Field cutting of posts will be permitted, however torch-cutting steel posts is prohibited.

Sign posts shall be plumbed vertical. The cross-sectional dimensions of the posts and/or the coating shall not be damaged during installation. Any post bent or otherwise damaged to the

extent that the post is considered unfit for use shall be removed and replaced with an acceptable post at the Contractor's expense.

3002.3 Storage of Signs

Signs delivered for use on a project or existing signs to be reinstalled shall be stored in a manner meeting the approval of the City's Traffic Division of Public Works. Any sign damaged, discolored or defaced during transportation, storage, or installation may be rejected.

3002.4 Sign Installation

Signs shall be mounted directly to the sign post with a grade 2 zinc plated 5/16" bolt, flat washer, nylon washer, sign, lock washer and nut. Signs on traffic signal posts or street light poles shall be mounted with strap or clamp type sign supports, or brackets as shown on the Plans or as approved by the City Traffic Division. The requirements for signs mounted on mast arms are described in the Missouri Department of Transportation's (MoDOT) Engineering Policy Guide, latest edition.

3002.5 Removal and Reinstallation of Existing Signs

Removal, transportation, storage, and reinstallation of existing signs should be as indicated in the Plans, Specifications, or Project Special Provisions. The Contractor is responsible for repair or replacement of any existing signs damaged during the removal and reinstallation operations at the Contractor's expense.

All sign blanks and sign posts that are removed and are not to be reinstalled on the project shall be delivered to the City's Public Works Maintenance Facility, 500 SE Sunnyside School Road. The Contractor is responsible for disposal of any items that are damaged or any items not to be salvaged.

New bolts, nuts, washers, and other required appurtenances shall be provided by the Contractor in order to reinstall existing signs. Such items shall be considered subsidiary to sign reinstallation.

3002.6 Final Clean Up

Before final acceptance, the Contractor shall restore to a condition equal to or better than that existing prior to construction all property, both public and private, within, adjacent to and beyond the limits of construction that have been disturbed or damaged while executing the work. This includes, but not limited to, existing curb and gutter, sidewalk, pavement, drainage structures, irrigation systems, street lighting and traffic signal equipment. All unpaved areas damaged during construction shall be restored to the original condition. Unless otherwise directed, grassy areas which were originally sodded shall be re-sodded. Restoration work shall be at the Contractor's expense. All restoration work shall be acceptable to the City Inspector.

3003 SIGNING MEASUREMENT AND PAYMENT

Measurement and payment shall be specified in the contract documents.

3004 PAVEMENT MARKING GENERAL

3004.1 Scope

This work shall consist of furnishing of all material, equipment, and labor for the complete installation of permanent pavement markings. Temporary pavement markings shall conform to the temporary traffic control requirements in Section 3008.

3004.2 Codes and Standards

All work and material shall be in accordance with the latest requirements of the Manual on Uniform Traffic Control Devices (MUTCD) and all applicable local ordinances.

3004.3 Modification of Specifications

These Specifications may be modified or deleted by appropriate items in the Project Special Provisions or by written authorization by the City Engineer, or assigned designee.

3004.4 Incidental Work and Parts

Work incidental to pavement markings that is not covered in these Specifications shall be performed in accordance with the City of Blue Springs specifications and standards. All incidental parts, which are not shown on the Plans or specified in the Specifications and which are necessary to complete the installation of pavement marking, shall be supplied and installed by the Contractor to the satisfaction of the City Engineer, or assigned designee. No additional payments will be made for incidental work or parts.

3004.5 Integrity of Design and Installation Standards

The Contractor shall make no design modification, material substitution, or revision of any kind without prior approval of the City Engineer. Materials or installation procedures deemed unsatisfactory by the City Engineer, with regard to retroreflectivity, bead distribution, paint thickness, overspray, accuracy, line width, consistency, tracking, or failure to comply with approved specifications shall not be used for pavement marking.

3004.6 Permits and Inspections

The Contractor shall contact the Public Works Engineering Department before any project work begins to notify of the construction schedule and to request project inspections. The Contractor is responsible for obtaining all necessary permits from the City, and is responsible for all associated costs, before any work can begin.

3004.7 Warranty

The Contractor shall warranty both the labor and the pavement marking materials used for a minimum period of one year from the date of application; the warranty period and time referenced deficiency measures noted below shall be extended for the duration of applicable project bonds. The Contractor shall submit a written warranty on company letterhead, which at a minimum shall require the Contractor to replace any line or symbol with any of the following deficiencies:

- More than 10% of a 1,000 foot length of a longitudinal line fails due to workmanship or materials within one year of the date of application,
- More than 10% of an individual symbol fails due to workmanship or materials within one year of the date of application, or
- A line or symbol has retroreflectivity values less than 150 millicandelas/sq m/lux for white and 100 millicandelas/sq m/lux for yellow within one year of the date of application.

3005 PAVEMENT MARKING MATERIALS AND EQUIPMENT

3005.1 Scope

This section governs the furnishing of all material and equipment supplied by the Contractor, as required to complete the installation of pavement markings as shown on the Plans or as specified in the Project Special Provisions.

3005.2 Material Selection

The type of pavement marking material to be used on a specific project depends on the type of marking and surface. If the material to be used is not specified in the Plans or in the Project Special Provisions, the table on the following page shall be used for material selection. Selected material shall be approved by the Public Works Department prior application.

TABLE OF PAVEMENT MARKING MATERIALS

Marking / Surface	Longitudinal Lines	Diagonal Lines	Crosswalk & Stop Lines	Dashed Lines	Symbols
Asphalt	Thermoplastic*	Thermoplastic*	Grooved Thermoplastic	Thermoplastic	Grooved Thermoplastic
Concrete	Urethane	Urethane	Grooved Thermoplastic	Urethane	Grooved Thermoplastic
Nova-Chip/Microsurface	Thermoplastic*	Thermoplastic*	Grooved Pre-Formed Thermoplastic	Pre-Formed Thermoplastic	Grooved Pre-Formed Thermoplastic

Slurry Seal	Thermoplastic* or High-Build Paint	Thermoplastic* or High-Build Paint	Grooved Pre-Formed Thermoplastic	Pre-Formed Thermoplastic	Grooved Pre-Formed Thermoplastic

*Binder-sealer recommended by the manufacturer will be required on surfaces older than two months.

3005.3 Grooving for Pavement Marking

A. Description. This work shall consist of furnishing and installing a groove in the pavement for placement of pavement markings as shown on the plans or as directed by the engineer.
B. Construction Requirements.
    a. The grooves shall be cut such that the surface of the groove is uniform with minimal variation in height.
    b. The grooves shall be located where the final pavement marking will be placed according to the plans or as directed by the engineer.
    c. On bituminous pavements the width of the groove shall be 7 inches. On PCCP pavements the width of the groove shall be 10 inches.
    d. The final depth of the groove on bituminous pavements shall be 50 mils, plus or minus 5 mils. The final depth of the grove on PCCP pavement shall be 80 mils, plus or minus 5 mils.
    e. The groove shall be clean and dry before the installation of the pavement marking can begin.
    f. All debris resulting from the installation of the grooves shall be removed and disposed of by the contractor.

3005.4 High-Build Paint

High-build paint shall meet the requirements of Section 1048.90 of the Missouri Department of Transportation's (MoDOT) 2011 Specification Book for Highway Construction, March 2014.

3005.5 Pre-Formed Thermoplastic

Pre-formed thermoplastic materials shall be suitable for use on either asphalt or concrete pavements. A manufacturer recommended heat source fuses the markings to the asphalt or concrete pavements. Glass beads are pre-mixed into the material furnished, and also must be applied to the surface either before or after fusion to the pavement. Upon cooling, the material produces an adherent reflectorized marking of specified thickness and width, capable of resisting deformation by traffic. Pre-formed thermoplastic materials shall comply with AASHTO M 249 with exception of the relevant differences due to the material being supplied in a pre-formed state, and must meet the following requirements:

A. Material shall have a minimum thickness of 90 or 125 mils as supplied by the manufacturer.
B. Material shall be resistant to deterioration due to exposure to sunlight, water, oil, gasoline, salt, or adverse weather conditions.

C. All pigments must be heavy metal free, including, but not restricted to lead, cadmium, and mercury.
D. After application, the material must exhibit no appreciable deformation or discoloration, remain tack free, and not lift from the pavement under normal traffic conditions within a road temperature range of 20° F to 150º F.
E. Material shall be capable of conforming to pavement contours, breaks, and faults through the action of traffic at normal pavement temperatures.
F. Color: Yellow color must meet the following minimum chromaticity coordinates:

CIE Chromaticity Coordinate limits (Initial)								
Color	1		2		3		4	
	x	y	x	y	x	y	x	y
Yellow	0.475	0.450	0.490	0.433	0.520	0.450	0.495	0.475

White color shall be pure white (free of tint)

G. Retroreflectivity: The following minimum retroreflectivity requirements shall be met when using an acceptable 30-meter retroreflectometer within 14 days after application:

i. White 300 millicandelas/sq m/lux (min.)
ii. Yellow 225 millicandelas/sq m/lux (min.)

3005.6 Thermoplastic

Thermoplastic pavement marking material shall be applied to asphalt surfaces in a molten state, and which upon cooling to normal pavement temperature, produces an adherent reflectorized stripe capable of resisting deformation. Thermoplastic material shall meet the requirements of AASHTO M249-79. Thermoplastic shall only be applied to surfaces that are less than two months old, unless a binder-sealer recommended by the manufacturer is applied.

3005.7 Urethane

Urethane pavement marking material shall consist of a homogeneous blend of modified urethane resins and pigments designed to provide a simple volumetric mixing ratio of two components (must be two volumes of Part A to one volume of Part B). No volatile solvent or fillers will be allowed.

A. Pigmentation: The pigment content by weight of component A shall be determined by low temperature ashing according to ASTM 0 3723. The pigment content shall not vary more than ± two percent from the pigment content of the original qualified paint.

White Pigment shall be Titanium Dioxide meeting ASTM D 476 Type II, Rutile.

Yellow Pigment shall be an Organic Yellow and contain no heavy metals.

B. Upon heating to application temperature, the material shall not exude fumes, which are toxic or injurious to persons or property when handled according to manufacturer

specifications. The urethane pavement marking material compositions shall not contain free isocyanate functionality.

C. Daylight Reflectance: The daylight directional reflectance of the cured modified urethane. material (without reflective media) shall be a minimum of 80 percent (white) and 50 percent (yellow) relative to magnesium oxide when tested using a color spectrophotometer with a 45 degrees circumferential /zero degrees geometry, iIluminant C, and two degrees observer angle. The color instrument shall measure the visible spectrum from 380 to720 nm with a wavelength measurement interval and spectral bandpass of 10 nm. In addition, the color of the yellow modified urethane shall visually match Color Number 33538 of Federal Standard 595a with chromaticity limits as follows:

CIE Chromaticity Coordinate limits (Initial)								
Color	1		2		3		4	
	x	y	x	y	x	y	x	y
Yellow	0.490	0.470	0.475	0.438	0.485	0.425	0.539	0.456

D. Weathering Resistance: The modified urethane, when mixed in the proper ratio and applied at 14 to 16 mils wet film thickness to an aluminum alloy panel (Federal Test Std. No. 141, Method 013) and allowed to cure for 72 hours at room temperature, shall be subjected to accelerated weathering for 75 hours. The accelerated weathering shall be completed by using the light and water exposure apparatus (fluorescent UV - condensation type) and tested according to ASTM G 53.

The cycle shall consist of four hours UV exposure at 50nC (122 OF) and four hours of condensation at 40°C (104 OF). UVB 313 bulbs shall be used. At the end of the exposure period, the material shall show no substantial change in color or gloss.

E. Drying Time: The modified urethane material, when mixed in the proper ratio and applied at 14 to 16 mils wet film thickness and with the proper saturation of glass spheres, shall exhibit a no-tracking time of three minutes or less when tested according to ASTM D 711.

F. Adhesion: The catalyzed modified urethane pavement marking materials when applied to a 100 x 100 x 50 mm (4 x 4 x 2 in.) concrete block shall have a degree of adhesion which results in a 100 percent concrete failure in the performance of this test.

The concrete block shall be brushed on one side and have a minimum strength of 3,500 psi. A 2 in. square film of the mixed modified urethane shall be applied to the brushed surface and allowed to cure for 72 hours at room temperature. A 2 in. square cube shall be affixed to the surface of the modified urethane by means of an epoxy glue. After the glue has cured for 24 hours, the modified urethane specimen shall be placed on a dynamic testing machine in such a fashion so that the specimen block is in a fixed position and the 2 in. cube (glued to the modified urethane surface) is attached to the dynamometer head. Direct upward pressure shall be slowly applied until the modified

urethane system fails. The location of the break and the amount of concrete failure shall be recorded.

G. Hardness. The modified urethane marking materials, when tested according to ASTM 0-2240, shall have a Shore D Hardness greater than 75. Films shall be cast on a rigid substrate at 14 to 16 mils in thickness and allowed to cure at room temperature for 72 hours before testing.
H. Abrasion. The abrasion resistance shall be evaluated on a Taber Abrader with a 1,000 gram load and CS-17 wheels. The duration of test shall be 1,000 cycles. The wear index shall be calculated based on ASTM test method 0-4060 and the wear index for the catalyzed material shall not be more than 80. The tests shall be run on cured samples of modified urethane material which have been applied at a film thickness of 14 to 16 mils to code S-16 stainless steel plates. The films shall be allowed to cure at room temperature for at least 72 hours and not more than 96 hours before testing.
I. Tensile. When tested according to ASTM 0-638, the modified urethane pavement marking materials shall have an average tensile strength of not less than 6,000 pounds per square inch. The Type IV Specimens shall be pulled at a rate of X" per minute by a suitable dynamic testing machine. The samples shall be allowed to cure at 75 ºF± 2°F for a minimum of 24 hours and a maximum of 72 hours prior to performing the indicated tests.
J. Compressive Strength. When tested according to ASTM D-695, the catalyzed modified urethane pavement marking materials shall have a compressive strength of not less than 12,000 pounds per square inch. The cast sample shall be conditioned at 75°F± 2°F for a minimum of 72 hours before performing the indicated tests. The rate of compression of these samples shall be no more than ¼" per minute.

3005.8 Drop-On Glass Beads

Drop-on glass beads shall be specifically manufactured to be compatible with pavement markings, and shall comply with AASHTO M 247, Type I.

3006 PAVEMENT MARKING CONSTRUCTION REQUIREMENTS

3006.1 Scope

This section governs the installation and removal of pavement markings as shown on the Plans or as specified in the Project Special Provisions.

3006.2 Surface Preparation

The surface on which markings are to be placed shall be clean and dry. The street surface shall be cleaned of debris, sand, or any other deleterious material by sweeping and or use of jets of compressed air immediately preceding the application of markings. New PCC pavements shall be blast-cleaned to remove all curing compounds.

3006.3 Weather Limitations

The pavement surface temperature and air temperature shall be determined before the start of each day of marking operation and at any other time deemed necessary by the City Engineer, or assigned designee. Temperatures shall be obtained with appropriate devices using the manufacturer's recommended procedure.

The pavement markings shall not be applied if the pavement shows any visible signs of moisture or it is anticipated that damage causing moisture, such as rain showers, may occur during the installation and curing periods.

3006.4 High-Build Paint Application

Paint shall be machine applied using spray guns designed and adjusted to apply paint at the required thickness and width. If there is any evidence of gun clogging, splattering or uneven paint distribution, painting operations shall cease until equipment is restored to proper operation. Paint shall be applied from a vehicle that was specifically manufactured for pavement marking applications.

The pavement surface temperature and ambient air temperatures shall be above 50° F during all times when paint is being applied. Paint shall not be applied if the forecast conditions for the eight hours immediately following final application include precipitation. High-build paint shall be applied to a minimum wet thickness of 20 mils. Paint may be heated to a maximum temperature of 150° F before application.

Drop-on glass beads shall be mechanically applied to the wet paint directly behind the paint spray guns. Glass beads shall be applied evenly at a minimum rate of 9 pounds per gallon of paint. Glass beads shall be applied evenly and shall completely cover the painted area. If beads do not embed properly in the paint, all marking operations shall cease until the Contractor can demonstrate that the problem has been corrected.

The glass beads shall appear uniform on the entire marking surface. The cured paint shall properly adhere to the pavement surface. If the marking paint does not provide initial retroreflectivity or if the marking does not have the required minimum thickness or required color, the Contractor shall re-apply the marking paint to the required thickness, at the Contractor’s expense, and shall meet all requirements as previously described.

3006.5 Pre-Formed Thermoplastic Application

To apply pre-formed thermoplastic, use a heating device recommended by the material manufacturer to fuse the pre-formed thermoplastic to the pavement. Apply the pavement markings as recommended by the manufacturer. When recommended by the manufacturer, use solvent or other type of adhesive primer. Remove all existing markings or exposed aggregate before applying pre-formed thermoplastic.

3006.6 Thermoplastic Application

Thermoplastic material shall be applied to the pavement by the extrusion method wherein one side of the shaping die is the pavement and the other three sides are contained by, or a part of, suitable equipment for heating and controlling the flow of material. The equipment used to install hot thermoplastic materials under this Specification shall be constructed to provide mixing and agitation of the materials. Conveying parts of the equipment between the main material reservoir and the shaping die shall be so constructed as to prevent accumulation and clogging. All parts of the equipment that come in contact with the material shall be constructed as to be easily accessible and exposable for cleaning and maintenance. The equipment shall be constructed so that all mixing and conveying parts up to and including the shaping die will maintain the materials at a temperature not less than 375° F. To assure that the thermoplastic does not fall below the minimum temperature, the shaping die shall be heated by means of a gas-fired infrared heater or a heated, oil-jacketed system. The equipment shall be so constructed as to insure continuous uniformity in the dimensions of the stripe. The applicator shall provide a means for cleanly cutting off square stripe ends and shall provide a method of applying "skip" lines. The use of pans, aprons or similar appliances that the die overruns will not be permitted under this Specification. The equipment shall be so constructed as to provide for varying die widths and to produce varying widths of traffic marking.

A special kettle shall be provided for melting and heating the thermoplastic material. The kettle must be equipped with a thermostat so that heating can be done by controlled heat transfer liquid rather than by direct flame, so as to provide positive temperature control and prevent overheating of the material. The heating kettle and applicator shall be so equipped and arranged as to meet the requirements of the National Board of Fire Underwriters, of the National Fire Protection Association, of the state and local authorities.

Glass beads applied to the surface of the completed strip shall be applied by an automatic bead dispenser attached to the striping machine in such a manner that the beads are dispensed almost instantaneously upon the installed line. The glass bead dispenser shall be equipped with an automatic cut-off control synchronized with the cut-off of the thermoplastic material.

The equipment shall be so arranged as to permit preheating of the pavement immediately prior to application of the thermoplastic material if preheating is recommended by the thermoplastic manufacturer. The applicator shall be mobile and maneuverable to the extent that straight lines can be followed and normal curves can be made in a true arc. The applicator shall be capable of containing a minimum of 125 pounds of molten material.

The pavement and ambient air temperatures shall be not less than 55° F, and the thermoplastic material shall be applied in a melted state at a temperature of 375° F to 450° F. The temperature of the thermoplastic in the shaping die shall be maintained at the manufacturer's recommended application temperature, but in no case shall the temperature fall below 375° F.

The finished lines shall have well defined edges and be free of waviness. All lines will have minimal dribbles, runs and overlaps. In the event that thermoplastic long lines must stop and then continue, the restart shall line up to within 0.5 inches of the existing long line and maintain a

totally straight line. The minimum thickness of thermoplastic lines shall be not less than 90 mils near the edges, nor less than 125 mils at the center. The drop-on glass beads shall be applied at a rate of one pound per 20 square feet of line.

3006.7 Urethane Application

The urethane pavement marking compounds shall be applied through equipment specifically designed to precisely meter the two components in the ratio of 2:1. This equipment shall produce the required amount of heat at the mixing head and gun tip and maintain those temperatures within the tolerances specified. This equipment shall also have as an integral part of the gun carriage, a high pressure air spray capable of cleaning the pavement immediately prior to the marking application.

The equipment shall be capable of spraying both yellow and white urethane, according to the manufacturer's recommended proportions and be mounted on a truck of sufficient size and stability with an adequate power source to produce lines of uniform dimensions and prevent application failure. The truck shall have at least two urethane tanks each of 110 gallon minimum capacity and shall be equipped with hydraulic systems and agitators. It shall be capable of applying glass beads by the double drop pressurized bead system. The system shall apply both the first drop glass beads and the second drop glass beads at a rate of 10 lb/gal. The equipment shall be equipped with pressure gauges for each proportioning pump. All guns shall be in full view of operators at all times. The equipment shall have a metering device to register the accumulated installed quantities for each gun, each day. Each vehicle shall include at least one operator who shall be a technical expert in equipment operations and urethane application techniques.

The pavement markings shall be applied at a minimum uniform wet thickness of 20 mils in accordance with the manufacturer's installation instructions. At the time of installation the pavement surface temperature and the ambient temperature shall be above 35° F and rising. Urethane shall not be applied if the forecast conditions for the eight hours immediately following final application include precipitation.

3006.8 Pavement Marking Removal

All pavement marking removal shall be per the Plans or as authorized by the City Engineer, or assigned designee. Pavement markings shall be completely removed with minimal damage to the pavement. No more than five percent of the existing marking shall remain. The pavement surface shall not be left scarred with an image that misleads traffic. Any excess damage or scarring of the pavement shall be repaired at the Contractor's expense.

3006.9 Deficiencies

The Contractor shall remove and replace, at the Contractor’s expense, any finished markings that have the following deficiencies:

- Drag marks, gashes, gouges, foreign covering, discolored areas, or areas that have failed to solidify

- Improper adhesion, length or thickness
- Ragged appearance with areas that do not present sharply defined edges
- Lateral deviation in excess of two inches in a length of 200 feet of marking

3006.10 Final Clean Up

Before final acceptance, the Contractor shall restore to a condition equal to or better than that existing prior to construction all property, both public and private, within, adjacent to and beyond the limits of construction that have been disturbed or damaged while executing the work. The Contractor shall be responsible for removing all pavement marking material spilled upon the road surface or adjoining area. All restoration work shall be acceptable to the City Inspector.

3007 PAVEMENT MARKING MEASUREMENT AND PAYMENT

Measurement and payment shall be specified in the contract documents.

3008 TEMPORARY TRAFFIC CONTROL GENERAL

3008.1 Scope

The safety and mobility of all right-of-way users, including workers, drivers, and pedestrians throughout the project area is of paramount importance and shall be the responsibility of the Contractor. All work performed, whether in the right-of-way or adjacent to the right-of-way, that impacts vehicular or pedestrian traffic in any way shall be properly signed, marked, barricaded, and otherwise protected. This work shall consist of furnishing of all material, equipment, and labor to provide safe temporary traffic control within or adjacent to the area of work.

3008.2 Codes and Standards

All work and material shall be in accordance with the latest requirements of the Manual on Uniform Traffic Control Devices (MUTCD), Standard Highway Signs (SHS), American Traffic Safety Services Association (ATSSA) Quality Standards for Work Zone Traffic Control Devices, Standards of the American Society of Testing Materials (ASTM), National Cooperative Highway Research Program (NCHRP) Report 350, Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG), City of Blue Springs Pavement Marking and Signing specifications and standards, and all applicable local ordinances.

3008.3 Modification of Specifications

These Specifications may be modified or deleted by appropriate items in the Project Special Provisions or by written authorization by the City Engineer.

3008.4 Traffic Control Plans

If a traffic control plan is not part of the Plans the Contractor shall submit a traffic control plan in accordance with the Manual on Uniform Traffic Control Devices (MUTCD) as well as all

federal, state, and local regulations and ordinances. Contractor is responsible for obtaining the Public Works Department's approval of said traffic control plan, before implementation.

If the Contractor would prefer to use a traffic control plan that differs from the approved plans, the Contractor may request modifications to the traffic control plan. The Contractor will submit a plan based on the timeframes and requirements of the Contract. Contractor is responsible for obtaining the Public Works Department's approval of said traffic control plan, before implementation.

Based on field conditions or unforeseen circumstances, the Contractor and/or Public Works Department may request modifications to the traffic control plan, whether it is the approved plan or the Contractor's plan.

The Contractor is required to maintain access to all properties served by the streets within the construction site limits.

3008.5 Minimum Requirements

The temporary traffic control requirements shown on the Plans are minimum requirements only and do not attempt to address in depth the variety of situations that may occur once construction has begun. In no way do the requirements shown on the Plans relieve the Contractor of his responsibility for selecting proper traffic control devices and implementation procedures that will assure the safety of motorists, pedestrians, and workers at all times. The Contractor shall be fully responsible for damage or injuries whether or not traffic control devices have been provided.

3008.6 Incidental Work and Parts

Work incidental to temporary traffic control that is not covered in these Specifications shall be performed in accordance with the City of Blue Springs specifications and standards. All incidental parts, which are not shown on the Plans or specified in the Specifications and which are necessary to provide proper traffic control, shall be supplied and installed by the Contractor to the satisfaction of the Public Works Department. No additional payments will be made for incidental work or parts.

3008.7 Permits and Inspections

The Contractor shall contact the City Inspector 48 hours prior to installing any traffic control devices. The Contractor is responsible for obtaining all necessary permits from the City, and is responsible for all associated costs, before any work can begin. The City Inspector shall inspect and approve the final location of all traffic control devices.

3009 TEMPORARY TRAFFIC CONTROL MATERIALS AND EQUIPMENT

3009.1 Scope

This section governs the furnishing of all channelizers, construction signing, barricades, and other material and equipment supplied by the Contractor, as required, to implement the

temporary traffic control as shown on the Plans or as specified in the Project Special Provisions. All equipment and material shall be in good condition, and shall meet the approval of the City Engineer.

3009.2 Construction Signs

All construction signs shall comply with the size, shape, legend, layout, and color requirements of the MUTCD and Standard Highway Signs book. For all signs that will be used at night, the legend, border, and background other than black shall be made from high intensity retro-reflective sheeting.

Supports or posts used for mounting signs or devices shall be designed to yield upon impact to minimize hazards to motorists, and be approved by NCHRP Report 350. Portable sign supports should not be used for durations of more than three (3) days. Sand bags shall not be used as ballast for sign supports for durations of more than seven (7) days. Supports and posts shall not be installed in pavement.

For mobile operations, a sign may be mounted on a work vehicle, a shadow vehicle, or a trailer stationed in advance of the work area or moving along with it.

3009.3 Channelizers

Channelizers, including cones, tubular markers, drums, and trim-lines shall comply with the size, shape, legend, layout, and color requirements of the MUTCD. Trim-line channelizers are the preferred channelizing devices. Cones may not be used at nighttime.

3009.4 Barricades

Barricades shall comply with the size, shape, legend, layout, and color requirements of the MUTCD. Contractor shall be responsible for removing and cleaning up any sand bags that have sand escaping from them.

3009.5 Arrow Panels

Arrow panels are a matrix of lamps capable of flashing or sequential displays, to be used where necessary to divert traffic. Two types of arrow panels are acceptable for use on City streets; Type C and Type D, meeting the requirements listed in the MUTCD.

3009.6 Warning lights

Type A, B, and C Warning lights shall be portable, battery powered, yellow, enclosed lights. All types of warning lights shall be in accordance with the current edition of "Purchase Specification for Flashing and Steady-Burn Warning Lights", published by the Institute of Transportation Engineers.

3009.7 Temporary Pavement Markings

Temporary pavement markings on finish surface pavement or existing surface pavement shall be removable retro-reflective polymer marking tape. When installed on pavement that will be

removed, surfaced, or resurfaced, temporary pavement markings shall be water-borne traffic paint or removable retro-reflective polymer marking tape.

3009.8 Portable Changeable Message Boards

Portable changeable message boards may be provided by the City at the discretion of the Public Works Department. The Engineer shall coordinate the use of portable changeable message boards with the City's Public Works Operations Division. The Operations Division shall be notified at least five (5) days before a portable changeable message board is required. All messages displayed on the boards shall be approved by the City Engineer.

3009.9 Temporary Concrete Traffic Barrier

Temporary concrete traffic barrier shall be per the standards and specifications of the Missouri Department of Transportation (MoDOT).

3010 TEMPORARY TRAFFIC CONTROL CONSTRUCTION REQUIREMENTS

3010.1 Scope

This section governs the installation and placement of traffic control devices as shown on the Plans, the Standard Drawings, and as specified in the Project Special Provisions. All temporary traffic control shall be in conformance with the MUTCD.

3010.2 Sign Installation

The installation of all construction signage shall be in compliance with the MUTCD and the City of Blue Springs Standard Drawings for Signing. All existing and temporary construction signs shall be removed or covered when they are not applicable. No sign posts shall be installed in paved surfaces in a manner that could cause damage to the finished surface.

Signs shall be properly maintained for cleanliness, visibility, and correct positioning. Signs that have lost significant legibility shall be promptly replaced.

Type B warning lights shall be installed in conjunction with all construction warning signs that will be in place at nighttime, which alert road users about a change in alignment, traffic control, lane closure, or road closure. Warning lights shall be mounted on signs in a manner that, if hit by an errant vehicle, they will not be likely to penetrate the windshield.

3010.3 Temporary Pavement Marking Installation

Temporary pavement markings are required to delineate the travel way for vehicles when the intended traffic pattern differs from the normal traffic pattern for a duration of three calendar days or more. The installation of all temporary pavement markings shall be in compliance with the MUTCD and the City of Blue Springs Standard Drawings for Pavement Marking.

All travel lanes should be at least 11 feet wide, however a minimum lane with of 10 feet may be allowed if approved by the Public Works Department. A "Narrow Lanes" sign shall be installed in accordance with the latest requirements of the Manual on Uniform Traffic Control Devices (MUTCD).

Where temporary pavement markings are to be placed on a surface which has existing markings, the incorrect markings shall be removed or obscured to the fullest extent possible without damage to the pavement surface. Any appreciable damage or different appearance from the surrounding surface shall be repaired by the Contractor at his expense, by methods approved by the Public Works Department.

On the finish surface of pavement, interim markings are required if the permanent pavement markings cannot be installed within 24 hours. Interim markings on finish surface of pavement shall consist of four inch (4") wide by two feet (2') long stripes on the center line of the street or lane line, at approximately 50 foot spacing. Interim markings shall be the same color and configuration as the permanent pavement markings.

3010.4 Placement of Channelizers

Channelizers shall be used to delineate the travel way for vehicles when the intended traffic pattern differs from the normal traffic pattern on a street. Channelizers shall be spaced as indicated in the MUTCD.

Type C warning lights may be mounted on channelizers that delineate the edge of the travel way. If warning lights are installed on channelizers, they shall be mounted in a manner that, if hit by an errant vehicle, they will not be likely to penetrate the windshield.

3010.5 Lane Closures

Lane closures are not permitted on arterial or collector streets before 9:00 A.M. and after 4:00 P.M. Monday thru Friday, nor anytime on Saturday, Sunday or holidays observed by the City unless prior approval is received through the Public Works Department. Emergency repairs will be evaluated on a case-by-case basis. The Contractor shall not store materials or park vehicles within an otherwise moving lane of traffic.

All lane closures for durations longer than 30 minutes shall be signed and delineated with traffic control devices as illustrated in the Standard Drawings. Lane closures for durations of 30 minutes or less are considered to be short duration or mobile operations. Lane closures for short duration or mobile operations, at a minimum, shall require that a vehicle be equipped with high-intensity rotating beacon, flashing beacon, oscillating beacon, or strobe lights. Warning signs, channelizers, and/or arrow panels should also be considered, if possible.

The Public Works Department reserves the right to suspend or delay certain operations to adequately provide for the movement of traffic. This may include periods of inclement weather or unusually heavy traffic.

3010.6 Flaggers

Flaggers are required anytime vehicles are directed to cross into an opposing lane of traffic on arterial or collector streets. If proper line-of-sight cannot be provided at intersections, drives, or curves, flaggers will also be required. Flaggers shall be trained by an ATSSA certified program. Flaggers shall be equipped with a STOP/SLOW paddle, and must be properly attired per the requirements of the MUTCD.

3010.7 Street or Sidewalk Closures

All street or sidewalk closures must be approved by the Public Works Department. If a detour route will be provided around the closure, the detour route signing must be inspected and approved before the street or sidewalk can be closed.

When a section of street is completely closed to traffic, Type 3 barricades shall be erected at the points of closure. Barricades must extend completely across a roadway and its shoulders or from curb to curb. Type A warning lights should be installed on each Type 3 barricade used to alert drivers of a closure. Where provisions must be made for access of equipment and authorized vehicles, the Type 3 barricades should be provided with gates or movable sections that can be closed when work is not in progress, or with indirect openings that will discourage public entry. Where access is provided through the Type 3 barricades, the Contractor shall assure closure at the end of each working day.

When a street is closed, but access must still be allowed for local traffic, the Type 3 barricades usually are not erected completely across a roadway. Instead, an arrangement should be devised that will permit local use but effectively discourage use by through traffic. A sign with the appropriate legend concerning permissible use by local traffic shall be installed.

Whenever possible, a section of sidewalk that is removed should be replaced the same day, or other materials may be used to temporarily fill the area in order to maintain pedestrian traffic.

3010.8 Detours

All detour routes are subject to the approval of the Public Works Department. Where detours are permitted, all necessary detour route signing must be installed a minimum of 48 hours before the detour is in effect to allow for inspection. All detour signing shall utilize high intensity retro-reflective sheeting. While traffic is detoured, construction operations shall be expedited. Periods when detours are allowed will be strictly enforced.

3010.9 Excavations, Embankments, and Obstructions

The Contractor shall be responsible for maintaining all safeguards around excavations, embankments, obstructions, or open trenches on an around-the-clock basis, whether or not work is being actively pursued.

An all-weather surface wedge capable of supporting vehicles should be provided adjacent to an edge drop-off of more than two inches (2”), but less than four inches (4”). Such a wedge should have a slope no greater than 1:1. An all-weather surface wedge capable of supporting vehicles

shall be provided adjacent to an edge drop-off of more than four inches (4”). For drop-offs of more than four inches (4”), the maximum slope of the wedge shall be 3:1. Concrete traffic barrier may be used in lieu of wedge; and should be considered if an edge drop-off exceeds twenty-four inches (24”), or for other factors such as the presence of heavy machinery or workers. “Shoulder Drop Off” signs (MUTCD No. W8-9) shall be installed adjacent to any edge drop-off of more than two inches (2”) that is not protected by a wedge or barrier.

If it is necessary to leave a trench excavated in the street open during times when work is not actively being pursued, the Contractor shall provide structurally adequate steel plates to bridge the excavation. All steel plates shall be A36 certified steel, minimum one inch (1”) thick, with lift hooks, securely fastened to the pavement with stakes or pins. Steel plates shall be installed per the requirements of the City of Blue Springs specifications and standards.

Orange mesh temporary fencing shall be installed around all excavations outside the street during times when work is not actively being pursued. Fencing shall be at least four feet (4’) in height, bright orange in color, and attached to posts capable of supporting the fencing without significant sagging or bowing. If the excavation or an obstruction extends into a sidewalk or driveway, a Type 2 barricade with a Type A warning light should be placed adjacent to the fencing or obstruction to warn of the hazard.

3010.10 Additional Traffic Control

The Public Works Department may require additional signs, channelizers, barricades, warning lights, flaggers, or other traffic control devices at any time or at any place that, in his opinion, are necessary for proper protection of vehicular or pedestrian traffic and workers.

3010.11 Maintenance Work

The Contractor shall be responsible for maintaining all traffic control devices on an around-the-clock basis, whether or not work is actively being pursued. All traffic control devices shall be maintained in acceptable condition as defined by the latest ATSSA “Quality Standards for Work Zone Traffic Control Devices.” Devices in unacceptable or marginal condition as determined above shall be removed from the job site and replaced with devices in acceptable condition. The Contractor shall be responsible for cleaning all temporary traffic control devices as needed so that they have a neat and clean appearance at all times.

The Contractor shall be responsible for periodic checks of traffic control devices at night to verify that all devices are visible to drivers.

3010.12 Deficiencies

Deficiencies in traffic control shall be corrected immediately. Should the Contractor fail to enforce the traffic control plan or fail to clean, replace, or otherwise maintain the traffic control devices within 24- hours of verbal or written notice from the City Engineer or designee, the City may take one or more of the actions listed on the following page:

A. City or another agency employed by the City may correct deficiencies in signing or warning devices and deduct the cost from the Contractor's pay estimate,
B. Stop the work until deficiencies are corrected,
C. Suspend all pay estimates until deficiencies are corrected, or
D. Place the Contractor in default.

3010.13 Final Clean Up

Before final acceptance, the Contractor shall restore to a condition equal to or better than that existing prior to construction all property, both public and private, within, adjacent to and beyond the limits of construction that have been disturbed or damaged while executing the work. This includes, but not limited to, existing curb and gutter, sidewalk, pavement, drainage structures, irrigation systems, street lighting and traffic signal equipment. All unpaved areas damaged during construction shall be restored to the original condition. Unless otherwise directed, grassy areas which were originally sodded shall be re-sodded. Restoration work shall be at the Contractor's expense. All restoration work shall be acceptable to the City Inspector.

3011 TEMPORARY TRAFFIC CONTROL MEASUREMENT AND PAYMENT

Measurement and payment shall be specified in the contract documents.

Blue Springs, Missouri
Public Works Department

SECTION 3500 - SANITARY SEWERS

CITY OF BLUE SPRINGS, MISSOURI
CONSTRUCTION SPECIFI CATIONS

(We are adopting the 2017 APWA Sanitary Sewer Standards Section 2500 with certain exceptions as specified in the 2018 Blue Springs Supplement)

3501 MATERIALS 2
A. General 2
B. Pipe and Fittings for Sanitary Sewers 2
C. PVC Sewer Pipe and Fittings 3
D. Ductile Iron Fittings (Only) 4
E. HDPE Pipe and Fittings 4
F. Granular Bedding Aggregate Material 5
G. Backfill 5
H. Trench Checks 5
I. Pipe Encasement 5
J. Pipe Collars 5
K. Pipe Anchors 5
L. Building Sewer Stubs 5
M. Casing pipe 5
O. Manholes 6
P. Utility Markers (Pressurized Installation Only) 10
3502 CONSTRUCTION AND INSTALLATION 10
A. General 10
B. Sanitary Sewer Installation 12
C. Acceptance Tests for Completed Sewers 20
D. Manhole Installation: 25
E. Acceptance Testing for Completed Manholes 28
3503 ACCEPTABLE MANUFACTURERS AND MODELS 28
A. General 29

3501 MATERIALS

A. General: All materials shall conform to the latest revision of the reference standard applying to that particular material.

B. Pipe and Fittings for Sanitary Sewers

1. Allowable Materials: Pipe and fitting materials used in the construction of sanitary sewers shall be:

    a. Polyvinyl Chloride (PVC)
    b. High Density Polyethylene (HDPE) (for force mains only)
    c. Ductile Iron (DI) special thickness Class 50 (for fittings only) & Class 52 (for aerial crossings only). Pipe and fittings shall have a hydrogen sulfide resistant ceramic quartz filled amine cured novalac epoxy interior lining, 40 mil nominal thickness.

2. Requirements: The pipe manufacturer shall furnish pipe of materials, joint types, sizes, and strength classes indicated and specified. The Contractor shall furnish maximum pipe lengths normally produced by the manufacturer except for fittings, closures, and appurtenances.

3. Manufacturer's Experience: The Manufacturer shall be experienced in the design, manufacture, and commercial supplying of the specified material.

4. Inspection and Testing: Inspection and testing shall be performed by the Manufacturer's quality control personnel in conformance with applicable standards.

5. Markings: Each pipe or fitting shall have the following information plainly and permanently marked by indenting on the outside surface of the pipe or painted thereon with waterproof paint:

    a. Pipe size and class or designation.
    b. Date manufactured and lot number.
    c. Manufacturer's name or trademark.

6. Handling: The Manufacturer and Contractor/Developer shall use equipment and methods adequate to protect the pipe and joint elements and to prevent shock contact of adjacent units during moving or storage. Damaged sections that cause reasonable doubt as to their structural strength or water-tightness shall be rejected.

7. On-Site Inspection: All pipe and appurtenances shall be inspected by the City Inspector prior to installation, and all damaged pieces, as well as any pieces not complying with the City of Blue Springs Standard Specifications, shall be immediately removed and replaced by pipe and appurtenances as may be acceptable to the Inspector at the expense of the Contractor/Developer.

8. Certification: Suppliers shall submit certifications with their material delivery. These certifications shall be given to the Inspector.

C. PVC Sewer Pipe and Fittings

1. PVC Sewer Pipe and Fittings (4-inch through 15-inch diameters only): Pipe and fittings shall conform to ASTM D 3034 and F1336, except as otherwise specified herein.

    a. Material: The pipe shall be made of PVC plastic having a cell classification of 12454B or 12364B as defined in ASTM D 1784. The fittings shall be made of PVC plastic having a cell classification of 12454B or 13343B as defined in ASTM D1784.

    b. Design: Pipe shall have an integral wall bell and spigot joint and a minimum wall thickness complying with SDR 26. Fittings shall have a minimum wall thickness complying with SDR 26.

    c. Joints: Joints shall conform to ASTM D 3212. Joints shall be push-on type only with the bell-end grooved to receive a gasket. Elastomeric seals (gasket) shall have a basic polymer of synthetic rubber complying with ASTM F 477. Natural rubber gaskets shall not be accepted.

    d. Fittings:

        i. Fittings defined as wye connections suitable for assembly to 4- or 6-inch building sewers shall be bell-end with a minimum wall thickness complying with SDR 26 and shall be furnished by the pipe manufacturer.

        ii. Fittings shall be clearly marked with their SDR number. The markings shall be applied to the fittings in such a manner that they remain legible after installation and inspection has been completed.

2. PVC Pressure-Rated Pipe (SDR Series): Pipe shall conform to ASTM D 2241 except as otherwise specified herein.

    a. Material: The pipe shall be made of PVC plastic having a cell class of 12454B or 14333B, as defined in ASTM D 1784.

b. Design: Pipe shall have an integral wall bell and spigot joint. Pipe shall have a minimum wall thickness complying with Table 2 in ASTM 2241.

c. Joints: Joints shall conform to ASTM D 3212 for gravity lines and ASTM D 3139 for pressure lines. Joints shall be push-on type only with the bell-end grooved to receive a gasket. Elastomeric seals (gasket) shall have a basic polymer of synthetic rubber complying with ASTM F 477. Natural rubber gaskets shall not be accepted.

d. Fittings: Fittings shall be DI and shall conform to the requirements of Paragraph 3501.D.

D. Ductile Iron Fittings (Only): Fittings shall conform to ANSI/AWWA C151/A21.51, ANSI/AWWA C110/A21.10, and ANSI/AWWA C153/A21.53, except as otherwise specified herein.

1. Design: All DIP fittings shall meet the requirements of ANSI/AWWA C150/A21.50 and ANSI/AWWA C151/A21.51.

2. Joints: Mechanical and push-on joints for pipe and fittings shall conform to the requirements of ANSI/AWWA C111/A21.11. Natural rubber gaskets shall not be accepted.

3. Coatings: Fittings shall be furnished with exterior bituminous coating complying with ANSI/AWWA C151/A21.51.

4. Polyethylene Encasement: All ductile iron pipe fittings shall be installed with a polyethylene tube encasement having a thickness of 0.008 inches (8 mils) and complying with Section 4.1.1. of ANSI/AWWA C105/A21.5.

E. HDPE Pipe and Fittings: Pipe and fittings shall conform to ANSI/AWWA C901 and ANSI/AWWA C906 except as otherwise specified herein.

1. Material: The pipe and fittings shall be made of polyethylene (PE) plastic having a grade if PE34 with a minimum cell classification of 345464C, as defined in ASTM D 3350.

2. Design: All HDPE pipe and fittings shall meet the requirements of ANSI/AWWA C901 and ANSI/AWWA C906. Pipe shall have an integral wall bell and spigot joint and a minimum wall thickness complying with DR 11. The pressure class shall be 1.5 times the working pressure plus 100 psi surge allowance.

3. Fittings: HDPE fittings shall comply with ANSI/AWWA C906 and the requirements of ASTM D 2683 for socket-type fittings, ASTM D 3261 for butt heat fusion fittings, and ASTM F 1055 for electrofusion type fittings.

F. Granular Bedding Aggregate Material: See Section 2100.

G. Backfill: See Section 2100.

H. Trench Checks: Trench checks shall consist of MCIB Mix No. A-535-3/4-2-0.410.

I. Pipe Encasement: Concrete used for pipe encasement shall be MCIB Mix No. A-535-3/4-2-0.410. Reinforcing steel shall be new billet steel complying with the requirements of ASTM A 615, Grade 60.

J. Pipe Collars: Concrete used for pipe collars, whether reinforced or non-reinforced, shall be MCIB Mix No. A-535-3/4-2-0.410. Reinforcing steel, when required, shall be new billet steel complying with the requirements of ASTM A 615, Grade 60.

K. Pipe Anchors: Concrete used for pipe anchors, whether reinforced or non-reinforced, shall be MCIB Mix No. A-535-3/4-2-0.410. Reinforcing steel, when required, shall be new billet steel complying with the requirements of ASTM A 615, Grade 60.

L. Building Sewer Stubs: Building sewer stubs shall be SDR 26 (minimum) PVC.

   a. Old building sewers may be used in connection with new buildings but will be required to be rehabilitated with an insituform or approved equal liner.

M. Casing pipe

   1. Pipe

      a. The casing pipe shall be made of steel, meeting the requirements of ASTM A 139, grade B, with a minimum yield strength of 35,000 psi.

      b. The minimum wall thicknesses required are shown in the following table:

Casing Diameter (inch)	Minimum Wall Thickness
10, 12, 14, 16	0.188” (3/16”)
18, 20, 22	0.250” (1/4”)
24, 26	0.281” (9/32”)
28, 30, 32, 34	0.312” (5/16”)
36, 38, 40, 48	0.344” (11/32”)

   2. Pipe Supports:

a. Casing Spacers: Casing spacers shall be a two-piece shell or band made from T-304 stainless steel of a minimum 14 gauge thickness. The shell/band shall have risers made of 10 gauge T-304 stainless steel and have a PVC liner. The bearing surface (skid or runner) shall be made of an ultra-high molecular weight polymer, glass reinforced polyester, or fiberglass reinforced nylon. The shell/band shall be bolted together with T-304 stainless steel bolts. The configuration of the carrier pipe in the casing pipe shall be centered. End seals shall be made by the same manufacturer as the casing spacers and shall use stainless steel bands to hold end seals to pipes.

3. Ends of the Casing Pipe: The ends of the casing pipe shall be closed with one of the following:

a. Manufactured end seal.
b. Concrete plug with allowances for water flow.

O. Manholes

1. Precast Sections: Precast concrete manholes shall conform to ASTM C 478 with the following modifications.

a. Four foot diameter manholes are required to have a precast invert.

b. Wall thickness not less than one-twelfth of the inside diameter or 5 inches, whichever is greater, shall be used.

c. Cement, fine aggregate, coarse aggregate and water used in the manufacture of precast manholes shall be as specified in MCIB, Section No. 1 (Materials). ***All concrete shall be corrosion resistant using*** ConmicShield® ***or approved equal antimicrobial additive with Content colorant or approved equal added.***

d. Integral cast bases shall be used unless prior approval is obtained from the City Engineer. The diameter of the base pad shall be 8 inches greater than the outside diameter of the manhole.

e. Pipe penetrations shall be fitted with a flexible pipe-to-manhole connector.

f. The minimum distance from the invert of the downstream pipe to the top surface of the base shall be 3 inches.

g. Riser Rings

i. Paved (Roadway): Precast riser rings shall be 4 or 6 inches in thickness and shall use East Jordan Iron Works INFRA-RISER® rubber composite adjustment riser or approved equal.

ii. HDPE (Non-Pavement Areas): Injection-molded HDPE adjusting rings as manufactured by Ladtech, Inc. or equal.

2. Cast-In-Place-Concrete: Concrete shall comply with the requirements of MCIB Mix No. A-535-3/4-2-0.410.

3. Reinforcing Steel: Reinforcing steel shall be new billet steel complying with the requirements of ASTM A 615, Grade 60.

4. Joint Sealant

   a. Between Precast Sections: Joints between precast manhole pipe sections, and between the manhole casting frame and precast manhole pipe sections, shall be sealed with preformed butyl joint sealants meeting the requirements of ASTM C 990. The minimum bead dimension shall be 1 square inch. The butyl component of the preformed joint sealant shall consist of 60-percent (minimum) butyl rubber. Preformed joint sealants shall remain flexible at temperatures as low as 0° F.

   b. Exterior of Joints: The exterior of all joints, including the joint between the manhole casting frame and the precast manhole pipe sections, shall be sealed with one of the following:

      i. Conseal CS-212 or Infi-Shield 6” Gator Wrap, or an approved equal: The butyl component of the tape shall consist of 50 percent (minimum) butyl rubber, shall contain 2 percent or less volatile matter, and shall be 0.030 inches thick. The backing component shall be EPDM rubber. A release paper may be utilized.

      ii. The casting can be sealed to the structure with an external sealing system. The seal shall be a continuous band, made of EPDM (Ethylene Propylene Diene Monomer) rubber with a minimum thickness of 65 mils. Each unit shall have a 2-inch wide mastic strip on the top and bottom edge rubber band. The mastic shall be non-hardening butyl rubber sealant, with a minimum thickness of ¼-inch, and shall seal to the cone/top of the manhole and over the lip of the casting. Prior to placement of the mastic against the manhole or casting, the surfaces shall be coated with a primer capable of enhancing the mastic adhesion. The primer coat shall cover the entire surface area where the mastic is intended to adhere.

5. Non-Shrink Grout: Non-shrink grout shall be in the plastic state and show no expansion after set as tested in accordance with ASTM C 827 and shall develop compressive strength not less than 3,000 pounds per square inch with a trowelable mix within 24 hours per ASTM C 109. The placement time shall be not less than 45 minutes based on initial set per ASTM C 191.

6. Gasket: Pipe openings shall contain flexible gaskets complying with the requirements of ASTM C 923.

7. Waterproofing: All precast sections shall be waterproofed prior to shipment to the project site. Waterproofing shall be accomplished using one of the following coatings:

    a. Exterior manhole surfaces shall be coated with one of the following materials:

        i. A total dry film thickness of not less than 14.0 mils of bituminous coating.

        ii. A total dry film thickness of not less than 4.0 mils of Tnemec Series 66 Hi-Build Epoxiline or approved equal.

8. Manhole Castings

    a. Material for all iron castings shall comply with the requirements of "Drainage Structure Castings," AASHTO M306, Section 3, except if cast iron is used, it shall be ASTM A48/AASHTO M105, Class 30B or better.

    b. Workmanship and Finish: Manhole castings shall comply with the requirements of AASHTO M306, Paragraphs 4.1 and 5.1. All castings shall be manufactured true to pattern and component parts shall fit together in a satisfactory manner.

    c. Chemical Composition and Hardness: Chemical composition and hardness shall be as follows:

Property	Range
Total Carbon	2.8-4.0%
Manganese	0.3-0.8%
Phosphorus	0.05-0.25%
Sulfur	0.05-0.15%
Silicon	1.8-3.0%
Chromium	0.05-0.2%
Nickel	0.0-0.1%
Hardness	200-240 Brinell

    d. Seating and Bearing Surfaces: All horizontal-bearing surfaces shall be machined. Castings shall conform to the requirements of AASHTO M306, Paragraph 4.3.

    e. Rating: Castings shall be heavy duty and capable of handling loads of at least 40,000 pounds. Proof-load testing shall conform to the requirements of AASHTO M306, Section 7. Proof-load testing is not required for the adapters.

    f. Markings:

i. Imported castings shall meet the country-of-origin markings as required in Title 19, Code of Federal Regulations, Part 134 (19 CFR 134).

ii. Lettering for country-of-origin marking shall not exceed 1 ½ inches.

iii. Castings shall conform to the requirements of AASHTO M306, Section 11. Julian heat date shall be cast, not stamped, into the castings.

g. Dimensional Tolerances: The dimensions of all castings shall be within the permissible variations specified in AASHTO M306, Paragraph 4.2, except 4.2.4 shall be replaced with the following: No casting shall weigh less than 95 percent of the specified weight shown on Standard Detail Drawing SAN-05.

h. Frames and Covers: Frames and covers shall meet the following minimum requirements:

i. Critical dimensions and Blue Springs part numbers shown on Standard Detail Drawing SAN-05.

ii. All manhole frames (except the slab bolt-down manhole frame) shall be designed and delivered with a full mud ring. Partial projections shall not be accepted.

iii. All covers shall have two concealed pick holes that meets the manufacturer's requirements.

iv. All covers shall have the "City of Blue Springs" and "Sewer" cast into the piece in 1½ inch and 3 inch letters, respectively.

v. Castings shall be fully interchangeable in the field with the equivalent models indicated on the city's standard detail sheets number SAN-05.

vi. Covers marked with other cities' names and/or logos shall not be accepted.

9. Epoxy Manhole Liner: Epoxy manhole liner for existing manholes downstream of force main sanitary sewer system shall meet the following minimum requirements:

a. Epoxy Manhole Liner for Manholes: The epoxy manhole liner shall be chemical resistant (below a pH of 2.0), VOC compliant, moisture tolerant, 100% solids, two (2) component epoxy system with the following properties:

Flexural Strength [ASTM D-790]: >10,000 psi

Compressive Strength [ASTM D-695]: >10,000 psi

Tensile Strength [ASTM D-638]:	>7,000 psi
Adhesion:	Concrete Substrate Failure

b. The epoxy liner shall consist of Ultrabuild Epoxy System as provided by Citadel Technologies, Inc. or approved equal.

P. Utility Markers (Pressurized Installation Only):

1. PVC and HDPE force main shall have a tracer wire installed along the top of the pipe per standard detail SAN-17. Prior to backfilling the tracer wire shall be inspected.

3502 CONSTRUCTION AND INSTALLATION

A. General

1. Notification

a. Disruption of Sanitary Sewer Service:

i. When a disruption of sanitary sewer service will occur, the Contractor shall notify Public Works Operations (816-228-0195) at least 72 hours in advance to make the necessary arrangements.

ii. It shall be the Contractor's responsibility to place door hangers on the affected premises at least 48 hours in advance of the disruption. The door hanger shall indicate the date and time of the disruption and its anticipated length.

b. The Contractor's work shall be scheduled in a manner to accommodate the schedules of the City and the affected customers.

2. Protection of Existing Water Mains, Sewers, Structures, or Utilities

a. Where new lines approach, cross, connect to, or run parallel to existing water or sewer mains, the Contractor shall be held completely responsible for protecting, preserving, and otherwise maintaining existing line during construction of new line. Any damage inflicted to water and sanitary sewer mains or structures must be promptly reported to DigRite (1-800-DIG-RITE). Any damage inflicted to storm sewer lines or structures must be reported promptly to the Public Works Operations Division (816-228-0195) and arrangements made for repair. Any damage inflicted to any other utility must be reported promptly to the respective utility and arrangement made for the repair.

b. Where new construction interferes with operation of existing mains, the Contractor shall provide bypass lines or other temporary connections that are required to maintain continuous service.

c. The Contractor shall protect all existing structures, utilities, and work of any kind against damage or interruption of service that may result from the operations of the Contractor. Damage or interruption of service resulting from failure to do so shall be repaired or restored promptly at the expense of the Contractor.

d. The Contractor shall give reasonable notice to utility companies and to other owners of property when such property is liable to injury or damage by the execution of the Work, so that the owners of such utility or property may take precautionary measures.

d. The Contractor shall be responsible to adjust to finish grade any existing utility/appurtenances (i.e. valves, meter wells, sanitary sewer manhole, storm junction box etc.) that is affected by construction.

3. Handling and Storage

a. Handle pipe materials and fittings in a manner to assure installation in a sound and undamaged condition. Use slings, lifting bags, hooks, and other devices designed to protect the pipe, joint elements, and coatings. In handling plastic pipe of 10 feet long or greater, a double sling will be required.

b. Ship, move, and store with provisions to prevent movement or shock contact with adjacent units.

c. Pipe shall be handled in a manner that minimizes the damage to the coating. Damaged coating shall be repaired in a manner complying with the pipe manufacturer's recommendations.

4. Inspection of Materials: All pipe, fittings, and accessories shall be examined by the City Inspector prior to installation for soundness and specification compliance. Rejected materials shall be marked and promptly removed from the project site, and replaced with approved materials.

5. Alignment: Pipe shall be laid to the lines and grades as shown on the approved Engineering Plans.

6. Cleaning: All pipe, fittings, and accessories shall be kept clean of foreign matter while being handled or stored. During installation, foreign matter shall not enter the pipe or appurtenances. At the end of each working day, temporary plugs shall be

installed at the upstream and downstream terminations of the pipeline. The plugs shall be braced to prevent accidental entry into the sanitary sewer system.

B. Sanitary Sewer Installation

1. Installation Standards: All pipes and fittings shall be installed in accordance with the following standards:

   a. DIP Fittings - ANSI/AWWA C 600.

   b. PVC Pipe - ASTM D 2321.

   c. HDPE Pipe - Plastics Pipe Institute, "Underground Installation of Polyethylene Pipe".

2. Installation

   a. Governmental Requirements: Sanitary sewer main installation shall comply with applicable local, State, and Federal requirements.

   b. Trench Dewatering: See Section 2100.

   c. Drainage Course Crossings: See Section 2100.

   d. Trench Widths

      i. Minimum Widths: Trench widths and pipe clearances shall not be less than those shown in standard detail SAN-11

      ii. Maximum Widths

         (a) Maximum trench widths shall not exceed the manufacturer's recommendations.

         (b) The allowable maximum trench widths hereinafter specified apply only to that portion of the trench below the horizontal plane parallel to and 6 inches above the top of the pipe.

         (c) The allowable maximum widths may be exceeded at manholes, bore pits, tees, and in unstable earth material. Where the maximum trench width is exceeded, the Contractor shall provide appropriate embedment as indicated by the Design Engineer and the City Engineer.

      iii. Trench Slope: See Section 2100.

iv. Trench Shields: See Section 2100.

e. Compacted Fill: See Section 2100.

f. Pipe Embedment: All pipe shall be bedded in bedding material with a minimum thickness beneath the pipe as specified on Standard Detail Drawing SAN-11.

g. Bedding Installation: See Section 2100.

3. Backfill: See Section 2100.

4. Tracer Wire: When tracer wire is required, the tracer wire shall be installed along the top of the pipe per Standard Detail Drawing SAN-17. The wire shall be accessible at every manhole or vault. Tracer wire shall be inspected by the public works inspector prior to backfill.

    a. If new sanitary sewer service lines are installed or connected from or to an underground facility or if the infrastructure is repaired, replaced, or rehabilitated, the contractor, utility, or person conducting the installation, connection, repair, replacement, or rehabilitation to use trace wire, or a similar device capable of being located by an above surface detection system designed to give approximate locations of the underground sewer service line, to mark the location of the pipes and lines in those areas that are located within a public right-of-way, easement, or street. This provision must apply to all installations of sewer without regard to their status as underground facilities. A violation of these provisions must result in a presumption of negligence against the individual or company failing to install tracer wire or a similar technology, and a violator must be liable for all damages caused by his or her failure to act in accordance with these provisions.

5. Wyes and Building Sewer Stubs: Wyes and building sewer stubs shall be installed as shown on the Engineering Plans or specified herein.

    a. Sewer mains with service laterals shall not exceed 15 feet in depth.

    b. Building sewer stubs shall be adequately plugged to prevent foreign matter from entering the pipe during construction.

    c. The size and slope of the building sewer shall be subject to the approval of the Public Works Department, but in no event shall the diameter be less than four (4) inches. The slope of such pipe shall be not less than one-eighth (1/8) inch per foot.

d. Whenever possible the building sewer shall be brought to the building at an elevation below the basement floor. No building sewer shall be laid parallel to or within three (3) feet of any bearing wall, which might thereby be weakened. The depth shall be sufficient to afford protection from frost. The building sewer shall be laid at uniform grade and in straight alignment insofar as possible. Changes in direction shall be made only with properly curved pipe and fittings.

e. In all buildings in which any building drain is too low to permit gravity flow to the public sewer, sanitary sewers carried by such drain shall be lifted by approved artificial means and discharged to the building sewer. All appurtenance of the sanitary sewer service line shall be the responsibility of the owner.

f. All excavations required for the installation of a building sewer shall be open trench work unless otherwise approved by the City. Pipe laying and backfill shall be performed in accordance with the City's standard detail; sanitary sewer embedment, SAN-007, except that no backfill shall be placed until the work has been inspected.

g. All excavations for building sewer installation shall be adequately guarded with barricades and lights so as to protect the public from hazard. Streets, sidewalks, parkways and other public property disturbed in the course of the work shall be restored in a manner satisfactory to the City.

h. Wyes shall be installed at a maximum of 45 degrees and not less than 30 degrees with pipe spring-line, for pipe sizes 8- through 16-inch diameters. Wyes shall not be installed in pipe sizes equal to or greater than 18 inches in diameter.

i. The connection of the building sewer into the public sewer shall be per Standard Detail Drawing SAN-07.

j. When the building sewer stub grade exceeds 20 percent, pipeline anchors shall be installed as required under Paragraph 6501.E.7 with the first anchor not more than 12 or less than 5 feet upstream of the wye.

k. All building sewer stubs shall be constructed bell to spigot.

l. All joints and connections shall be made gastight and watertight.

m. The applicant for the Building Sewer Permit shall notify the Community Development Department when the building sewer is ready for inspection and connection to the public sewer. The connection shall be made to the satisfaction of the Building Inspector or designated personnel.

f. For new construction, where a wye has been provided for a private building sewer, a second wye shall not be provided (cut-in by the builder).

g. A wooden board or metallic locating tape extending from the end of the stub to the ground surface shall be placed at the end of each stub.

h. The Contractor shall maintain an accurate record for submittal to the Design Engineer of location, size, and direction of each wye and insertable fitting and the elevation, location, size, and length of each building sewer stub. Locations shall use the pipeline stationing as shown on the Engineering Plans.

6. Gravity Sewers: All gravity sewers shall be installed to the alignment, elevation, slope, and with pipe embedment as specified and/or shown on the Engineering Plans.

7. Pipe Encasement, Collars, Anchors, and Trench Checks

a. Concrete construction shall comply with ACI 301, Specifications for Structural Concrete.

b. Total or partial encasement of pipe in concrete shall be used where the required safe supporting strength of the pipe cannot be obtained by other bedding methods. Concrete encasement shall also be provided at locations to protect public water supplies or where there exists the possibility that standard bedding may be eroded by currents of water under and around the pipe.

c. Concrete encasement shall be constructed at locations indicated and in accordance with details as shown on the Engineering Plans and in the Standard Detail Drawings. Start and terminate encasement at a pipe joint. Adequately support and block the pipe to maintain position and prevent flotation. Form to dimensions indicated or construct full width of a trench.

i. Longitudinal reinforcement shall be continuous.

ii. Concrete encasement shall be protected and cured so as to prevent excessive evaporation of moisture or freezing. Backfilling will not be considered as a suitable method of curing the encasement.

iii. Backfill trench only after concrete encasement has obtained a minimum of 2000 psi. All backfilling shall be done in accordance with Section 2100.

d. Collars shall be constructed at locations indicated on and in accordance with details shown on the Engineering Plans and on Standard Detail Drawing SAN-13.

e. Thrust collars shall be constructed at locations indicated on and in accordance with details shown on the Engineering Plans and on Standard Detail Drawing SAN-14.

f. Trench Checks: Trench checks shall be constructed at locations indicated on and in accordance with details shown on the Engineering Plans.

8. Pipe Laying: All pipe shall be installed in accordance with the pipe manufacturer's recommendations, except as modified herein.

a. Pipe laying shall not proceed if the trench width as measured at the top of pipe exceeds the maximum allowable trench width. If this occurs, the Contractor shall submit to the Design Engineer for approval a better bedding for the pipe or pipe of sufficient strength to provide safe supporting strength.

b. All pipe and fittings shall be stored and handled with care to prevent damage thereto. Do not use hooks to transport or handle pipe or fittings. Do not drop pipe or fittings.

c. Pipe and fittings rejected by the Inspector shall be promptly marked and removed from the project site. All pipe and fittings shall be examined for soundness and specification compliance prior to placement in the trench and rejected pipe or fittings shall not be incorporated into the pipeline. Check the class or pipe strength to be sure proper pipe is installed.

d. Clean joint contact surfaces prior to jointing. Use lubricants as recommended by the pipe or joint manufacturer. Keep lubricants and applicators clean.

e. Pipe laying shall begin at the lowest point. The Contractor will not be allowed to lay any pipe if manholes are not on the project site. The pipe laying upstream of a manhole shall not proceed until the base of the manhole has been placed and leveled.

f. Unless otherwise required, lay all pipe straight between manholes. Excavate bell holes for each pipe joint. When jointed, the pipe shall form a true and smooth pipeline.

g. The alignment of all pipelines between adjacent manholes shall be true to line and grade. The pipeline from manhole to manhole shall reflect the full bore of the pipe. The pipe shall be truly centered into the abutting pipe.

h. The grade lines shown on the profile drawings extend from the centerline of the top manhole to the centerline of the bottom manhole. The pipes and appurtenances shall be truly laid to line and grade throughout, all junctions and other pieces required shall be properly excavated for and laid as shown on the Engineering Plans, and the following tolerances from true horizontal alignment and vertical grade shall be maintained:

Horizontal Alignment: +12 inches

Vertical Grade: + 0.1 feet

Pipe installed but not meeting these tolerances shall be ordered removed and replaced at the Contractor's expense.

i. The sewer trench shall be excavated to sufficient depth to allow embedment to be placed in the bottom of all trenches. At the pipe joints, the trench shall be excavated to an additional depth so that the bell will not rest on the bottom of the trench, and all the weight of the pipe shall be evenly distributed along the entire length of the barrel of the pipe.

j. The sewer must be made watertight at all points; any leaks or other defects discovered at any time before the final acceptance of the Work shall be immediately repaired or that portion of the sewer shall be rebuilt if necessary.

k. In all cases, full length sticks of pipe shall be used, except in making closures.

l. Clean interior of all pipe, fittings, and joints prior to installation. To exclude entrance of foreign matter during discontinuance of installation, close open ends of pipe with snug fitting closures. Take reasonable precautions to not let water fill the open trench, and include provisions to prevent pipe flotation. Remove water, sand, mud, and other undesirable backfill materials from trench before removal of end cap.

m. In forming joints, each length of pipe shall be carefully aligned in such a manner as to form an accurate concentric joint, thus providing a uniform circular pipe opening. Each length of pipe shall thrust into the bell and shall be securely held in position until the next length of pipe has been placed. Insofar as possible, commence laying the downstream end of line and install pipe with spigot or tongue end downstream.

n. The pipeline trench excavation shall be dewatered sufficiently to allow pipe joints to be made under dry conditions. No joints shall be made under water.

o. Joints:

    i. Joints shall in general be made in accordance with the manufacturer's recommendations and as specified herein. All joints to be welded or fused shall be performed by a technician certified by the manufacturer.

    ii. Clean and lubricate all joint and gasket surfaces with a lubricant recommended by the pipe manufacturer.

    iii. Care shall be exercised by the Contractor to insure against damage to the joint material in storage, handling, or placing operations.

iv. No damaged joint material shall be permitted to be used, and the same shall be removed from the job site.

v. All pipe joints shall be completed by insuring that the ends of the pipe to be joined are in contact and completely shoved into the "home" position.

p. Pipe shall be cut in a neat workmanlike manner without damage to the pipe. Cutting of the pipe with a torch is not permitted. Smooth cut by power grinding to remove burrs and sharp edges. Repair the lining as required and approved by the City Inspector.

q. All pipelines shall be plugged at the end of each day. Plugs or other positive methods of sealing shall be utilized at all times to protect any existing system from entrance of storm water or other foreign matter.

r. When a sanitary sewer line crosses an existing pipeline (water lines and storm sewer), and the clearance is less than 18 inches, concrete encasement shall be required for the sanitary sewer in a manner approved by the City's on-site representative.

9. Temporary Plugs

a. Provide and install plugs as manufactured by the pipe supplier or as fabricated by the Contractor, if approved. Plugs shall be watertight against hydraulic heads up to 20 feet. Secure plugs in place in a manner that facilitates removal when required for pipe connections.

b. Plugs shall be installed as specified or as shown on Engineering Plans. Also, the open end of the sewer shall be plugged at the end of the work day with a suitable mechanical plug to prevent entry of foreign material until work is resumed.

10. Removal of Water: The Contractor shall provide dewatering as specified in Section 2100. Damaged pipe or structures of any kind resulting from insufficient dewatering facilities or similar lack of proper conduct of the work shall be replaced by the Contractor at their own expense. No structure or pipes shall be laid in water, and no water shall be allowed to run into or over any concrete work or pipe, or into or through any pipe.

11. Sewer Main Connections to Existing Pipelines and Structures

a. General: Connect the pipe to existing structures and pipelines where indicated.

b. Tying a Sewer Main to an Existing Manhole: Prepare the structure by making an opening with the manufacturer's recommended clearance all around the fitting to

be inserted. The concrete structure shall be core drilled, and a flexible pipe-to-manhole connector/gasket shall be installed in such a manner that a watertight condition will result. Refer to Standard Detail Drawing SAN-12 for flexible pipe-to-manhole connectors/gaskets.

c. Adding a Manhole onto an Existing Sewer Main (See detail drawing SAN-10):

   i. The Contractor shall cut the existing sewer main, set a pre-cast base onto a 6-inch thick (minimum) crushed rock bedding layer, and insert the sewer pipe through the manhole to connect the existing ends of the sewer main. The ends may be connected to the existing sewer through the use of rigid couplings if a bell(s) is (are) not available. The inverts may be formed using non-calcium chloride high-early strength concrete.

   ii. Any portion of the existing sewer damaged by the Contractor shall be repaired or replaced. Any damaged vitrified clay pipe shall be replaced with PVC pipe, as a minimum, or C900 if required by its location.

   iii. Bypass pumping shall be required and shall be coordinated with Public Works Inspections who can be contacted at 816-228-0195.

d. Pipe Connecting to a Structure: Pipe connecting to a structure shall be supported with bedding aggregate as specified in Section 2100.

12. Connection of Pipes of Dissimilar Materials (See detail drawing SAN-13):

    a. General: The connection of pipes of different materials shall be made using approved transition couplings, and shall provide a permanent and watertight connection that will withstand the hydrostatic test pressure.

13. Abandonment of Sewer Mains and Building Sewer Stubs

    a. Prior to abandonment of a sewer main, the Contractor shall verify that no existing services will be affected. Building sewer stubs shall be properly abandoned prior to abandoning the sewer main.

    b. If a sewer main is indicated for abandonment, it shall be abandoned by removal and backfill if required or by plugging each end of the line segment with a 1-foot thick plug of non-shrink grout sealed with a Portland cement grout.

    c. If the building sewer stub to be abandoned is connected to a VCP sewer main with a wye, a short piece of pipe is left in the end of the wye, the pipe is plugged with an expandable plug, and the plug is encased with concrete. If the building sewer stub to be abandoned is connected to a VCP sewer main via a break-in

connection, the building sewer stub shall be removed from the main and a minimum 6-foot section of PVC is installed.

d. If the building sewer stub to be abandoned is connected to a PVC sewer main with an in-line wye or tee, the building sewer stub is removed, and a PVC plug is installed on the end of the wye/tee. If the building sewer stub to be abandoned is connected to a PVC sewer main via a saddle connection, the building sewer stub is removed from the main, and the hole is plugged with a stainless steel full-circle repair clamp.

14. Protection of Water Supplies

a. There shall be no physical connection between a public or private potable water supply system and a sewer, or an appurtenance thereto, that would permit the passage of any wastewater or polluted water into the potable water supply.

b. Sewer mains, i.e., house connections, building sewers, trunk lines, interceptors, force mains, etc., shall not be constructed within a 100-foot radius of a public water supply well. Greater separation may be required where soil and drainage conditions indicate the need for greater protection. Sewer mains constructed of DIP may be constructed within 10 feet of a private water supply well. Sewer mains constructed of other materials must be at least 50 feet from a private water supply well.

c. For sewer mains paralleling or crossing water mains, see KC APWA specification 5505.C.3.

d. Water and sewer mains shall not be placed in the same trench or excavation.

C. Acceptance Tests for Completed Sewers

1. General

a. The Contractor shall furnish all labor, equipment, water, materials, and reports for the required acceptance tests. All pipelines, including building sewer stubs, shall undergo and pass all required tests to determine soundness and workmanship. Pipelines that do not comply with the City of Blue Springs Standard Specifications shall be repaired and/or replaced and shall be retested until the pipeline meets said specifications.

b. No testing shall be performed before backfill and compaction operations have been completed unless otherwise approved by the City Inspector. In general, testing for sanitary sewers shall begin at least 30 days after completion of the sanitary sewer. After backfilling has been completed, the Contractor shall conduct all testing in the presence of the City Inspector.

c. Each reach of sewer shall meet the requirements of the acceptance tests. All defects shall be repaired to the satisfaction of the City Inspector.

d. The Contractor shall clean excess mortar, joint sealant, and other dirt and debris from the pipe and flush the pipe with clear water prior to inspection.

2. Sewer Pipe Alignment and Grade Testing: Alignment, grade and visible defects shall be checked as follows:

a. Sewer Pipe Deflection Testing: Flexible pipelines (i.e., PVC pipe) shall be tested for deflection by pulling a mandrel through the entire length thereof.

i. The mandrel (go/no-go) device shall be cylindrical in shape and constructed with nine evenly-spaced arms or prongs. Mandrels with fewer arms will be rejected as not sufficiently accurate. The dimensions of the mandrel shall be as listed in the table below. The mandrel diameter dimension shall carry a tolerance of ±0.01 inch. Allowances for pipe wall thickness tolerances or ovality (from heat, shipping, poor production, etc.) shall not be deducted from the mandrel diameter dimension but shall be counted in as part of the 5 percent or lesser deflection allowance. Contact length shall be measured between points of contact on the mandrel arm. The length shall not be less than as shown in the table below.

Nominal Diameter (in)	Mandrel Length (in)	Mandrel Diameter (in)[1]	
		SDR 26[2]	SDR 21[3]
8	8	7.37	7.41
10	9	9.21	9.21
12	10	10.96	10.96
15	12	13.42	N/A
18	15	N/A	15.47
21	16	N/A	N/A
24	18	N/A	20.63
27	27	N/A	N/A

1 Mandrel diameter = [avg. outside diameter - 2*(min. wall thickness)]*0.95
2 Calculated using values from ASTM D3034.
3 Calculated using values from ASTM D2241.

ii. In general, the pipe shall be tested no sooner than 30 days after backfilling and compacting of line segment but prior to final acceptance to verify that installed pipe is within specified deflection tolerances.

iii. The City Inspector shall be responsible for approving the mandrel. In the event the Contractor provides the mandrel, he/she shall provide proving

rings to verify this. No mandrel testing will be witnessed or approved by the City Inspector without completion of the aforementioned verification of the mandrel size for the Work.

iv. The mandrel shall be hand-pulled by the Contractor through all sections of PVC sewer mains. Any sections of sewer not passing the mandrel test shall be uncovered, and the Contractor shall re-round or replace the sewer to the satisfaction of the City Inspector. These repaired sections shall be retested.

b. Sections of DIP sewer main shall be visually checked for deflection, i.e., not deflection tested with the mandrel due to the potential for damaging the cement mortar lining.

c. Television Inspection: Sewer mains installed as part of the Work are subject to inspection by closed circuit television prior to the end of the correction period at the City's expense. Any deficiencies noted shall be repaired at the expense of the Contractor.

3. Exfiltration-Infiltration Testing

a. General

i. Air pressure or hydrostatic tests shall be conducted on sewers prior to acceptance by the City. The exfiltration-infiltration shall not exceed 50 gallons per day per inch of nominal diameter per mile of sewer main for any section of the Work.

ii. Immediately prior to conducting a test, the groundwater level shall be determined by auguring a vertical hole adjacent to the pipe and measuring the distance to the water level. Exfiltration head and air test pressures shall be adjusted for groundwater elevations over the top of the pipe.

b. Sewer Pipe Exfiltration Testing: Exfiltration tests shall be performed by the Contractor using one or a combination of the methods as set forth below. The required air pressure and/or exfiltration testing shall be successfully performed on carrier conduits prior to sealing of the ends of the casing conduits. PVC gravity sewer pipe shall be air tested.

i. Air Testing for Gravity Sewer Mains

(a) The Contractor may perform air tests for all pipe sizes.

(b) Furnish all facilities required including necessary piping connection, test pumping equipment, pressure gauges, bulkheads, regulators to avoid over pressurization, and all miscellaneous items required.

(c) Each section of gravity pipeline between manholes and/or structures shall be tested after backfilling as outlined below and in accordance with ASTM F 1417. The time-pressure drop method specified in 8.2.2 of ASTM F 1417 shall be used.

(d) If the groundwater level is 2 feet or more above the top of the upstream end or if the test pressure required for the test is more than 9 psig, air testing should not be used.

(e) The pipe plug for introducing air to the sewer main shall be equipped with two taps. One tap will be used to introduce air into the line being tested through suitable valves and fittings, so that the input air may be regulated. The second tap will be fitted with valves and fittings to accept a pressure test gauge indicating internal pressure in the sewer pipe. Additional valves and fitting will be incorporated on the tap used to check internal pressure so that a second test gauge may be attached to the internal pressure tap. The pressure test gauge will also be used to indicate loss of air pressure due to leaks in the sewer main.

(f) The pressure test gauge shall meet the following minimum specifications:

Size (diameter)	4-1/2 inches
Pressure Range	0-15 psi
Figure Intervals	1 psi increments
Minor Subdivisions	0.05 psi
Pressure Tube	Bourdon Tube or diaphragm
Accuracy	+/-0.25% of maximum scale reading
Dial	White coated aluminum with black lettering, 270 arc and mirror edge
Pipe Connection	Low male ½-inch N.P.T.

Calibration data not more than one year old shall be supplied with all pressure test gauges. Certification of pressure test gauges will be required from the gauge manufacturer. This certification and calibration data shall be given to the City Inspector prior to the performance of any air tests conducted for the Work.

(g) Plug ends of line and cap or plug all connections to withstand internal pressure. Due to safety considerations, the Contractor must take care to brace both the end of the pipe and plug before introducing test pressure

into the system. The Contractor can then connect the air control equipment to the air hose and begin to pressurize the system. During the pressurization process, the Contractor shall monitor the air pressure of the system so that internal pressure does not exceed 5.0 pounds per square inch gauge (psig). After reaching 4.0 psig, throttle the air supply to maintain between 4.0 and 3.5 psig for at least 2 minutes in order to allow equilibrium between air temperature and pipe walls. During this time, check all plugs to detect any leakage. If plugs are found to leak, bleed off air, tighten plugs, and again begin supplying air. After temperature has stabilized, the pressure is allowed to decrease to 3.5 psig. At 3.5 psig, begin timing to determine the time required for pressure to drop to 2.5 psig. If the pressure drop-is greater than that shown in the table below, the pipe shall be presumed free of defects.

Pipe Size (in)	Required Time per 100 LF (sec)	Maximum Required Time (sec)
8	70	227
10	110	283
12	158	340
15	248	425
18	356	510
21	485	595
24	634	680
27	765	765
30	851	851

If air test fails to meet above requirements, repeat the test as necessary after all leaks and defects have been repaired and backfilled.

ii. Hydrostatic Tests for Gravity Systems:

(a) Test section shall be filled with water not less than 12 hours prior to testing. Refill the test section of pipe prior to performing the test.

(b) Perform at depths of water as measured above center line of pipe of not less than 4 feet or more than 10 feet (consideration shall be given for a water table above said centerline). Maintain the test as necessary to locate all leaks but not less than two hours.

(c) The Design Engineer shall determine the maximum allowable exfiltration rate for a given test section and then field verify that the maximum exfiltration rate has not been exceeded for that section. The maximum allowable exfiltration rate shall be approved by the City Engineer prior to testing.

c. Sewer Pipe Infiltration Testing: Where sewers are laid within the groundwater table, infiltration testing shall be conducted. Where the City Inspector discovers evidence of infiltration, the Design Engineer and the City Engineer shall be contacted. The Contractor shall install weirs or other suitable flow rate measuring devices adequate to determine, to the satisfaction of the City Engineer, that the specified infiltration limit is not exceeded for that reach of gravity sewer. Where the specified infiltration limit is exceeded, the Contractor shall repair or replace the defective reach of the pipeline. Following repair of the pipeline, the Contractor shall re-measure infiltration flow rates and make additional repairs until an acceptable infiltration flow rate is achieved.

D. Manhole Installation:

1. Bases

a. Integral cast bases shall be reinforced in accordance with ASTM C 478. Precast integral cast bases shall be installed on a maximum of 6 inches of bedding aggregate. Depths exceeding this amount shall be filled with MCIB/KCMMB 4,000 psi concrete mix.

b. If integral cast bases cannot be used, cast-in-place concrete bases shall be used with the approval of the City Engineer. Cast-in-place bases shall be MCIB Mix No. WA 585-3/4-2-0.410 concrete mix and have a minimum thickness of 8 inches. The bottom wall sections shall be embedded in the base section a minimum of 4 inches. The bottom precast wall section shall not be set upon a previously poured base. Wood shall not be used for supporting or leveling the wall section prior to pouring the base.

2. Inside Dimensions: The minimum horizontal clear distance in the barrel of the manholes shall not be less than 4 feet.

3. Precast

a. Delivery: Precast concrete components shall not be delivered to the job until representative concrete control cylinders have attained at least 80 percent of the specified minimum design strength.

b. Inspection: Precast concrete shall be inspected when delivered. Rejection of defective or cracked precast concrete components shall be in accordance with ASTM C 478.

c. Construction: Precast sections shall be cleaned of all dirt, grass, and other deleterious matter. Seal wall and cone joints with a minimum of two beads of preformed butyl joint sealant. Seal the joints between the top of the cone,

adjustment or riser rings and the manhole frame with a double bead of preformed butyl joint sealant. Sections shall be placed so that steps are aligned but without rotation or damage to sealant integrity. Lift holes in excess of 2 inches in depth shall be patched with non-shrink grout.

4. Cast-in-Place:

   a. Wall Thickness: Wall thickness shall conform to the dimensions as shown on the Engineering Plans.

   b. Construction: Reinforcement steel shall be placed as shown on the Engineering Plans. Tie-holes shall be patched with non-shrink grout. Wall sleeves, where required, shall be installed as shown on the Engineering Plans. Water stops shall be installed at the wall and slab connection and shall be of the size, thickness, and material shown on the Engineering Plans.

   c. Waterproofing: Interior protective coatings, where required, shall conform to the material specifications. Application shall conform to the manufacturer's recommendation.

5. Sealants. A double bead of preformed butyl joint sealer shall be applied to all joints. For the minimum bead dimension, see Paragraph 3501.O.4. The vertical spacing between manhole sections shall not exceed 1/4 inch. Joint sealants shall not be applied on damp or dirty surfaces.

6. Joint Wraps: The exterior of all joints, including the frame and cover assembly, shall be sealed with two layers of approved joint sealant consisting of Conseal CS-212 or Infi-Shield 6” Gator Wrap or approved equal. The tape shall be overlapped at least twice its width. The tape shall not be stretched during application. Primer and/or adhesive, as recommended by the tape supplier, shall be employed for adverse, critical, or other applications.

7. Existing Manhole Epoxy Liner: Installation of epoxy manhole liner shall consist of: cleaning the entire manhole interior surface, preparation of the manhole interior surface, frame seal, grade adjustment, cone/wall joint, pipe seals, bench and invert as required, and lining the manhole interior surface with a two component, 100% solids epoxy coating system which provides a durable, high strength, monolithic lining, at an average thickness of 125 mils with a minimum thickness of 120 mils. The first two manholes downstream of a force main entering the system shall be lined along with any other manholes identified on the Engineering Plans.

8. Gaskets. When gaskets are used, two gasket clamps shall be utilized at each pipe-to-gasket connection with the take-up screws for the gasket clamps being positioned a minimum of 90° apart.

9. Steps: Steps shall be aligned vertically below the casting and spaced at 16-inch centers. The top step shall be not more than 1 foot below the top of the cone. The lowest step shall be not more than 1 foot above the invert bench. Field drilled step holes are not permitted in precast concrete manholes unless approved by the Inspector.

10. Castings:

    a. Castings shall be installed with the mud ring inserted inside the manhole opening and resting on a minimum of two rows of preformed butyl joint sealant.

    b. Bolt-down castings shall be held in place as shown on the Engineering Plans.

    c. Bolt-down castings shall be bolted to the manhole, not to the adjusting ring.

11. Top Slabs: Thickness shall conform to the dimensions and reinforcement steel shall be placed as shown on the Engineering Plans.

12. Precast Inverts: Inverts shall be at least MCIB Mix No. WA-585-3/4-2-0.410 concrete mix with Con^{mic}Shield® ***or approved equal antimicrobial additive with Contint colorant or approved equal added*** and steel-troweled to produce a dense, smooth finish. The invert channel shall be "U" shaped in cross section and extend upward three-fourths of the inside pipe diameter. Smooth transitions shall be formed for pipes of different sizes, elevation, and bends. The invert bench shall be sloped to drain. In no case shall the inverts extend into the pipe.

13. Top Elevation: The finish top elevation of manhole castings shall conform to the following unless otherwise shown on the Engineering Plans or directed by the Inspector.

    a. In paved or future paved areas, the top of the casting shall conform to the slope of the pavement and be 1/8 inch below the finished pavement elevation.

    b. In non-pavement areas, the top of the casting shall be at the elevation shown on the Engineering Plans or as directed by the City Inspector.

14. Manhole Adjustment: All new manholes will be provided with an adjustment ring(s) underneath the casting as shown on Engineering Plans. A maximum of two 6-inch or three 4-inch riser rings shall be installed on top of the cone section. Minimize the number of riser rings used. The joints shall be sealed with a double bead of preformed butyl joint sealant. If the top of an existing manhole is required to be raised to an elevation that will exceed 12 inches, or lowered more than the adjustment rings will allow, all vertical adjustments shall be made to the barrel of the manhole.

15. Manhole Backfilling: Manhole backfilling shall be governed by Section 2100.

E. Acceptance Testing for Completed Manholes

1. General: All manholes and other structures installed or otherwise disturbed during construction shall be tested for infiltration-exfiltration by the method described herein. Infiltration-exfiltration testing shall be performed in the presence of the Inspector. The Contractor shall notify the City Inspector 2 working days prior to beginning manhole testing. All visible leaks shall be repaired by the Contractor prior to testing and during the correction period.

2. Infiltration-Exfiltration Testing:

   a. For new manholes, lift holes penetrating the manhole wall in excess of 2 inches in depth shall be plugged with an approved non-shrink grout prior to testing. All pipes entering the manhole shall be plugged at least 8 inches into the sewer pipe. The plug shall be inflated at a location beyond the manhole/pipe. The plug and pipe shall be braced securely to prevent either item from being drawn into the manhole.

   b. Test Method: The vacuum test apparatus shall be placed inside or on top of the casting and the seal inflated according to manufacturer's directions as appropriate. A vacuum of 10 inches of mercury shall be drawn, and then the vacuum pump shall be shut off. With valves closed and hoses removed, the time shall be measured for the vacuum to drop to 9 inches of mercury. The manhole shall be acceptable if the time for the vacuum to drop from 10 inches to 9 inches is as follows:

Manhole Depth	Time (min)
10 feet or less	2.0
10.1 to 15.0 feet	2.5
15.1 to 25 feet	3.0
25.1 feet or greater	3.5

   c. Resealing, repairs, and retesting shall be allowed at the discretion of the Inspector.

   d. If the manhole fails the initial test, necessary repairs shall be made with a water reactive elastomeric chemical grout, such as 3M Scotch Seal Chemical Grout 5600, or a water reactive polymer solution, such as Avanti AV-202, or equivalent. Resealing and retesting shall be performed until the manhole passes the test.

3503 ACCEPTABLE MANUFACTURERS AND MODELS

A. General: A list of acceptable manufacturers and models for various materials is provided on the City's standard detail drawings and can be found on the City's website at http://www.bluespringsgov.com/1349/Design-Construction-Manual.

Blue Springs, Missouri
Public Works Department

SECTION 3900 – WATER MAINS

CITY OF BLUE SPRINGS, MISSOURI
CONSTRUCTION SPECIFICATIONS

(We are adopting the 2017 APWA Standards Section 2900 with certain exceptions as specified in the 2018 Blue Springs Supplement)

3901 MATERIALS 2
A. General 2
B. Pipe and Fittings for Water Mains 2
C. Ductile Iron Pipe and Fittings 3
D. Polyvinyl Chloride Pipe or Molecularly Oriented Polyvinyl Chloride Pipe and Fittings 4
E. Granular Bedding Aggregate Material 4
F. Backfill 4
G. Trench Checks 4
H. Utility Markers 4
I. Thrust and Straddle Blocks 4
J. Pipe Encasement 4
K. Valves 4
L. Valve Boxes 8
M. Backflow Prevention Devices (BFPD) 9
N. Fire Hydrants 9
Service Lines from the Water Main to the Water Meter 9
P. Casing Pipe 10
3902 CONSTRUCTION AND INSTALLATION 11
A. General 11
B. Water Main Installation 13
C. Disinfection 20
D. Hydrostatic and Leakage Testing 21
3903 ACCEPTABLE MANUFACTURERS AND MODELS 22
A. General 22

3901 MATERIALS

A. General: All materials shall comply with the latest revision of the reference standard applying to that particular material.

B. Pipe and Fittings for Water Mains

1. Allowable Materials: Pipe and fitting materials used in the construction of water mains shall be:
    a. Ductile Iron (DI), special thickness Class 52
    b. Polyvinyl Chloride and Molecularly Oriented Polyvinyl Chloride (PVC & PVCO), for 6 to 12-inch diameter pipe only AWWA C900 and AWWA C909

2. Requirements: The pipe manufacturer shall furnish pipe of materials, joint types, sizes, and strength classes indicated and specified. The Contractor shall furnish maximum pipe lengths normally produced by the manufacturer except for fittings, closures, and specials.

3. Manufacturer's Experience: The Manufacturer shall be experienced in the design, manufacture, and commercial supplying of the specified material.

4. Inspection and Testing: Inspection and testing shall be performed by the manufacturer's quality control personnel in a manner complying with applicable standards.

5. Markings: Each pipe or fitting shall have the following information plainly and permanently marked by indenting in the outside surface of the pipe or painted thereon with waterproof paint:

    a. Pipe size and class or designation.
    b. Date manufactured and lot number.
    c. Manufacturer's name or trademark.
    d. For ductile iron pipe, in lieu of the above listed markings, the information may be provided on an adhesive bar code labeling system that complies with AWWA Standards. The adhesive label shall be provided on the outside surface near the bell.

6. Handling: The Manufacturer and Contractor/Developer shall use equipment and methods adequate to protect the pipe and joint elements and to prevent shock contact of adjacent units during moving or storage. Damaged sections that cause reasonable doubt as to their structural strength or water-tightness will be rejected.

7. On-Site Inspection: All pipe and appurtenances will be inspected by the City Inspector prior to installation, and all damaged pieces as well as any pieces not

complying with the City of Blue Springs Standard Specifications shall be immediately removed and replaced by pipe and appurtenances as may be acceptable to the Inspector at the expense of the Contractor/Developer.

8. Certification: Suppliers shall submit certifications with their material delivery. These certifications shall be given to the City Inspector.

C. Ductile Iron Pipe and Fittings

1. Design: Unless otherwise stated in these standards, specifications shall incorporate the provisions of the AWWA standards, manuals and manufacturers' recommended installation procedures. All DI pipe (DIP) shall comply with ANSI/AWWA C150/A21.50 and ANSI/AWWA C151/A21.51. The minimum thickness shall be Special Thickness Class 52.

2. Fittings:

    a. All DI fittings shall comply with ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53 and shall have a pressure rating of 350 psi.

    b. All DI fittings shall have the pressure rating and the letters "DI" or "DUCTILE" distinctly cast into the outside surface.

    c. Fittings may be furnished with a fusion-bonded epoxy coating complying with ANSI/AWWA C116/A21.16, a standard thickness exterior bituminous coating complying with ANSI/AWWA C151/A21.51, or a standard thickness cement mortar interior lining complying with ANSI/AWWA C104/A21.4.

3. Joints: Mechanical and push-on joints for pipe and fittings shall comply with ANSI/AWWA C111/A21.11. Natural rubber gaskets shall not be accepted.

4. Restrained Joint Pipe: Restrained joint pipe and fittings shall meet the requirements of 3901.I or per the pipe manufacturer's recommendation, whichever is greater.

5. Coatings: Pipe shall be furnished with a standard thickness exterior bituminous coating complying with ANSI/AWWA C151/A21.51. Fittings may be furnished with a fusion-bonded epoxy coating complying with ANSI/AWWA C116/A21.16.

6. Linings: Pipe shall have a standard thickness cement mortar interior lining complying with ANSI/AWWA C104/A21.4.

7. Polyethylene Encasement: All DIP and DI fittings shall be installed with a polyethylene tube encasement having a thickness of 0.008 inches (8 mils) and complying with Section 4.1.1. of ANSI/AWWA C105/A21.5.

D. Polyvinyl Chloride Pipe or Molecularly Oriented Polyvinyl Chloride Pipe and Fittings

1. Design: All PVC & PVCO pipe shall comply with ANSI/AWWA C900 or C909 for sizes 6-inch through 12 inch diameter. The minimum pressure class shall be Pressure Class 235.

2. Fittings: Where fittings are required, they shall be ductile iron and comply with Paragraph 3901.C.2.

3. Joints: Joints for pipe and fittings shall comply with ANSI/AWWA C900 or C909.

4. Restrained Joint Pipe: Restrained joint pipe and fittings shall be per the pipe manufacturer's recommendation.

E. Granular Bedding Aggregate Material: See Section 2100.

F. Backfill: See Section 2100.

G. Trench Checks: Trench checks shall consist of flowable backfill.

H. Utility Markers:

1. PVC & PVCO water main shall have a tracer wire installed along the top of the pipe per Standard Detail WAT-17. Prior to backfilling the tracer wire shall be inspected. Prior to acceptance, the tracer wire shall be tested for continuity by the Public Works Department.

I. Thrust and Straddle Blocks: Engineered straddle blocks shall be installed on the last section of pipe when terminating any straight run section of pipe. A suitable fitting shall be mechanically secured to the end of the pipe. In the case where a future valve is required the valve shall have a plug installed to protect the integrity of the valve. All changes of direction require mechanical joints to be mechanically restrained with a Megalug gland or approved equal and an engineered thrust block. A combination of push joint restraints, and Megalug mechanical joint restraints (or approved equal) may be used in lieu of thrust blocks for directional changes. A minimum of 5 sections of pipe in each direction from the fitting shall be restrained with push joint restraints

J. Pipe Encasement: Concrete used for pipe encasement shall be MCIB Mix No. A-535-1/2-4.

K. Valves

1. General

    a. All valves shall be certified as suitable for contact with drinking water by an accredited certification organization complying with ANSI/NSF Standard 61, Drinking Water Systems Components–Health Effects.

    b. All valves shall have a 2-inch square nut operator.

    c. Direction to open shall be counterclockwise and be marked as such.

    d. Valves on the existing water system or valves that separate newly constructed mains from the existing water system shall be operated by City staff. The Water Utilities Supervisor shall be notified prior to operating any valves.

2. Butterfly Valves (12 inch and larger only)

    a. Design: All butterfly valves shall comply with ANSI/AWWA C504 for Class 150B service, as modified herein.

    b. Body: Valve bodies shall be constructed of cast iron ASTM A 126, Class B and comply with AWWA C504 in terms of laying lengths and minimum body shell thickness. Valve ends shall be mechanical joint or flanged as shown on the drawings and shall comply with AWWA C504.

    c. Disc: Valve discs shall be made from cast iron ASTM A 126, Class B or ASTM A 48, Class 40 for 24-inch and smaller valves. For valves larger than 30 inches, the valve discs shall be built from DI complying with ASTM A 536. Disc shall be furnished with Type 316 stainless steel seating edge to mate with the rubber seat on the body. Discs for valves 20 inches and smaller shall be of an on-center design.

    d. Seat: The valve seat shall be Buna-N rubber located on the valve body. Resilient seats on the valve disc are not acceptable. For 20-inch and smaller valves, the valves shall have bonded seats that meet test procedures outlined in ASTM D 429, Method B. For valves 24 inches and larger, the seat shall be retained in the valve body by mechanical means without use of metal retainers or other devices located in the flow stream.

    e. Shaft: Valve shaft shall be 18-8 Type 304 stainless steel complying with ASTM A 276. Shaft seals shall be standard self-adjusting split V packing. Shaft seals shall be of a design allowing replacement without removing the valve shaft.

    f. Bearings: Valve bearings shall be sleeve-type that are corrosion resistant and self-lubricating.

g. Actuator: Valve actuators shall be fully grease-packed and have stops in the open/close position. The actuator housing shall be cast or ductile iron. The valve actuator shall be attached to the body with a minimum of three bolts. The actuator shall have a mechanical stop that will withstand an input torque of 450 foot pounds against the stops without damage. The traveling nut shall engage alignment grooves in the housing. The actuator shall have a built-in packing leak bypass to eliminate possible packing leakage into the actuator housing. Actuators for valves 16 inches and larger shall be the link lever type to provide characterized closure and prevent line shock when closing.

h. Coatings: All internal and external surfaces shall be covered with a polyamide cured epoxy coating applied over a sand blasted "new white metal surface" per SSPC-SP10 to a minimum of 6 mils in compliance with AWWA C550.

i. Testing: Each valve shall be factory tested per AWWA C504. If the drawings call for valves that have been subjected to and passed a one-time pressure test of 192.5 psi prior to delivery (for those areas of the City where the line pressure exceeds 100 psi), those valves shall be clearly marked to that effect. The manufacturer shall provide for testing certification, which shall be given to the City Inspector upon delivery of the valves to the site.

3. Gate Valves (less than 12 inches)

a. Design: All gate valves shall comply with ANSI/AWWA C509 or AWWA C515 for resilient-seated gate valves, as modified herein. Gate valves shall be designed for underground direct burial service. The minimum design working water pressure shall be 200 psig. All internal parts shall be accessible without removing the body from the water main.

b. Body: Valve bodies shall be constructed of cast iron (ASTM A 126, Class B) or DI (ASTM A 536) complying with AWWA C509 or AWWA C515 in terms of minimum body shell thickness. Valve ends shall be mechanical joint or flanged as shown on the drawings and shall comply with AWWA C509 or AWWA C515.

c. Gate/Wedge: The valve gate or wedge shall be fully encapsulated with rubber to create a resilient seat.

d. Stem: the valve stem shall be non-rising and made of stainless steel complying with ASTM B 351. Stem seals shall be the O-ring type, not flat gaskets.

e. Coatings: The coating shall be non-toxic and impart no taste to the water. All internal and external surfaces shall be covered with a fusion bonded epoxy coating complying with AWWA C550. Although the AWWA standard only refers to interior coatings, the external epoxy coating shall be applied in a manner

similar to that used for application of the interior coating. Coating shall be applied prior to assembly such that all exposed external areas—including end connection bolt holes, body-to-bonnet bolt holes, etc.—shall be coated with epoxy.

f. Bolts: Stainless steel nuts and bolts

g. Testing: Each valve shall be factory tested per AWWA C509 or AWWA C515.

4. Air Release Valves

a. Design: These valves shall be combination air valves, performing the functions of both an air release and an air/vacuum valve. All air release valves shall comply with ANSI/AWWA C512.

b. Body: Valve bodies shall be constructed of cast iron complying with ASTM A 126, Class B and shall have a working pressure rating of at least 150 psi.

c. Connections: Inlets and outlets shall be full size, national standard pipe tapered (NPT) equal to the nominal valve size. The valve shall have two additional NPT connections for the connection of gauges, testing, and draining.

d. Seat: Resilient seat shall be Buna-N.

e. Orifice Button: The valve shall have an adjustable threaded orifice button.

f. Internal Parts: Floats, guide shafts, and bushings shall be constructed of Type 304 stainless steel. Non-metallic floats, linkage, or bushings are not acceptable. Floats shall be unconditionally guaranteed against failure, including pressure surges.

g. Coating: The exterior of the valve shall be coated with a universal alkyd primer.

h. Refer to the City of Blue Springs Standard Detail Drawing WAT-12 for a listing of acceptable manufacturers and models.

5. Tapping Valves:

a. Tapping valves shall have the same characteristics as gate valves specified in Paragraph 3901.K.3. of the City of Blue Springs Standard Specifications. Tapping valve ends shall comply with Section 4.4.1.4.4 of ANSI/AWWA C509.

b. A flange x mechanical joint (MJ) gate valve with all characteristics specified in Paragraph 3901.K.3. of the City of Blue Springs Standard Specifications may be used in lieu of a standard tapping valve if the tapping machine to be used does not have a full-size cutter.

L. Valve Boxes

1. Valve Box Covers: All valve box covers, whether in pavement or grassed areas, shall meet the following requirements:

    a. Cast iron castings shall conform to the requirements of "Gray Iron Castings," ASTM A48/AASHTO M105, Class 30B.
    b. Dimension Tolerances:

        i. The dimensions of all castings shall be ± 1/8 inch of the dimensions shown in the Standard Detail Drawing WAT-05.

        ii. No casting shall weigh less than 95 percent of the specified weight shown in the Standard Detail DrawingWAT-05.

    c. Workmanship and Finish:

        i. Castings shall be free of casting defects such as porosity, rough surfaces and shrinkage.

        ii. Surfaces shall be free of fused on sand and shall be smooth.

        iii. Runners, risers, fins and other cast-on pieces shall be removed.

    d. Interchangeability: Approved ring and lid castings are indicated on the City of Blue Springs Standard Detail Drawing WAT-04.

    e. Markings:

        i. Imported castings shall meet the country-of-origin markings as required in accordance with Title 19, Code of Federal Regulations, Part 134 (19 CFR 134).

        ii. The word "WATER" shall appear on the cover as shown on the Standard Detail Drawing WAT-04.

2. Valve Boxes:

    a. Refer to the City of Blue Springs Standard Detail Drawing WAT-02 for construction requirements and a listing of Acceptable Manufacturers and Models. Valve box shall be cut to finish grade after final site grading is complete. Buried valve boxes shall be uncovered and extended by the Contractor/Developer prior to final acceptance of the Work by the City.

3. All valves with the operating nut greater than 3 feet below finished grade or road surface shall be provided with extension stems to bring the operating nut to within 3 feet of the finished grade. Stem guides shall be provided to keep the valve stem extensions concentric with the valve box.

M. Backflow Prevention Devices (BFPD)

1. See City of Blue Springs Municipal Code for BFPD requirements.

N. Fire Hydrants

1. All fire hydrants shall be the traffic model, break-away type, and comply with the current AWWA C502.

2. Hydrants shall have two 2½-inch nozzles and one 4½-inch pumper nozzle with national standard fire hose coupling screw thread. Nozzle caps shall be the "nut type" having the same dimensions as the operating nut. Such caps shall be securely chained to the base of the hydrant.

3. The size of the hydrant main opening shall be 5¼ inches.

4. The hydrant shall be furnished with a 6-inch isolation gate valve in accordance with City of Blue Springs Standard Detail Drawing WAT-01.

5. Hydrants shall be factory painted red (baked on enamel) according to the following schedule:

6. Extension Kits

   a. Extension kits shall be supplied by the hydrant manufacturer.

   b. All extensions shall be factory painted red (baked on enamel).

7. Hydrants shall be furnished with temporary black plastic caps or shall be covered with black plastic bags until the hydrants are available for service.

8. Refer to the City of Blue Springs Standard Detail Drawing WAT-01 for a listing of acceptable manufacturers and models.

O. Service Lines from the Water Main to the Water Meter: Service lines 2 inches in diameter and smaller shall be made of Type K soft copper, complying with ASTM B 88. Service lines greater than 2 inches in diameter shall be DIP, PVC, or PVCO pipe and

shall comply with Paragraphs 3901.C. or 3901.D, respectively, of the City of Blue Springs Standard Specifications, subject to restrictions based on the City's currently-adopted Fire Code.

1. If new water service lines are installed or connected from or to an underground facility or if the infrastructure is repaired, replaced, or rehabilitated, the contractor, utility, or person conducting the installation, connection, repair, replacement, or rehabilitation to use trace wire, or a similar device capable of being located by an above surface detection system designed to give approximate locations of the underground water service line, to mark the location of the pipes and lines in those areas that are located within a public right-of-way, easement, or street. This provision must apply to all installations of water without regard to their status as underground facilities. A violation of these provisions must result in a presumption of negligence against the individual or company failing to install tracer wire or a similar technology, and a violator must be liable for all damages caused by his or her failure to act in accordance with these provisions.

P. Casing Pipe

1. Pipe

   a. The casing pipe shall be made of steel complying with ASTM A 139, grade B, with a minimum yield strength of 35,000 psi.

   b. The minimum wall thicknesses required are shown in the following table:

Casing diameter (inch)	Minimum Wall Thickness
10, 12, 14, 16	0.188" (3/16")
18, 20, 22	0.250" (1/4")
24, 26	0.281" (9/32")
28, 30, 32, 34	0.312" (5/16")
36, 38, 40, 48	0.344" (11/32")

2. Spacers: Casing spacer shall be a two-piece shell or band made from T-304 stainless steel of a minimum 14 gauge thickness. The shell/band shall have risers made of 10 gauge T-304 stainless steel and have a PVC liner. The bearing surface (skid or runner) shall be made of an ultra-high molecular weight polymer, glass reinforced polyester, or fiberglass reinforced nylon. The shell/band shall be bolted together with T-304 stainless steel bolts. The configuration of the carrier pipe in the casing pipe shall be centered. End seals shall be made by the same manufacturer as the casing spacers and shall use stainless steel bands to hold end seals to pipes.

3. Ends of the Casing Pipe: The ends of the casing pipe shall be closed with one of the following:

a. Manufactured end seal.

b. Concrete plug with allowances for water flow.

3902 CONSTRUCTION AND INSTALLATION

A. General

1. Notification

a. Disruption of Water Service:

i. When a disruption of water service will occur, the Contractor shall notify Water Utilities Operations at least 72 hours in advance to make the necessary arrangements.

ii. It shall be the Contractor's responsibility to place door hangers on the affected premises at least 48 hours in advance of the disruption. The door hanger shall indicate the date and time of the disruption and its anticipated length.

iii. Once the work begins, the work shall be continuous (24 hours per day) until completed.

b. The Contractor's work shall be scheduled in a manner to accommodate the schedules of the City and the affected customers. In the event closing of valves to make a connection will affect a customer:

i. who cannot be without service, as approved by Public Works, the Contractor shall make provisions to provide temporary service to that customer.

ii. who can temporarily be without service, the maximum amount of time the customer may be without service, without Contractor furnished provisions for temporary service, shall be 8 hours.

2. Protection of Existing Water Mains, Sewers, Structures, or Utilities

a. Where new lines approach, cross, connect to, or run parallel to existing water or sewer mains, the Contractor shall be held completely responsible for protecting, preserving, and otherwise maintaining existing line during construction of new line. Any damage inflicted to water and sanitary sewer mains or structures must be promptly reported to Water Utilities Operations and arrangement made for the repair. Any damage inflicted to storm sewer lines or structures must be reported

promptly to the Public Works Operations Division and arrangement made for repair. Any damage inflicted to any other utility must be reported promptly to the respective utility and arrangement made for the repair.

b. The Contractor shall protect all existing structures, utilities, and work of any kind against damage or interruption of service that may result from the operations of the Contractor. Damage or interruption of service resulting from failure to do so shall be repaired or restored promptly at the expense of the Contractor.

c. The Contractor shall give reasonable notice to utility companies and to other owners of property when such property is liable to injury or damage by the execution of the Work, so that the owners of such utility or property may take precautionary measures.

d. The Contractor shall be responsible to adjust to finish grade any existing utility/appurtenances (i.e. valves, meter wells, sanitary sewer manhole, storm junction box etc.) that is affected by construction.

3. Handling and Storage

a. Handle pipe materials and fittings in a manner to assure installation in sound and undamaged condition. Use slings, lifting bags, hooks, and other devices designed to protect pipe, joint elements, and coatings. In handling plastic pipe of 10 feet or more long, a double sling will be required.

b. Ship, move, and store with provisions to prevent movement or shock contact with adjacent units.

c. Pipe shall be handled in a manner that minimizes the damage to the coating. Damaged coating shall be repaired in a manner complying with the pipe manufacturer's recommendations.

4. Inspection of Materials: All pipe, fittings, and accessories shall be examined by the City Inspector prior to installation for soundness and specification compliance. Rejected materials shall be marked and removed from the project site, and replaced with approved materials.

5. Alignment: Pipe shall be laid to the lines and grades as shown on the approved Engineering Plans.

6. Cleaning: All pipe, fittings, and accessories shall be kept clean of foreign matter while being handled or stored. During installation, foreign matter shall not enter the pipe or appurtenances. At the end of each working day, a temporary plug shall be installed at the termination of the pipeline.

B. Water Main Installation

1. Installation Standards: All pipes shall be installed in a manner complying with the following standards:

   a. DIP - ANSI/AWWA C600.
   b. PVC & PVCO Pipe - ANSI/AWWA C605.

2. Installation

   a. Governmental Requirements: Water main installation shall comply with applicable local, state, and federal requirements.

   b. Trench Dewatering: See Section 2100.

   c. Drainage Course Crossings: See Section 2100.

   d. Trench Widths

      i. Minimum Widths: Trench widths pipe clearances shall be not less than those shown in Standard Detail Drawing WAT-18.

      ii. Maximum Widths: Maximum trench widths shall be governed by existing soils, trench type, bedding, and laying conditions. Maximum widths shall not exceed the manufacturer's recommendations.

      iii. Trench Slope: See Section 2100.

   e. Compacted Fill: See Section 2100.

   f. Pipe Embedment: DIP and PVC & PVCO pipe shall be bedded in bedding material with a minimum thickness beneath the pipe as specified in Paragraph 3902.B.2.d. See Section 2100.

   g. Bedding Installation: See Section 2100.

3. Backfill: See Section 2100.

4. Tracer Wire: When tracer wire is required, tracer wire shall be installed along the top of the pipe per Standard Detail WAT-17 so that the wire is in relatively continuous contact with the pipe. The wire shall be accessible at every valve box. tracer wire shall be inspected by the Public Works Inspector prior to backfill.

5. Service Connections

a. The City will install a corporation connection at the main for individual, commercial, industrial, and residential service lines that are 1 inch in diameter and less. No tap fees are required for 1 ½ inch and larger as they are performed by the owner. The Contractor/Developer shall notify Water Utilities Operations 48 hours in advance of requiring a service connection.

b. Taps: Refer to the City's Standard Detail Drawing WAT-04.

   i. A saddle shall be required when PVC or PVCO pipe is tapped

   ii. A direct tap with a tapping machine is required for DIP.

c. For service lines larger than 2 inches in diameter, a tee shall be cut in with appropriate valving or a tapping sleeve and valve shall be installed. The Contractor/Developer shall notify Water Utilities Operations and the City Inspector 48 hours prior to starting this work.

d. Excavation for service connections shall be provided by the Contractor/Developer as illustrated in the Standard Drawings. The excavation shall be prepared prior to the time scheduled with Water Utilities Operations for the tap.

e. Installation of meters greater than 2-inch diameter must be specifically approved by Public Works.

f. Excavation shall be adequately protected in accordance with City of Blue Springs standards and specifications. Backfilling shall take place as soon as practicable.

6. Thrust and Straddle Block Restraint

a. All tees and bends shall be provided with thrust blocks and be mechanically restrainted with a Megalug gland or approved equal as shown in the Standard Detail Drawing WAT-14.

b. Concrete construction shall comply with ACI 301, Specifications for Structural Concrete.

c. Concrete shall extend from fitting to undisturbed soil and shall be installed so that all joints are accessible.

d. Concrete shall be placed and cured for a minimum of 24 hours prior to energizing the water main.

e. Straddle blocks shall be constructed on the last section of pipe at all line terminations and shall comply with details shown on the Engineering Plans and

in the Standard Detail Drawing WAT-15. All termination points require a fire hydrant assembly. If the main is to be extended in the future, a valve of the same size shall be provided. A plug shall be installed in the valve to protect the integrity of the valve seat.

7. Pipe Encasement

   a. Total or partial encasement of pipe in concrete shall be used where the required safe supporting strength of the pipe cannot be obtained by other bedding methods. Concrete encasement shall also be provided at locations where there exists the possibility that standard bedding may be eroded by currents of water under and around the pipe. Concrete construction shall comply with ACI 301, Specifications for Structural Concrete.

   b. Concrete encasement shall be constructed at locations indicated and complying with details as shown on the Engineering Plans and in the Standard Drawings. Start and terminate encasement at a pipe joint. Adequately support and block the pipe to maintain position and prevent flotation. Form to dimensions indicated or construct full width of the trench.

      i. Longitudinal reinforcement shall be continuous.

      ii. Concrete encasement shall be protected and cured so as to prevent excessive evaporation of moisture or freezing. Backfilling will not be considered as a suitable method of curing the encasement.

      iii. Backfill trench only after concrete encasement has obtained a minimum of 2,000 psi. All backfilling shall be done in accordance with Section 2100.

8. Pipe Laying: All pipe installation shall comply with the pipe manufacturer's recommendations, except as modified herein.

   a. Pipe laying shall not proceed if the trench width as measured at the top of pipe exceeds the maximum allowable trench width. If this occurs, the Contractor shall submit to the Design Engineer and the City Engineer a better bedding design for the pipe or pipe of sufficient strength to provide safe supporting strength for approval.

   b. All pipe and fittings shall be stored and handled with care to prevent damage thereto. Do not use hooks to transport or handle pipe or fittings. Do not drop pipe or fittings.

   c. Pipe and fittings rejected by the City Inspector shall be marked and promptly removed from the project site. All pipe and fittings shall be examined for soundness and specification compliance prior to placement in the trench and

rejected pipe or fittings shall not be incorporated into the pipeline. Check the class or pipe strength to be sure proper pipe is installed.

d. Clean joint contact surfaces prior to jointing. Use lubricants as recommended by the pipe or joint manufacturer. Keep lubricants and applicators clean.

e. Excavate bell holes for each pipe joint. When jointed, the pipe shall form a true and smooth pipeline.

f. On transmission mains, the pipes and appurtenances shall be truly laid to line and grade as approved and to manufacturer's recommendations. Pipe installed but not meeting approved line and grade shall be ordered removed and replaced at the Contractor's expense.

g. The trench shall be excavated to sufficient depth to allow embedment to be placed in the bottom of all trenches. At the pipe joints, the trench shall be excavated to an additional depth so that the bell will not rest on the bottom of the trench, and all the weight of the pipe shall be evenly distributed along the entire length of the barrel of the pipe.

h. The water main must be made watertight at all points; any leaks or other defects discovered at any time before the final acceptance of the Work shall be immediately repaired or that portion of the water main shall be rebuilt if necessary.

i. In all cases, full length sticks of pipe shall be used, except in making closures.

j. Clean interior of all pipe, fittings, and joints prior to installation. To exclude entrance of foreign matter during discontinuance of installation, close open ends of the pipe with snug fitting closures. Take reasonable precautions to not let water fill the open trench, and include provisions to prevent pipe flotation. Remove water, sand, mud, and other undesirable backfill materials from the trench prior to removal of the end cap.

k. In forming joints, each length of pipe shall be carefully aligned in such a manner as to form an accurate concentric joint, thus providing a uniform circular pipe opening. Each length of pipe shall thrust into the bell and shall be securely held in position until the next length of pipe has been placed.

l. The pipeline trench excavation shall be dewatered sufficiently to allow pipe joints to be made under dry conditions. No joints shall be made under water.

m. Joints:

i. Joints shall in general be made complying with the manufacturer's recommendations and as specified herein.

ii. Clean and lubricate all joint and gasket surfaces with lubricant recommended by pipe manufacturer.

iii. Care shall be exercised by the Contractor to insure against damage to joint material in storage, handling, or placing operations.

iv. No damaged joint material shall be permitted to be used and the same shall be removed promptly from the job site.

v. All pipe joints shall be completed by insuring that the ends of the pipe to be joined are in contact and completely shoved into "home" position.

n. Pipe shall be cut in a neat workmanlike manner without damage to pipe. Cutting of pipe with a torch is not permitted. Smooth cut by power grinding to remove burrs and sharp edges. Repair the lining as required and approved by the City Inspector.

o. All pipelines shall be plugged at the end of each day's progress with a watertight plug. Plugs or other positive methods of sealing shall be utilized at all times to protect any existing system from entrance of storm water or other foreign matter.

p. When a water main crosses an existing pipeline (sanitary sewer, storm sewer, service laterals or force mains) and the clearance is less than 18 inches, concrete encasement shall be required for the existing pipeline in a manner approved by the City's on-site representative.

9. Valves, Fittings, and Hydrants:

a. Valves, fittings, and hydrants shall be set and jointed to a new pipe in the manner specified for cleaning, laying, and jointing pipe.

b. Valves, fittings, hydrants, and pipe shall be supported in such a manner that there is no deflection in the valve or fitting-to-pipe joint. Larger valves and fittings may require additional support so that the pipe does not have to support the weight of the valve or fitting. In no case shall hollow pipe be used as a support mechanism.

c. Valve boxes and lids shall be installed over each valve. The valve box shall be supported in a manner to remain centered and plumb over the operating nut of the valve. The valve box shaft shall not transmit shock or stress to the valve. Valve box covers shall be installed flush with the finish grade, or as directed by the City Inspector.

d. Hydrants:

   i. Hydrants shall be installed as shown in the Standard Detail Drawing WAT-01.

   ii. Refer to AWWA Manual M17 for additional installation guidelines.

10. Removal of Water: The Contractor shall provide dewatering as specified in Section 2103. Damaged pipe or structures of any kind resulting from insufficient dewatering facilities or similar lack of proper conduct of the work shall be replaced by the Contractor at their own expense. No structure or pipes shall be laid in water, and no water shall be allowed to run into or over any concrete work or pipe, or into or through any pipe.

11. Water Main Connections to Existing Main

    a. The Contractor/Developer shall furnish and install all of the fittings necessary for connections between new water mains and existing water mains. The use of tapping sleeves and valves is to be minimized and shall only be allowed where required on approved engineering drawings. The installation of tapping sleeves and valves shall be done while a City Inspector is present.

       i. All tapping sleeves will be required to meet the following air test:

          - < 12-inch, hold 45 psi for 1 minute
          - > 12-inch, hold 60 psi for 1 minute

       ii. Tapping into existing mains shall be done with no interruption of existing services unless otherwise approved by the Public Works Operations Division at (816) 228-0195 72 hours prior to disruption of service.

       iii. Tapping sleeves are not allowed on lines of the same size.

    b. Valves on the existing water system or valves that separate newly constructed mains from the existing water system shall be operated by City staff. This operation shall be coordinated with city staff.

    c. Special care should be taken when making a connection to an existing main. No foreign material or contaminants will be permitted to enter the water system.

    d. Thrust blocks shall be provided at the new connection to provide thrust restraint as shown in the Standard Drawings

    e. Separation of connections to an existing main shall be a minimum of 20 feet.

12. Abandonment of Water Mains

a. No existing water mains shall be abandoned prior to contacting Water Utilities Operations at least 72 hours in advance.

b. Prior to abandonment of a water main, the Contractor shall verify that no existing services will be affected.

c. If a water main is indicated for abandonment, it shall be abandoned by removal and backfill if required or by plugging each end of the line segment. To plug each end of the line segment, a section of pipe at least 10 feet long shall be cut out of the existing line. The water shall be drained out to the fullest extent practicable, and the ends shall be sealed with a 1-foot thick plug of non-shrink grout sealed with a Portland cement grout and coated with an epoxy coating.

d. Location of cut line and plugs shall be shown on the engineered drawings.

e. Hydrants (complete) shall be removed and returned to Water Utilities Operations.

13. Abandonment of Service Lines

a. For 2-inch and smaller water service lines that are connected to a water main (that is to remain in service), the water service line shall be abandoned by removing the corporation valve and replacing it with a plug.

b. For greater than 2-inch water service lines that are connected to a water main (that is to remain in service), the water service line shall be abandoned by removing the valve and installing a blind flange, severing the water service line within 2 feet of the valve, plugging the service line with concrete, removing the valve box, backfilling the hole left after removing the valve box, and repairing the surface. The valve box shall be returned to the Water Utilities Operations.

14. Protection of Water Supplies

a. There shall be no physical connection between a public or private potable water supply system and a sewer, or an appurtenance thereto, that would permit the passage of any wastewater or polluted water into the potable water supply.

b. For water mains paralleling or crossing sewer mains, see Section 6900 of the City of Blue Springs Design and Construction Manual.

c. Water and sewer mains shall not be placed in the same trench or excavation.

15. Connection of Pipes of Dissimilar Materials: The connection of pipes of different materials shall be made using approved transition couplings, and shall provide a permanent and watertight connection that will withstand the hydrostatic test pressure.

C. Disinfection

3. General

a. Precautions, methods, procedures and materials for disinfection shall comply with the current AWWA C651.

b. Precaution shall be taken to protect the interior of pipes, fittings, and valves against contamination. Pipe shall be handled in such a manner to prevent the entrance of foreign material or water.

c. All water mains shall be disinfected and tested. Not more than 4,000 feet of water main shall be installed without disinfecting and testing.

d. The Contractor/Developer shall notify the Inspector at least 48 hours prior to commencing disinfection.

e. Existing water distribution system valves shall be operated by City staff.

f. Samples shall be taken of water that has stood in the main for at least 16 hours after final flushing has been completed and shall be tested by a state-certified laboratory, as approved by the City, for bacteriological quality complying with "Standard Methods for the Examination of Water and Wastewater." The samples shall meet the MDNR standard.

g. Samples shall be taken at locations selected by the City Inspector. Generally, sample locations and frequency should meet requirements specified in the Missouri Department of Natural Resources Minimum Design Standards for Missouri Community Water Systems.

h. If the continuous feed method of chlorination is selected, bacteriological samples shall not be taken until the water mains have passed hydrostatic and leakage tests.

2. Filling: After installation, the entire main shall be completely filled with water to eliminate air and be flushed to remove any material that may have entered the main. Flushing velocities shall not be less than 2.5 feet per second.

a. If the continuous feed method of chlorination is selected, the filling and flushing shall be done prior to chlorination.

b. If the tablet method of chlorination is selected, the filling shall be done very slowly (i.e., less than 1 ft/s) and in the presence of the City Inspector. The water main shall be flushed after it has been chlorinated.

3. Chlorination: Chlorination shall comply with the procedures given in AWWA C601.

    a. The basic chlorination process is described below.

        i. Chlorinate the water main and measure chlorine at the ends of the water main and ends of all branches. A minimum of 25 milligrams per liter (mg/l) free chlorine should be detected at each location, or additional chlorination is required until that level is reached.

        ii. When acceptable chlorine levels are detected at all points, the Contractor/Developer shall operate all valves and hydrants within the newly-constructed section (except for the valve tying the new construction to the City's distribution system) in order to disinfect appurtenances.

        iii. The chlorinated water shall be retained in the water main for at least 24 hours.

        iv. If the required minimum residual of 10 mg/l chlorine is not present in all portions of the water main after 24 hours, rechlorinate the water main.

        v. If the required minimum residual of 10 mg/l chlorine is present in all portions of the water main, flush the water main until chlorine measurements show the water leaving the test main are no higher than that prevailing in the system.

        vi. Disposal of Heavily-Chlorinated Water: The heavily-chlorinated flush water shall be discharged to a storm sewer and the flush water shall be dechlorinated in a manner complying with AWWA C651, Appendix C.

        vii. Samples for bacteriological testing shall be taken through a corporation stop and copper tubing.

        viii. The first set of bacteriological samples will be taken under the direction of the City Inspector, who will take this and all subsequent samples to the laboratory.

        ix. The laboratory shall be one certified by MDNR for microbiological analyses.

        x. Generally, the chlorination process should meet requirements specified in the Missouri Department of Natural Resources Minimum Design Standards for Missouri Community Water Systems.

D. Hydrostatic and Leakage Testing

Hydrostatic pressure and leakage testing shall be performed by the Contractor/Developer per 2902.9.B of the Kansas City Metropolitan Chapter of APWA Construction and Material Specifications, latest edition. Arrangements to perform testing shall be made with the Engineering Division of Public Works at (816) 228-0121.

3903 ACCEPTABLE MANUFACTURERS AND MODELS

A. General: A list of acceptable manufacturers and models for various materials or approved equals is provided on the City's standard drawings and updated on a regular basis. The Standard Details can be found on the City's web site at http://www.bluespringsgov.com/1349/Design-Construction-Manual.