TECHNICAL SPECIFICATIONS FOR PUBLIC IMPROVEMENT PROJECTS

Revised January 2024

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TECHNICAL SPECIFICATIONS

GENERAL PROVISIONS

The provisions in this section shall be applicable to public improvement projects within the limits of the City of Olathe, Kansas. The provisions shall apply to all parts of the *Technical Specifications and Design Criteria for Public Improvement Projects* including all revisions, amendments and supplements.

GP01 DEFINITIONS

Whenever the following words, phrases, or abbreviations appear in these specifications, they shall have the following meanings:

A. *Bond* shall mean performance, maintenance, and statutory bonds and other instruments of security furnished by the Contractor and his surety in accordance with these specifications.

B. *City* shall mean the City of Olathe, Kansas, a municipal corporation, acting by and through its duly elected governing body and its duly appointed officials.

C. *City Engineer or Engineer* shall mean the City Engineer of the City of Olathe and his/her authorized representatives acting on behalf of the City.

D. *Contractor* shall mean a person, partnership, or corporation duly licensed and bonded to the City of Olathe performing construction operations within the City of Olathe.

E. *Day* shall mean a calendar day of twenty-four (24) hours measured from midnight to the next midnight.

F. *Design Engineer* shall mean a licensed engineer under contract to the developer or the City of Olathe for the purpose of preparing and sealing engineering design drawings and specifications for a specific public improvement project.

G. *Project Inspector* shall mean an authorized representative of the City Engineer who has been assigned to assure conformance to the requirements of the design drawings and specifications by the Contractor.

H. *Structures* shall mean bridges, basins, street drainage structures, box culverts, headwalls, retaining walls, manholes and similar construction.

I. Whenever the words as *directed, as required, as permitted*, or words of like meaning are utilized it shall be understood that the directions, requirements, or permission of the City Engineer is intended. Similarly, the words *approved, acceptable, and satisfactory* shall refer to approval by the City Engineer.

GP02 REFERENCED STANDARDS

Whenever references are made to standard specifications, methods of testing, materials codes, practices and requirements, it shall be understood that the latest revision of said references shall govern unless a specific revision is stated. The following abbreviations shall have the following meaning:

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute

AISC	American Institute of Steel Construction
ISO	Insurance Services Office
ASTM	American Society for Testing and Materials
ANSI	American National Standards Institute, Inc.
APWA	American Public Works Association
AWWA	American Water Works Association
MARC	Mid-America Regional Council
KDOT	Kansas Department of Transportation
KCMMB	Kansas City Metro Materials Board
MUTCD	Manual on Uniform Traffic Control Devices
CRSI	Concrete Reinforcing Steel Institute
NEC	National Electrical Code

Where the words *these specifications* appear or where words of similar connotation are used it shall be understood that such reference refers to the *Technical Specifications and Design Criteria for Public Improvement Projects* of the City of Olathe. Where reference is made to the Standard Specifications for Road and Bridge Construction it shall mean that reference is made to the latest edition of the KDOT *Standard Specifications for Road and Bridge Construction* including all revisions, amendments, and supplements.

GP03 PERMIT FOR CONSTRUCTION

All streets, storm sewers, sanitary sewers, waterlines, street lights and related construction shall require a permit and conform to the City of Olathe *Technical Specifications and Design Criteria for Public Improvement Projects*. Residential private improvements shall be inspected by the City of Olathe. Fees assessed for private improvements shall be the same as those assessed for public improvements.

No construction of any private street or public improvement project shall be undertaken until the following criteria and requirements have been fully met:

- Construction plans and specifications have been submitted to and approved by the City Engineer.
- Suitable performance, maintenance and statutory bonds have been submitted to and approved by the City Engineer. All bonds shall be placed on file with the City.
- A contract for City inspection services, executed by the Contractor, and a copy of the bid proposal for construction have been submitted to and approved by the City Engineer.
- The fee for City inspection services must be paid by the Contractor prior to the issuance of a release for construction.
- Street sign costs must be paid by the Developer or Contractor, if applicable.
- Copies of recorded plats and easements must be on file with The City of Olathe Infrastructure department, if applicable.
- Excise tax paid by the Developer, if applicable.
- The Final Plat submitted for recording.

- Copies of the Stormwater Pollution Prevention Plan (SWPPP) must be on file with the City of Olathe.
- A Land Disturbance permit and National Pollutant Discharge Elimination System (NPDES) Notice of Intent (NOI) permit must be obtained for any construction activity which will result in a land disturbance of more than one acre.
- The Contractor shall be required to submit material certifications in compliance with the Approved Materials List.
- The Design Engineer shall submit shop drawings, digital project drawings and related CAD files.
- Five (5) working days advance notification from the Contractor prior to actual start of work must be received by the City Engineer.

Compliance with the above shall constitute the minimum requirements necessary to receive a construction permit. The City Engineer may cause additional requirements to be met prior to the issuance of a permit. Work discovered underway which is not in conformance with these requirements shall be ordered to cease and shall not be allowed to commence until such requirements have been met. Any improvements constructed shall be rejected until approval is given by the City Engineer.

GP04 <u>BONDS</u>

Suitable performance and maintenance bonds shall be furnished by the Contractor to the City Engineer guaranteeing the proper completion and maintenance of the construction involved in the public improvement project. The performance bond and the maintenance bond shall each be in an amount equivalent to the full cost of the improvement. The maintenance bond shall remain in effect for a period of two (2) years from the date of City Council acceptance for all public improvement projects unless the contract allows for the issuance of a Certificate of Substantial Completion. The two (2) year maintenance period for the items identified as substantially complete on the Certificate of Substantial Completion shall begin on the date stipulated on the Certificate.

The Contractor shall also submit a suitable statutory bond equivalent to the full cost of the improvement to the City Engineer.

The project shall not be released for construction until all bonds have been submitted to and approved by the City Engineer.

GP05 <u>INSURANCE REQUIREMENTS</u>

The Contractor shall procure, and maintain as required, insurance against claims for injuries to persons or damages to property which may arise from or in connection with the project. The cost of such insurance shall be included in the Contractor's bid as part of the project.

B. Contractor shall maintain the following coverages and minimum limits:

1. Commercial General Liability

   [Insurance Services Office (ISO) "occurrence" form or its equivalent] $1,000,000 per occurrence limit and products - completed operations limit. Any general aggregate limit should be at least $2 million with a per site/project endorsement.

2. Business Auto Coverage

   (Owned and non-owned autos) $1,000,000 per occurrence limit.

3. Workers Compensation and Employers Liability

   Workers compensation limits as required by the statutes of the State of Kansas and employers liability limits of $500,000/$500,000/$500,000. When workers compensation insurance policy is applicable, “other states” coverage is required.

4. Umbrella Liability

   Minimum limit of $1,000,000. Coverage to be in excess of the commercial general and automobile liability.

5. Coverage Limits

   Coverage limits for General and Auto Liability exposures may be met by a combination of primary and umbrella policy limits.

6. Exposure Limits

   The above are minimum acceptable coverage limits and do not infer or place a limit on the liability of the Contractor, nor has the City assessed the risk that may be applicable to Contractor. Contractor shall assess its own risks and if it deems appropriate and/or prudent, maintain higher limits and/or broader coverages. Contractor’s insurance shall be primary and any insurance or self-insurance maintained by the City shall be excess and not contribute with the coverage maintained by Contractor.

C. Additional Insured

City shall be listed by ISO endorsement, or its equivalent, as an additional insured for the project. Any and all coverage available to the named insured is applicable to the additional insured. Contractor’s insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability.

D. Verification of Coverage:

1. A certificate of insurance accompanied by an additional insured ISO form endorsement (CG 20 10; and CG 20 37) or equivalent effecting the coverage required by the City which includes products and completed operations. The certificate of insurance must include reference to the project number or description.

2. The insurance coverages are to be provided by Kansas authorized insurance companies with a Best’s rating of at least A- VII. Insurers not meeting these minimum standards must be approved by City.

3. Any self-insurance or self-insured retentions must be specified on the certificate of insurance. In addition, when self-insured the name, address and telephone number of the claims office must be indicated on the certificate or separate attached document. Any and all deductibles or self-insurance in the above described coverages shall be the responsibility and at the sole risk of the Contractor.
4. The commercial general liability policy shall not contain an endorsement excluding contractual or completed operations liability.
5. When any of the foregoing insurance coverages are required to remain in force after final payment, additional certificates with appropriate endorsements evidencing continuation of such coverage shall be submitted along with the application for final payment.
6. Any coverage provided by a Claims-Made form policy must contain a three year tail option, extended reporting period, or must be maintained for three years post contract.

E. Cancellation

Each insurance policy required shall not be suspended, voided, or canceled; except after thirty (30) days' advance written notice has been given to the City.

F. Subcontractors

All coverages for subcontractors shall be subject to all of the requirements stated herein.

GP06 SHOP DRAWINGS AND ENGINEERING DATA

The Contractor shall submit materials information certifying compliance with the Approved Materials List for all projects. Shop drawings and engineering data shall also be required on all projects. The Design Engineer shall be required to review and approve shop drawings prior to submitting them to the City Engineer. The Contractor shall submit samples and/or hard copies of warranties, operating instructions and other information when required by the contract documents or requested by the City Engineer.

An Approved Materials List is available on the City of Olathe website at the following location: **http://www.olatheks.org**

This list contains products that are approved for use on public improvement and capital improvement projects in the City of Olathe. The list is periodically revised. Products shown on this list may be used unless otherwise stipulated by the City Engineer. Products not shown on this list may be specified or approved for use by the City Engineer. The products shown on the Approved Materials List have been derived from this list. Material requirements are included in the Technical Specifications.

Materials information shall be submitted to the City Engineer and approved prior to issuance of the notice to proceed. Confirmation of the materials utilized must be verified by the Project Inspector and Contractor prior to issuing the Project Completion Certificate.

Engineering data covering all equipment and fabricated materials which will become a permanent part of the work shall be submitted to the City Engineer for review. This data shall include drawings and descriptive information in sufficient detail to show the kind, size, arrangement and operation of component materials and devices; the external connections, anchorages and supports required; performance characteristics; and dimensions needed for installation and correlation with other materials and equipment.

All submittals, regardless of origin, shall contain the Contractor's signature assuring conformance with these specifications and approved plans. Each submittal shall contain the City project number, Contractor's name and references to applicable specification paragraphs and drawings. Each submittal shall indicate the intended use of the item in the work. When catalogue pages are submitted, applicable items shall be clearly identified. The current revision, issue number and date shall be indicated on all drawings and other descriptive data.

The Contractor's signature of approval is a representation to the City Engineer that the Contractor accepts full responsibility for determining and verifying all quantities, dimensions, field construction criteria, materials, catalog numbers and similar data, and that he has reviewed or coordinated each submittal with the requirements of the work.

Each submittal shall include a statement prepared by the originator of the drawings and data certifying compliance with these Specifications and approved plans, except for deviations which are specifically identified.

All deviations from these Specifications shall be identified on each submittal and shall be tabulated in the Contractor's letter of transmittal. Such submittals shall, as pertinent to the deviations, indicate essential details of all changes proposed by the Contractor, including modifications to other facilities that may be a result of the deviation.

The Contractor shall accept full responsibility for the completeness of each submission, and, in the case of re-submission, shall verify that all exceptions previously noted by the City Engineer have been taken into account. In the event that more than one re-submission is required because of failure of the Contractor to account for exceptions previously noted, the Contractor may be required to reimburse the City for the associated additional review costs.

Any need for more than one re-submission, or any other delay in obtaining the City Engineer's review of submittals, will not entitle the Contractor to an extension of the contract time unless delay of the work is directly caused by a change in the work authorized by a Change Order or by failure of the City Engineer to return any submittal within twenty-one (21) days.

The City Engineer's review of drawings and data submitted by the Contractor will cover general conformity to the approved plans and specifications, external connections and dimensions which affect the layout. The City Engineer's review does not provide a thorough verification of all dimensions, quantities, and details of the material, equipment, device or item shown. City Engineer's review of submittals shall not relieve the Contractor from

responsibility for errors, omissions, or deviations, nor responsibility for compliance with these Specifications.

One digital copy of each drawing and necessary data shall be submitted to the City Engineer. The City Engineer will not accept submittals from anyone except the Contractor. Submittals shall be sequentially numbered without division by subcontracts or trades. Re-submittals shall bear the number of the first submittal followed by a letter (A, B, etc.) to indicate the sequence of the re-submittal.

If the shop drawings, data or samples as submitted describe variations and show a departure from the approved plans which the City Engineer finds to be in the interest of the City and minor as not to involve a change in Contract Price or time for performance, the City Engineer may return the reviewed drawings without noting an exception.

Submittals will be returned to the Contractor marked with one or more of the following codes:

NO EXCEPTIONS NOTED

This code is assigned when there are no notations or comments on the submittal. When returned under this code, the Contractor may release the equipment and/or material for manufacture.

EXCEPTIONS NOTED

This code is assigned when a confirmation of the notations and comments IS NOT required from the Contractor. The Contractor may release the equipment or material for manufacture, at their own risk, on the basis that all notations and comments must be incorporated into the final product.

EXCEPTIONS NOTED, CORRECT AND RESUBMIT

This code is assigned when a confirmation of the notations and comments is required from the Contractor. The Contractor may release the equipment or material for manufacture at their own risk; on the basis that all notations and comments must be incorporated into the final product. This confirmation shall specifically address each omission and nonconforming item that was noted. Confirmation is to be received by the City Engineer within twenty-one (21) calendar days of the date of the City Engineer's transmittal requiring the confirmation.

RETURN FOR CORRECTION

This code is assigned when notations and comments are extensive enough to require a re-submittal of the package. The Contractor SHALL NOT proceed with manufacture. All notations and comments must be incorporated into the final product. Installation and payment for equipment or materials will not be approved until re-submittal is received, reviewed and approved. This re-submittal is to address all comments, omissions and nonconforming items. Re-submittal shall be received by the City

Engineer within twenty-one (21) calendar days of the date of the City Engineer's transmittal requiring the re-submittal.

NOT ACCEPTABLE

This code is assigned when the submittal does not meet the intent of the Contract Documents. The Contractor must resubmit the entire package revised to bring the submittal into conformance with the approved plans.

RECORD COPY

This code is assigned when data is for record only and not subject to review. No additional copies are required unless requested by the City Engineer.

GP07 CHANGES IN THE WORK

Changes in the work from the approved project plans shall require the written consent of the City Engineer. The Design Engineer shall submit all proposed changes to the City Engineer for review. Written approval of the City Engineer shall be received by the Project Inspector prior to implementing the deviation. Any change in the work made without the consent of the City Engineer shall be subject to removal by the Contractor at his expense.

GP08 DAMAGES

The Contractor hereby expressly binds himself or itself to indemnify and hold harmless the City and its officers and employees against all suits or actions of every kind and nature brought or which may be brought, or sustained by any person, firm, or corporation, or persons, firms or corporations, in connection with or on account of the Contractor's work or in consequence of any negligence in connection with same, or an account of any poor workmanship, or on account of any act of commission or omission of the Contractor or his, its, or their agent or employees, or for any cause arising during the course of construction.

GP09 PROTESTS

If the Contractor considers any work requested of him by the Project Inspector to be outside the requirements of the approved plans, he shall immediately request a written decision or instructions and shall proceed to perform the work to comply with the Project Inspector's direction. If the Contractor considers such instructions unsatisfactory, he shall, within twenty-four (24) hours, file a written protest with the City Engineer, stating his objections along with supporting documentation. Unless protests or objections are made in the manner specified and within the time limit stated herein, the Contractor hereby waives all grounds for protest.

GP10 TRAFFIC CONTROL

The Contractor shall be required to submit a traffic control plan to the City Engineer for approval prior to beginning any work on the project. The flow of traffic in streets and access to private property shall be reasonably maintained at all times. The Contractor shall provide a safe roadway, and shall erect and maintain warning signs, barricades and sufficient safeguards around all excavations, embankments and obstructions. The Contractor shall provide suitable warning lights or flares and shall keep them lit from one-half hour prior to sunset until one-

half hour after sunrise and at all other times when visibility is limited. The Contractor shall further provide flagmen and watchmen when required by the City Engineer or Project Inspector for the protection of the public.

The design, placement and maintenance of traffic control devices shall conform to the most recent edition of the *Manual on Uniform Traffic Control Devices for Streets and Highways*.

The roadway shall be properly maintained and the Contractor shall coordinate his operations with the City Engineer to assure that suitable arrangements are made for detours, parking and access to private property, etc. The Contractor shall notify the Project Inspector forty-eight (48) hours in advance of a street closing or lane reduction. Traffic control devices on arterial roadways shall not be in-place prior to 8:30 a.m. or after 4:00 p.m. unless otherwise authorized by the City Engineer. In the event the Contractor is not maintaining a safe roadway, the City Engineer may take action to improve the roadway conditions at the Contractor's expense.

GP11 SAFETY

The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the work. The Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to: All persons on the work site or who may be affected by the work; all the work and materials and equipment to be incorporated therein, whether in storage on or off the site; and other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities and underground facilities not designated for removal, relocation or replacement.

The Contractor shall comply with all applicable laws and regulations of any public body having jurisdiction for safety of persons or property, and shall erect and maintain all necessary safeguards for such safety and protection. Prior to beginning construction, the Contractor shall notify owners of adjacent property and of underground facilities and utility owners, and shall cooperate with them in the protection, removal, relocation and replacement of their property. All damage, injury or loss to any property caused, directly or indirectly, by the Contractor, or agent of the Contractor, shall be remedied by the Contractor. The Contractor’s responsibilities, in this regard, remain until the work is complete.

The Contractor shall designate a qualified and experienced safety representative at the site whose responsibility shall be to prevent accidents and maintain and supervise safety precautions and programs. The City shall have the right to contact to the designated safety representative onsite.

GP12 AUTHORITY OF THE ENGINEER

The City Engineer is designated by the City of Olathe to exercise all authority on behalf of the City to ascertain that all construction of facilities is equal to or better than the minimum construction requirements set forth in the approved plans and these specifications. The City Engineer shall be represented by a Project Inspector to check any and all work performed,

including all materials to be incorporated in the work. The City Engineer shall have the sole authority to issue, in writing, any deviations from the provisions of these specifications or changes to the approved plans.

GP13 OBSERVATION OF THE WORK

General

All materials and workmanship shall be subject to observation, examination and testing by the City Engineer or his/her representative at any and all times during construction and at any and all places where such construction is performed. The City Engineer shall have the authority to reject defective material and workmanship or require its correction. Unacceptable workmanship shall be satisfactorily corrected. Rejected material shall be promptly segregated and removed from the project area and replaced with material of the specified quality to the satisfaction of the City Engineer. If the Contractor fails to proceed at once with correction of rejected workmanship or defective material, the City of Olathe may contract or otherwise have the defects remedied or rejected materials removed from the project area and charge the cost of the same against the Contractor, without prejudice to any other rights or remedies of the City of Olathe.

The Contractor shall have available on the work site at all times one (1) copy of the approved plans signed by the City Engineer, the latest edition of the *Technical Specifications and Design Criteria for Public Improvement Projects* and one (1) copy of the Stormwater Pollution Prevention Plan (SWPPP). The Contractor shall provide the constant attention necessary to facilitate the progress thereof and shall cooperate with the City Engineer, Project Inspector and other contractors. The Contractor shall designate and have on the work site at all times, as his agent, a competent superintendent capable of reading and thoroughly understanding the approved plans and specifications. The superintendent shall have full authority to execute the orders or directions of the City Engineer without delay and to promptly supply such materials, tools, equipment and labor as may be required. Such superintendent shall be furnished irrespective of the amount of work sublet.

The Contractor shall at all times employ the labor and equipment necessary to pursue all types of work to full completion in the manner and time required by the contract documents, plans and specifications. All workers shall have sufficient skill and experience to satisfactorily perform the work assigned to them. Workers engaged in specialized work shall have sufficient experience in such work and in the operation of the equipment required to perform all work satisfactorily.

Any person employed by the Contractor or by any subcontractor who, in the opinion of the City Engineer, does not perform in a proper and skillful manner or is intemperate or disorderly shall, at the written request of the City Engineer, be removed forthwith by the Contractor or subcontractor employing such person, and shall not be employed again in any portion of the work without the approval of the City Engineer.

Should the Contractor fail to remove such person or persons as required above, or fail to furnish suitable and sufficient personnel for the proper performance and supervision of the work, the City Engineer may suspend the work by written notice until such order(s) is/are complied with.

The Contractor shall promptly furnish all materials reasonably necessary for any tests which may be required. All tests required by the City Engineer shall not delay the work unnecessarily and will be made in accordance with the provisions of these specifications.

The Contractor shall notify the City Engineer sufficiently in advance of backfilling or concealing any facilities to permit proper observation. If any facilities are concealed without approval or consent of the City Engineer, the Contractor shall uncover for observation and recover such facilities all at his own expense, when so requested by the City Engineer.

Inspections and/or testing of the work and/or materials by City of Olathe representatives shall not relieve the Contractor and/or his sureties of full responsibility for materials furnished and/or work performed not in strict compliance with these specifications.

Any change or deviation from the approved plans and specifications that has been approved by the City Engineer must be received by the Project Inspector in writing prior to implementing the change. The Project Inspector is not authorized to alter any provisions or to issue instructions contrary to these specifications, or to make any revisions to any previously approved drawing.

Defective Work

The term "defective" is used in these documents to describe work that is unsatisfactory, faulty, not in conformance with the requirements of these specifications or not meeting the requirements of any observation, test, approval or acceptance required by law or these specifications.

Any defective work may be disapproved or rejected by the City Engineer at any time before final acceptance even though it may have been overlooked and included in a previous pay estimate.

The Contractor shall furnish samples of questionable equipment or materials from completed work for testing purposes when required by the City Engineer. All costs in connection with the testing of equipment and materials proven to be defective shall be paid by the Contractor.

Uncovering Work

If any work is covered without concurrence of the Project Inspector it must, if requested by the Project Inspector, be uncovered for his observation. Such work will be at the Contractor's expense.

Should it be considered necessary by the City Engineer at any time before final acceptance of the entire work to make an examination of work already completed by uncovering the same, the Contractor shall promptly furnish all necessary facilities, labor, and material. If such work is found to be defective or nonconforming, the Contractor shall be responsible for all costs of such examination and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the specifications, the actual cost of labor and materials required for the examination and replacement, plus fifteen (15) percent of such cost to cover supervision, general expenses and profit, shall be allowed to the Contractor. If completion of the work of the entire contract has been delayed thereby, a suitable extension of time shall be granted on account of the additional work involved.

GP14 HOURS OF WORK, WEEKEND OR HOLIDAY WORK

Work on Saturday, Sunday or legal holidays shall be as approved by the City Engineer. Requests for permission to work on legal holidays shall be considered upon advance written notification received a minimum of five (5) working days prior to the anticipated date of the work to be performed. Written requests for permission to work on Saturday or Sunday shall be received by 3:00 p.m. on the preceding Thursday. Requests for permission to work on a project past 5:00 p.m. shall be made to the project inspector by 12:00 p.m. (noon) of that day. The use of artificial light to permit night work shall not be permitted except in emergency situations.

Work will not be permitted prior to 7:00 a.m. and all work shall be completed prior to 7:00 p.m. The only exception to this is that no work will be permitted after sunset or before sunrise. Additionally, no paving operations will be permitted to start after 3:00 p.m. which cannot be completed by 5:00 p.m. The City Engineer may specify or approve alternate work schedules when it is deemed necessary.

The Contractor shall be responsible to provide compensation to the City for all applicable costs associated with overtime inspections.

Legal holidays observed by the City of Olathe are New Year's Day, Martin Luther Kings' Day, Presidents' Day, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving Day (including the following Friday) and Christmas. The actual days off for these holidays may vary and in certain situations additional days may be a part of the amount of time granted as an official holiday by the City of Olathe.

GP15 CLEAN UP

The Contractor shall frequently clean up all refuse, rubbish, scrap materials and debris resulting from his operations, so that at all times the site of the work shall present a neat appearance. Clean up shall include mowing of areas within the right-of-way, applicable easements and disturbed areas. Upon completion of the work, the contractor shall remove from the site and any adjoining property, all plants, buildings, rubbish, unused materials, forms, lumber and other materials belonging to him or his subcontractor. The Contractor or

his surety shall be responsible for any costs incurred by the City due to failure by the Contractor to clean up the site to the satisfaction of the City Engineer.

GP16 ACCEPTANCE OF WORK

Partial Acceptance

The City reserves the right to accept and make use of any completed section of the work without obligating the City to accept the remainder of the work or any portion thereof. A Certificate of Substantial Completion may be issued for the portions of the work that meet the requirements of the project contract documents pertaining to substantial completion.

Final Acceptance

When the final clean-up has been performed, the Contractor shall notify the Project Inspector in writing that all work has been completed. The Contractor shall also notify the Design Engineer of the project completion and shall forward him all field changes that occurred during the course of the work.

Within a reasonable time, the Project Inspector shall perform all necessary inspection procedures on the completed work and provide written notification of any remaining items or defects that have been discovered.

Prior to final acceptance, the Design Engineer shall prepare and submit to the City Engineer for approval revised drawings containing the documented field changes. The revised drawings shall be labeled “Conforming to Construction Records” and shall contain the certification of the Design Engineer. The drawings shall be submitted to the City Engineer in both digital and hard-copy format.

The Design Engineer shall compute any changes in the original contract amount and send a letter to the City Engineer verifying the final contract amount.

The Project Completion Certificate shall be written after all work has been completed, accurate drawings conforming to construction records have been received, applicable fees have been paid and all administrative processes have been finalized.

Maintenance Period

The Contractor or his surety shall be responsible for all necessary repair or replacement arising from workmanship or material deficiencies during the two (2) year period following the date of project acceptance by the City Council. The start of the two (2) year maintenance period for the portions of the work covered by the Certificate of Substantial Completion shall coincide with the date of substantial completion as shown on the certificate. The City Engineer shall notify the Contractor or his surety in writing of all work that is required. The Contractor shall have fifteen (15) days from the date of the letter to undertake with due diligence the required work. The City Engineer shall authorize others to make the repairs at the Contractor’s expense if he neglects to respond to the written request with due diligence. The City Engineer may also authorize emergency repairs without written notice to the Contractor if, in the judgment of the City Engineer, delay would cause serious loss, hazard or

damage. The cost of such emergency repairs shall be the responsibility of the Contractor or his surety.

SECTION 1000 - SITE PREPARATION

1001 SCOPE

This section covers the necessary clearing, grubbing, demolition and other appurtenant work in accordance with the approved plans.

1002 DEFINITIONS

Clearing shall include removal of all exposed vegetative matter, such as trees, brush, downed timber, rotten wood, sod, rubbish and other objectionable combustible materials. It shall include the removal and lawful disposal of wooden buildings, fences, lumber, waste dumps, abandoned utilities and trash and salvaging the specified materials.

Grubbing shall include removal of all stumps, roots, buried trees, brush and other objectionable combustible materials located on or below the surface of the ground which have not been included under the definition of "*Clearing*" above.

Demolition shall include destruction and removal of all non-vegetative matter located above, on or below the ground surface. This shall include, but not be limited to, all material derived from the demolition of Portland cement concrete items such as base courses, curbs, curb and gutters, sidewalks, floors, steps, driveways, drainage structures, fences, other miscellaneous items such as foundations or walls, iron or steel items and asphaltic items such as pavement and base courses.

1003 UTILITY COORDINATION

The Contractor shall be responsible for protecting existing and private improvements in the vicinity of clearing, grubbing and demolition operations. The Contractor shall not be responsible for the cost of utility locating services, but he shall be responsible for the cost of all damage to such facilities arising from his carelessness or negligence.

1004 LIMITS OF CONSTRUCTION

The limits for clearing, grubbing and demolition shall be as defined on the approved plans.

1005 PROGRESS OF CONSTRUCTION

Erosion and Sedimentation Control

Prior to clearing, grubbing and demolition, erosion and sedimentation controls shall be in place in accordance with Section 7300.

Clearing

Clearing shall proceed well in advance of the construction operation so as not to delay the progress of the work. The debris from clearing operations shall be lawfully hauled to a waste site, or shall be burned when authorized by the Fire Marshal. Under no circumstances will the authorization to burn on the site relieve the Contractor from damages which may result from his operations. In no case shall any materials be left on the project site, placed onto abutting properties or buried in embankments or trenches on the site. If disposal is on private

property, the Contractor shall obtain written permission from all impacted property owners. Copies of all agreements with the property owners shall be submitted to the City Engineer prior to disposal of the material.

Grubbing

Grubbing shall coincide with the clearing operation as closely as practical. Except for the special circumstances identified below, all stumps, roots, and other objectionable matter within the construction area shall be removed to a minimum depth of twelve (12) inches below the subgrade or the original ground, whichever is lower. All stumps, roots and other objectionable matter outside the limits of the construction area but within the right-of-way shall be cut off flush with the ground.

All stumps, roots, and other objectionable matter within the specified limits of embankments having a depth of two (2) feet or less shall be removed and disposed of. Piling and vacated utility poles shall be removed to a minimum depth of two (2) feet below the subgrade or the original ground, whichever is lower.

All stumps, roots and other objectionable matter found within borrow material shall be removed.

All stumps, roots and other objectionable matter found within the bottoms or sidewalls of excavation and trenching areas shall be completely removed. Except in areas to be excavated, stump holes and other excavated areas from which obstructions are removed, shall be backfilled with suitable material and compacted in accordance with Section 1100.

Demolition

Demolition work shall occur well in advance of the construction operation. Masonry and concrete walls, miscellaneous foundations or other objects extending below ground shall be removed to a depth of at least twelve (12) inches below the original ground or the subgrade, whichever is lower.

When explosives are used in demolition, the Contractor shall comply with the provisions of Section 4100.

Portland cement concrete pavement, base courses, curbs, curb and gutters, gutters, sidewalks and similar objects shall be removed at an existing joint or at a full depth sawed joint.

1006 PROTECTION OF TREES AND SHRUBS

Tree preservation areas, protection zones and stream setback areas shall be protected in accordance with the approved plans using standard orange barricade fencing material approved by the City Engineer. The fencing shall be four (4) feet in height and supported by metal channel posts spaced at a maximum of eight (8) feet on center. The fencing shall be located at the drip line of all trees or wooded areas and shall remain erect and secure throughout all construction phases.

During construction operations, the Contractor shall leave in place and protect from damage all trees, shrubbery and planting beds unless shown on the approved plans to be removed. Where existing trees are to remain, it shall be the responsibility of the Contractor to perform trimming operations on low branches. The trimming shall be performed in a professional manner. The Contractor shall not operate equipment within the drip line of protected trees.

1007 CONSTRUCTION STAKING

The Contractor shall be responsible for all staking required on the project unless otherwise stipulated in the approved plans. The Contractor shall be responsible for and shall provide all staking, furnish all stakes, labor, transportation and other materials as may be required for the proper staking of the work and establish temporary or permanent reference marks. All work performed on the project shall be done to the lines, grades and elevations shown on the plans.

Any work done without being properly located and established by base lines, off-set stakes, benchmarks, or other basic references may be ordered to be removed and replaced at the Contractor's expense.

The Contractor shall be responsible for the preservation of all permanent monuments, property corners, benchmarks, reference points and stakes. If the loss of stakes or reference marks causes a delay in the work, the Contractor shall have no claim for damages or extensions of time.

SECTION 1100 – GRADING

1101 SCOPE

This section covers the performance of all the work and appurtenances required for grading the project in in accordance with the approved plans.

1102 MATERIALS AND DEFINITIONS

Grading shall be defined as all excavation and placement of embankment and backfill.

Excavation is defined as the removal of materials from the construction area to the lines and grades shown on the approved plans.

Unless otherwise provided for in the Special Conditions and included in the approved plans, all excavation shall be unclassified, and the Contractor shall satisfactorily remove and dispose of all materials encountered regardless of their nature.

When provided for in the Special Conditions and included in the approved plans, the excavation may be classified according to the following categories:

Common Excavation
Suitable materials shall include all earth free of rock, sod, weeds, roots and other debris, with the appropriate soil characteristics and moisture content to obtain the required compaction.

Rock Excavation
Rock excavation shall include sandstone, limestone, blue shale or other similar material which, in the opinion of the City Engineer, requires drilling or blasting for removal.

Embankment is defined as the placement and compaction of material to the lines and grades as shown on the approved plans.

Construction of fills and embankments in frozen conditions shall not be permitted unless otherwise approved by the City Engineer. No fill or embankment material shall be installed on frozen surfaces, nor shall frozen materials, snow or ice be placed in any fill or embankment.

Material suitable for use as embankment shall be entirely imperishable and shall be approved by the City Engineer.

Earth embankment shall be free of waste material and shall contain less than ten (10) percent by volume of rock and gravel and contain no particles having a dimension greater than three (3) inches.

Rock embankment shall be free of waste material and shall contain ten (10) percent or greater by volume of rock or gravel with particles ranging in size from a minimum dimension of three (3) inches to a maximum dimension of twenty-four (24) inches.

Embankment material shall not include frozen material, organic material, topsoil, rubbish, broken concrete, brick, asphaltic concrete and other debris and soil.

1103 CONSTRUCTION - GENERAL

During grading operations, the work shall be performed in a manner and sequence that will provide positive drainage at all times. Unstable areas that develop during grading operations shall be undercut, backfilled with suitable material and compacted in accordance with the approved plans. No additional payment will be made to the Contractor for undercutting.

1104 EXCAVATION - GRADING

Excavation within the construction limits shall be performed to the lines and grades indicated on the approved plans.

All suitable material removed by excavation shall be used for embankment construction or elsewhere when directed by the City Engineer. The Contractor shall coordinate excavation operations to ensure suitable materials are readily available. No additional compensation will be made for any re-handling of materials.

Excavation materials in excess of the amount needed to complete the grading shall be considered as waste material, and shall be removed from the site by the Contractor.

Any additional fill material required which is not available from excavation within the construction limits shall be supplied by the Contractor at no expense to the City unless provided for in the approved plans. All such material brought to the site and incorporated in the work shall be approved by the City Engineer.

Unsuitable or unstable material, as determined by the City Engineer, shall be undercut to the depth required to reach stable material, backfilled with suitable material and compacted in accordance with the approved plans. No additional compensation for undercutting will be made unless provided for in the Special Conditions.

All roadway excavation in rock shall be undercut no less than twelve (12) inches for the full width of the roadway and backfilled with suitable soil or granular material. Undercut shall be unclassified excavation.

1105 EMBANKMENT - GRADING

Embankments shall be formed with suitable materials procured from excavations made on the project site or from approved borrow pits.

Where embankments, regardless of height, are placed against hillsides or existing embankments, either of which have a slope steeper than one (1) vertical to six (6) horizontal, the existing slope shall be benched or stepped in approximately eighteen (18) inch rises as the new fill is brought up in eight (8) inch lifts. Benching shall be of sufficient width to accommodate placing and compacting equipment. Each horizontal cut shall begin at the intersection of the original ground and the vertical sides of the previous cuts. Materials thus cut out shall be recompacted to the required density along with the new embankment material. Material cut out, bladed into place, and compacted shall not be measured and paid for directly but will be considered as incidental work.

Maximum slopes for final grades shall be 4:1. Any steeper slope shall require approval of the City Engineer. Any slope greater than 3:1 shall require City Engineer approval as well as a geotechnical analysis.

The existing surface upon which embankment material is to be placed shall have all unstable and unsuitable material, such as topsoil, peat, mulch, coal seams, disintegrated shale, rubbish, logs or stumps, and unconfined saturated soils, removed in accordance with Section 1000 prior to the embankment work.

Where embankments two (2) feet or less in depth are to be placed on areas covered by existing pavement, the existing pavement shall be removed and the cleared ground surface shall be compacted at optimum moisture to the specified density. Where embankments greater than two (2) feet in depth are to be placed on areas covered by existing pavement, the existing pavement shall be broken into pieces not larger than twenty-four (24) inches maximum dimension, left in place and the embankment started thereon.

Earth embankment shall be placed in successive horizontal layers distributed uniformly over the full width of the embankment area. Each layer of material shall not exceed eight (8) inches in thickness (loose measurement) and shall be compacted to the density specified in Section 1106 before the next layer is placed thereon. As the compaction of each layer progresses, continuous blading will be required to level the surface and to ensure uniform compaction. Embankment construction shall not be performed when the material to be compacted contains frost or is frozen.

Successive horizontal layers of rock embankment not exceeding two (2) feet in depth, shall be made by placing larger stones uniformly over the embankment area. Small stone fragments, sand, earth, or gravel shall be placed between the larger stones to fill all voids. Each layer shall be thoroughly compacted before the next layer is placed.

Large rocks shall be withheld from the top one foot of the embankment and only crushed stone or earth used in this layer. The crushed stone shall be well graded to form a dense mass when compacted.

1106 EMBANKMENT--BACKFILL AND COMPACTION

Embankment material shall be compacted in accordance with Section 1200 of the City of Olathe *Technical Specifications and Design Criteria for Public Improvement Projects*.

Backfilling of the curb shall be permitted when the concrete has been placed for a period of five (5) days or when the compressive strength of the concrete has reached seventy five (75) percent of its mix design strength, unless otherwise directed by the City Engineer. All fill material placed within the right-of-way shall be compacted to ninety-five (95) percent of maximum density at the optimum moisture content as determined by ASTM D698. The material used to backfill the curb shall be free of rock and debris and shall leave no voids when compacted.

The top portion of the backfill in unpaved areas shall be finished with at least twelve (12) inches of topsoil. Topsoil shall be approved by the City Engineer prior to placement, and unless otherwise directed, shall be material previously excavated and stockpiled during excavating and grading operations.

Grades on areas to receive topsoil shall be established and maintained as a part of the grading operations. Immediately prior to placing topsoil, the surface shall be loosened by discing or scarifying to a depth of two (2) inches to permit bonding of the topsoil to the underlying surface.

1107 STRUCTURE BACKFILL

The Contractor shall be responsible for any damage to the structure caused by his backfilling operations. Uneven loading of the structure during backfilling will not be permitted. Backfill around and outside of structures shall be deposited in layers not to exceed eight (8) inches in loose thickness and compacted to ninety-five (95) percent of maximum density at optimum moisture content as determined by ASTM D698. The Contractor shall be required to uniformly adjust the moisture of the material as necessary to comply with the optimum moisture range specified. Compaction of structure backfill by rolling will be permitted provided the desired compaction is obtained and damage to the structure is prevented. Compaction of structure backfill by inundation with water will not be permitted. Material for structure backfill shall be composed of earth only and shall contain no organic materials, broken concrete, stones, trash or debris of any kind.

No tamped, rolled or otherwise mechanically compacted backfill shall be deposited or compacted in water.

Backfill around and outside of structures that will ultimately lie under proposed pavements shall be compacted to the requirements of Section 1200.

1108 SHEETING AND SHORING

The Contractor shall be responsible for the safety of the excavation which shall comply with all OSHA regulations pertaining to trench safety. Except where banks are cut back on a stable

slope, excavation for structures shall be properly and substantially sheeted, braced, and shored, as necessary, to prevent any caving or sliding. Sheeting, bracing, and shoring shall be designed and constructed to withstand all loads caused by earth movement or pressure.

1109 FINAL GRADING

All areas which are to be finish graded shall be brought to the indicated elevations, slopes and contours. The use of suitable equipment for final area grading and dressing of slopes will be required. The Contractor shall be required to re-grade any areas that are not in accordance with the approved plans.

1110 CLEANUP

Cleanup shall follow the work progressively and final cleanup shall follow immediately behind the finish grading. The Contractor shall remove all equipment, tools, discarded materials and other construction items from the site. The entire right-of-way and easement shall be left in a finished, mowable and neat condition. Cleanup shall be considered a subsidiary obligation of the grading work.

1111 SETTLEMENT

The Contractor shall be responsible for all settlement of backfill, fills, and embankments which occur within two (2) years after the project is accepted by the City Council.

The Contractor shall repair or replace settlement deficiencies within thirty (30) days of receiving notice from the City Engineer. The Contractor shall be responsible for all costs associated with the repair work.

1112 TEMPORARY SURFACING

Temporary aggregate surface shall be provided for ingress and egress during construction at the direction of the City Engineer. Temporary aggregate surfacing shall meet the requirements of Section 1211 unless otherwise approved by the City Engineer.

Temporary surfacing for sidewalks, bikeways, trails and other walkways shall be asphaltic concrete or Portland cement concrete, with a minimum width of four (4) feet and minimum thickness of four (4) inches.

Temporary surfacing shall be subsidiary to other grading items unless stated otherwise in the approved plans.

SECTION 1200 - SUBGRADE PREPARATION

1201 SCOPE

This section governs all labor, equipment, tools and materials, and the performance of all work associated with subgrade preparation. The subgrade shall provide a foundation for streets, alleys, parking areas, sidewalks, drive approaches and concrete and gutter. This section does not include the construction of any base courses.

1202 DEFINITIONS

Subgrade is defined as a well-graded and compacted surface conforming to the lines, grades, cross-section and density specified on the approved plans, upon which pavement or curb and gutter will be placed.

Subgrade preparation is the operation of fine grading and compacting the subgrade in accordance with the specified lines, grades, cross-sections and density specified on the approved plans.

1203 GENERAL REQUIREMENTS

General

All underground work, including clearing, grubbing and demolition, shall be completed in accordance with the requirements of Section 1100 and the curb shall be staked with a string line in place prior to commencement of any subgrade preparation.

Prior to beginning any work on the street subgrade, the Contractor shall secure the services of a qualified testing agency to acquire samples of the material to be used for subgrade construction. These samples shall be analyzed to determine Proctor values, liquid limits and plasticity index. Copies of the analysis shall be provided to the City Engineer for review prior to commencing any subgrade preparation.

Pavement subgrades shall be modified with Cement in accordance with Section 1208 or replaced with aggregate base in accordance with Section 1211.

Foundation Treatment

Unless otherwise specified or shown on the approved plans, the soil below subgrade in cut sections shall be scarified, broken up, adjusted to a moisture content within the designated moisture range and compacted as specified on the approved plans.

When the depth of compaction in cut sections is shown to be more than nine (9) inches, material shall be removed to within nine (9) inches of the subgrade surface. The layer of material left in place shall be scarified, broken up, adjusted to satisfactory moisture content and compacted as specified on the approved plans. This process shall be repeated until the cut section is compacted to the grade and density indicated on the approved plans.

All roadway excavation in rock (e.g., shale, sandstone, limestone) shall be undercut to a depth no less than twelve (12) inches below the subgrade surface for the full width of the roadway and backfilled with suitable soil or aggregate base. Undercut shall be unclassified excavation.

1204 MOISTURE CONTENT REQUIREMENTS

The moisture content of the soil at the time of compaction shall be uniform and within the acceptable moisture range designated on the approved plans or as directed by the City Engineer.

When the moisture content of the soil is not satisfactory to the City Engineer, water shall be added or the material aerated, whichever is needed, to adjust the soil to the proper moisture content. In no case shall water be added without the consent of the City Engineer.

If Type B compaction is specified, the moisture content shall be sufficient to produce a uniform mixture. Acceptable Type B compaction is achieved when the tamping feet of a sheepsfoot roller "walk out" of the soil and rides on top of the lift being compacted.

1205 COMPACTION REQUIREMENTS

Roadway embankment fill materials shall be placed in horizontal layers not exceeding eight (8) inches, unless otherwise approved by the City Engineer. Each layer shall be compacted as specified before the next layer is placed. Effective spreading equipment shall be used on each layer to obtain uniform thickness prior to compaction.

Pavements, Drive Approaches, and Concrete Curb and Gutter

The subgrade for pavements and curbs shall be compacted to a density of at least ninety-five (95) percent of the maximum standard Proctor test for a depth of at least nine (9) inches below the finished subgrade elevation.

Subgrade for curbs and pavements shall be compacted using sheepsfoot rollers. The roller may be self-propelled, or machine drawn. The sheepsfoot roller shall be fully loaded with liquid or solid ballast to produce adequate compactive energy to the tamping foot. The roller shall have a minimum drum diameter of thirty (30) inches and minimum tamping foot length of six (6) inches.

Compaction of low plasticity or non-plastic, fine-grained material shall be considered adequate when the tamping feet "walk out", provided the entire weight of the roller is supported on the tamping feet.

Sand and gravel which cannot be compacted satisfactorily with a sheepsfoot roller shall be rolled with a pneumatic-tired roller. Each lift shall be rolled until no further consolidation is evident.

Sidewalks

In areas not requiring fill, the subgrade for sidewalk pavements shall be compacted to a density equivalent to the density of the immediately surrounding soil. In areas where fill is required, the subgrade shall be compacted to ninety-five (95) percent of the maximum dry density as determined by ASTM D698.

1206 PROTECTION AND MAINTENANCE OF SUBGRADE

Any settlement, erosion or other damage to the subgrade that occurs prior to the acceptance of the work shall be repaired to the specific lines, grades, cross-sections and density indicated on the approved plans, and shall be approved by the City Engineer.

All existing pavements, curbs, curb and gutters and sidewalks shall be protected during subgrade preparation with an earth cushion, timber planking or other methodologies approved by the City Engineer. Any damage to existing improvements shall be repaired or replaced to the satisfaction of the City Engineer at the Contractor's own expense.

1207 COMPACTION TESTING AND PROOF ROLLING

At the option of the City Engineer, compaction testing may be required prior to the placement of pavement. The subgrade must successfully pass compaction testing by a nuclear density/moisture gauge and proof rolling with a loaded tandem dump truck carrying a minimum load of sixteen (16) tons. If as a result of the testing/proof rolling, the City Engineer determines that further compaction is required, the Contractor shall recompact the area to the specified density.

1208 SUBGRADE TREATMENT

Cement

Cement treated subgrade shall be a uniform mixture of Cement and pulverized material compacted to the specified moisture content, Cement content, density and depth. The Cement shall be spread in an approved manner at the rate specified. Care shall be taken to prevent the Cement from flowing off the area to be treated. The Cement shall be distributed at a uniform rate in such a manner as to minimize the scattering of Cement by wind. Cement shall not be applied when wind conditions, in the opinion of the City Engineer, are such that blowing Cement becomes objectionable to adjacent property owners or significantly reduces the amount of Cement incorporated into the subgrade.

The Contractor shall secure the services of a qualified testing agency, approved by the City Engineer, to perform on site testing. The testing agency shall monitor placement, mixing, moisture content and in-place density. Copies of the test results shall be provided to the City Engineer for review prior to pavement placement. All costs incurred through the use of the testing agency shall be borne by the Contractor.

A sample of the Cement intended for use on the project shall be submitted to the testing laboratory for the purpose of developing a Cement Proctor. The Cement supplier shall submit a certified laboratory analysis indicating that the Cement used on the project conforms to

ASTM C1157, except the supplementary optional physical requirements in Table 4 shall not apply, and the minimum calcium oxide (CaO) content of the Cement shall be twenty-five (25) percent. Cement shall be sampled and tested in accordance with ASTM C150.

Cement shall be stored and handled in closed waterproof containers, and Cement that has been partially caked or set shall not be used. A certification indicating compliance to these specifications shall be provided with the scale ticket for each load delivered. The certification shall be signed by the Cement producer or his assigned representative.

Portland Cement

Portland Cement treated base shall comply with the Cement section above, except the type of Portland Cement and quantity of Portland Cement shall be as recommended by a Professional Engineer Registered in the State of Kansas. The minimum quantity of Portland Cement shall be five (5) percent unless otherwise approved by the City Engineer.

1209 CONSTRUCTION REQUIREMENTS

Preparation of Roadbed

The subgrade shall be trimmed as near as possible to finish subgrade elevations as shown on the approved plans. The subgrade may be trimmed to an elevation slightly below the proposed finished subgrade to allow for swell, depending on the soil characteristics.

Equipment

The machinery, tools and equipment necessary for proper execution of the work shall be mobilized and approved by the City Engineer prior to beginning of subgrade preparation. Pulverization of existing subgrade and blending the additives shall be accomplished using drum-rotary type tiller equipped with an adjustable water proportioning system. Initial compaction shall be achieved using a sheepsfoot compactor having a minimum operating weight of twelve (12) tons with a minimum centrifugal force of twenty-four (24) tons. Rubber-tired or smooth-wheeled rollers shall be used for final compaction of the stabilized section. All machinery, tools and equipment used shall be maintained in satisfactory and workmanlike manner.

Moisture Control

The required moisture content shall be established by the Contractor's testing agency based on laboratory tests on the materials and specific Cement content to be used for the treatment. Water shall be introduced directly into the rotary mixing drum during the tilling procedure. Final moisture content of the mix immediately prior to compaction shall be uniform and not exceed plus or minus three (3) percentage points of the specified optimum moisture content. If the moisture content exceeds the specified limits, additional Cement may be added to lower the moisture content at the expense of the Contractor. Lowering the moisture content by aeration following addition of Cement shall not be allowed. If the moisture content is below the specified limits, additional water shall be added and uniformly blended with the mixture.

Mixing

The pulverized subgrade material and Cement shall be thoroughly mixed until a homogenous, friable mixture of pulverized subgrade material and Cement meeting the specified size requirements is obtained. The subgrade material shall be pulverized through use of the specified equipment, to the depth designated on the approved plans. All clods shall be reduced in size by mixing until all particles pass through the 1" Sieve and fifty (50) percent of the particles pass through the one-half (1/2) inch sieve.

Compaction

The subgrade shall be compacted immediately after mixing and confirmation that the moisture content is within the specified range. The specified compaction shall be obtained within one hour after the incorporation of the Cement. The subgrade shall be sprinkled as necessary to maintain the specified moisture content. Compaction of the mixture shall continue until the entire depth of mixture is uniformly compacted to the specified density.

All non-uniform (e.g., too wet, too dry or insufficiently treated) areas shall be corrected immediately by scarifying the areas affected, adding or removing material as required and reshaping and recompacting.

The stabilized section shall be compacted to a minimum of ninety-five (95) percent of the combined materials' maximum dry density.

In addition to the requirements specified for density, the subgrade shall be compacted to the extent necessary to remain firm and stable under construction equipment. After each section is completed, the density and moisture content shall be verified by the testing agency. If the material fails to meet the density requirements, the City Engineer may require it be reworked as necessary to meet those requirements and/or require the Contractor to modify his construction methods. Additional Cement shall be added to the areas that are reworked at no additional cost to the City, and the amount required shall be determined by the testing agency. Should the section, due to any reason or cause, lose the required stability, density and finish before the pavement is placed or the work is accepted, it shall be reprocessed, recompacted and refinished at the sole expense of the Contractor. Reprocessing shall follow the same patterns as the initial stabilization including the addition of Cement.

Finishing and Curing

Following the compaction of the stabilized section, the subgrade shall be trimmed to the required lines and grade using equipment with automatic controls. The surface shall then be compacted with a smooth wheel or pneumatic tired roller.

The City Engineer may waive the use of automatically controlled equipment on projects containing narrow or irregular dimensions where operation of the automated equipment is impractical. Finishing of these areas may be as set forth above or the surface will be lightly

scarified during finishing operations and bladed to a uniform grade and cross section to eliminate any imprints left by the equipment.

Cement treated subgrade surfaces shall be protected against rapid drying by either of the following curing methods:

1. Maintain in a thorough and continuously moist condition by sprinkling.
2. Apply an asphaltic prime coat.

Proof Rolling

Proof rolling with a loaded tandem dump truck carrying a minimum load of sixteen (16) tons shall be required before acceptance of finish subgrade. Subgrade failures shall be repaired by incorporating additional cement into the subgrade, unless otherwise approved by the City Engineer.

1210 WEATHER LIMITATIONS

Cement mixing operations shall not be performed when the ambient air temperature or soil temperature is less than 40°F. The Contractor shall be responsible for protection and quality of the Cement modified subgrade mixture under any weather conditions.

1211 AB-3 MODIFIED AGGREGATE BASE

AB-3 Modified Aggregate Base may be used with City Engineer approval. The AB-3 Modified Aggregate Base shall be supplied in accordance with Section 1104 of the *Kansas Department of Transportation Standard Specifications for Road and Bridge Construction*, except as otherwise modified herein:

Paragraph 1104.2 (a); Composition shall be modified so that the AB-3 Modified shall consist of 100% limestone or dolomite produced by mechanical crushing.

Table 1104-1; Gradation and Plasticity of Aggregates for Aggregate Base Construction shall be modified so the AB-3 Modified shall have the gradation shown online AB-3; however, the plasticity index shall be between 0 and 5 with the liquid limit a maximum of 25.

Before delivery to the project site, the material shall be mixed with water in a stationary plant to obtain the moisture content as directed by the City Engineer.

1212 PAVEMENT WIDENING AND CONFINED AREAS

AB-3 Modified Aggregate Base shall be utilized for all pavement widening projects less than or equal to fifteen (15) feet in width, pavement projects which are less than 5,000 square feet or as directed by the City Engineer. The thickness of the aggregate base shall be as recommended by the Design Engineer; however, the minimum thickness shall be six (6) inches.

During construction, the maximum drop off at the edge of pavement shall be four (4) inches. Any drop off exceeding four (4) inches shall be wedged at a slope of 3:1 using Modified AB-3 aggregate base or asphalt as directed by the City Engineer. The subgrade and asphalt under the proposed curb and gutter, where applicable, shall be constructed and approved prior to removing the existing curb and gutter for pavement widening projects. All traffic control measures and drop off treatments shall conform to Table 1212-1.

Table 1212-1 *- Pavement Drop Off Treatment*

Condition	Treatment
Drop off is 2 inches or less and the adjacent area is not an open driving lane	None
Drop off is 2 inches or less and the adjacent area is an open driving lane	36"x36" W8-11 Uneven Lane signs shall be installed at the point of beginning with a maximum spacing of 1,000 feet
Drop off is between 2 and 4 inches	Shoulder Drop Off Signs (W8-9A and W7-3A) shall be installed at the beginning of the condition and at each intersecting roadway. Signs shall be removed or covered when not applicable. Install channelizers along the edge of pavement with spacing equal to the posted speed limit.
Drop off is greater than 4 inches	Construct a Modified AB-3 wedge and install channelizers along the edge of pavement with spacing equal to or less than the posted speed limit.

28SECTION 1300 - ASPHALTIC CONCRETE PAVEMENT

1301 SCOPE

This section discusses asphaltic concrete pavement requirements for roadways, sidepaths, trails, parking areas and other areas specified.

1302 GENERAL

Division 600 of the latest edition of the Kansas Department of Transportation *Standard Specifications for State Road and Bridge Construction* shall govern asphaltic concrete pavement requirements except as otherwise modified herein. The Contractor shall be responsible for all costs incurred for the asphaltic concrete mix design, material, delivery, placement, and testing, unless otherwise specified by the City Engineer.

If the project site has not been stabilized with seed and mulch prior to paving operations, erosion control devices including silt fence, wattles, or mulch berms shall be installed at the back of the curb and gutter or at the right-of-way in areas where the devices are needed to effectively control erosion and sedimentation. Erosion control devices in these locations must be installed before paving operations will be permitted. The devices shall be installed immediately after the curb has been backfilled. An exception will be granted when one or more lifts of base asphalt need to be placed before the curb and gutter can be poured. The placement of subsequent lifts of asphalt will not be permitted until the curb is backfilled and erosion control devices are in place.

Paving will not be permitted until the compressive strength of the concrete used for curb and gutter construction has reached seventy-five (75) percent of its design strength unless otherwise approved by the City Engineer.

The pavement shall be constructed to the lines, grades, dimensions, and details contained herein or as shown on the plans.

1303 MATERIALS FOR LOCAL AND COLLECTOR STREETS, SIDEPATHS, TRAILS AND PARKING AREAS

The requirements of this section shall apply to asphaltic concrete pavement for local and collector streets, sidepaths, trails and parking areas or where it is otherwise specified by the City Engineer.

Except as modified herein, asphaltic concrete pavement for local and collector streets shall conform to Division 600 of the latest edition of the Kansas Department of Transportation *Standard Specifications for State Road and Bridge Construction*, and shall be as follows:

Surface Course Mix.....BM-2, BM-2FR
Base Course Mix.....BM-2B, BM-2BFR

Mix Design Requirements

The Contractor shall be required to submit asphaltic concrete mix designs to the City Engineer for approval at least five (5) days before paving operations will be allowed to begin unless otherwise approved by the City Engineer.

Marshall Mix designs shall conform to the following requirements:

Number of Blows: 50
% Air Voids: 4%
VMA: 13.5% (minimum)
VFA: 65- 80 %
Stability: 1200 lbs. (minimum)
Flow: 8-16
The ratio of % minus no. 200 material to % effective asphalt: 0.6-1.6
Tensile Strength Ratio (TSR): 80%*
Binder: PG58-28 (source, specific gravity, mixing and compaction temperature shall be included in the mix design submittal)

** Meet the minimum TSR requirement for design only.*

Composition of Mix

Mix designation BM-2 or BM-2B shall be composed of a combination of aggregates and mineral filler supplements meeting the requirements of Section 1103 of the referenced KDOT specifications.

For mix designations BM-2FR and BM-2BFR, Fractionated Reclaimed Asphalt Pavement (FRAP) may be added as an aggregate source. FRAP is defined as having two or more stockpiles, where Reclaimed Asphalt Pavement (RAP) is processed into coarse and fine fractions. The fine FRAP stockpile will contain only material passing the ¼-inch screen. The coarse FRAP stockpile will contain material retained on the ¼-inch screen and passing the ¾-inch screen. No mix shall contain greater than twenty-five (25) percent FRAP. RAP shall not be used regardless of mix designation.

If FRAP is used, the percent of added FRAP, extracted gradation, asphalt content, source, and type of FRAP shall be included on the mix design submittal. The FRAP percentage contribution to the mix must be included in the design single point gradation.

The combined aggregate shall meet the grading and plasticity requirements of Table 1303-1:

Table 1303-1 *- Gradation and Plasticity Requirements and Mix Design Tolerances*

Plastic Index: 6 Max.

Moisture in Final Mix: 0.50% Max.

Sieve Size	% Retained Master Grading Limits		Design Job-Mix Tolerances (+/-)
	BM-2B BM-2BFR	BM-2 BM-2FR	
1"	0	0	--
3/4"	0-5	0	--
1/2"	--	0-8	6
3/8"	10-30	8-22	6
4	--	--	6
8	42-72	42-72	6
16	--	--	5
30	64-88	64-88	5
50	--	--	4
100	--	--	4
200 [1]	92-98	92-98	2

[1] If hydrated lime is used as an anti-strip agent, the specification limit shall be 91-98

The asphalt cement for all mixes shall be PG 58-28. Field tolerances for each bituminous mix shall be the optimum percent based on the Marshall Method test property curves for hot-mix design plus or minus 0.4%

Alternate mix designs may be allowed with the approval of the City Engineer.

Production Requirements

After the mix design is approved by the City Engineer, the asphalt supplier must maintain combined single point gradation (FRAP, if any, and virgin aggregate), stability, flow, and asphalt content within the required tolerances shown in the approved mix design. The ratio of % minus no. 200 material to % effective asphalt must be maintained within the range of 0.6 to 1.6 for field samples. FRAP stockpiles shall be inspected and must meet the approval of the City Engineer.

Field Density Requirements

BM-2, BM-2FR, BM-2B and BM-2BFR pavements shall have a minimum in-place density of ninety-five (95) percent of standard established by the Marshall density procedure, using a fifty-blow method. At the option of the City Engineer, compaction testing may be performed in the field using a nuclear density gauge to determine the density of the mixture as placed. If as a result of this testing the City Engineer determines that further compaction is required, the Contractor shall revise his rolling procedure to obtain the density as specified. Failure to achieve the required density shall result in rejection of the pavement.

Non-conforming Test Results

When the results of the field sampling and testing confirm the delivered mix has failed to meet the required specifications, the asphalt supplier shall be required to make any and all adjustments necessary to regain conformance. Paving operations shall be suspended if the supplier cannot bring the mix into conformance within an acceptable period of time as specified by the City Engineer. A test strip with test reports indicating the mix conforms to specifications may be required by the City Engineer before paving operations are allowed to resume. A non-conforming asphalt mix will result in corrective action up to and including removal and replacement as decided by the City Engineer.

A new mix design submittal will be required if changes to the mix beyond the specified allowances are necessary to regain conformance.

1304 MATERIALS FOR ARTERIAL STREETS

The requirements of this section shall apply to Superpave asphaltic concrete surface, leveling course and base asphalt pavement for service and arterial streets or where it is otherwise specified by the City Engineer.

General

The KDOT *Standard Specifications for State Road and Bridge Construction, latest edition*, Sections 109, 601, 611 (Class A), 1201, 1202 and 1203 shall govern the asphaltic concrete work except as otherwise modified herein. All testing required by this specification including mix design and field verification of the mix shall be the responsibility of the Contractor. The Contractor shall be required to submit asphaltic concrete mix designs to the City Engineer for approval at least five (5) days before paving operations will be allowed to begin unless otherwise approved by the City Engineer. The mix design shall be modified or redesigned whenever a material source changes, a quarry starts producing from a different geological unit, or a major change is made to the asphalt plant.

Superpave Mix Design Requirements

The asphaltic concrete mix design shall be the responsibility of the Contractor's laboratory. The laboratory shall be a commercial testing laboratory meeting the requirements of ASTM D 3666 05a and shall have previous experience testing materials and producing Superpave Asphaltic Concrete mix designs. The manager of the laboratory shall submit a copy of the current certification stating the laboratory complies with ASTM D 3666-05a requirements. The laboratory selected by the Contractor must meet the approval of the City Engineer.

The Contractor's laboratory shall submit a complete mix design report annually to the City Engineer prior to asphalt placement during the calendar year. The laboratory shall establish the mix design using the criteria specified herein. The volumetric properties of the submitted mix design shall meet the mix design requirements in Section 1304C. Detailed raw calculations for the composition of the mix design, all specific gravity calculations and material certifications shall be included. All aggregate quality tests must have been performed within twelve (12) months of the submission date of a mix design or a volumetric test report. After

the annual mix design has been approved, the most recent test report indicating the mix is within tolerances shall serve as the current mix design.

The finished mixture shall meet the requirements described below when prepared in accordance with AASHTO T 312-04 (using 6-inch nominal size molds) and the volumetric properties of compacted paving mixtures as calculated using Chapter 4 of *Superpave Mix Design, Superpave series No. 2 (SP-2), Third Edition 2001 Printing*, published by the Asphalt Institute referred hereafter as "SP-2", unless otherwise specified. The procedure shall be as specified in Chapter 5 and 6 of the SP-2. The Theoretical Specific Gravity (Gmm) shall be determined following AASHTO T 209-99 (2004) and the Bulk Specific Gravity of the Compacted Asphalt Mixture (Gmb) shall be determined following AASHTO T166-00. The material for the theoretical specific gravity (Gmm) and the material for the Gyratory Compactor specimens (pucks) shall be cured at 140+/-3º C (285+/-5º F) for four (4) hours in a closed oven after the mix is produced in the laboratory. Also, the plant-produced mixture shall be tested when the mix is four (4) hours old.

The mixture shall be transported to the laboratory in an insulated container and then stored in a laboratory oven at 140 +/-3° C (285 +/-5° F) minimum temperature for the remainder of the curing period. The curing oven shall be the forced air type and may be operated at a temperature not to exceed the maximum temperature at which the mixture may be discharged from the plant as specified in paragraph "Mixing Plants" in SP-2. This procedure shall be used when the water absorption as determined by ASTM C 127-04 and ASTM C 128-04a of any aggregate in the mixture exceeds 1.25 percent. The mixture shall be compacted at 140 +/-3° C (285 +/-5° F). The theoretical specific gravity (Gmm) shall be performed using the Type E-A 4500ml metal vacuum pycnometer with a clear polymethyl methacylate PMMA lid. The vacuum shall be applied for fifteen (15) minutes to gradually reduce the residual pressure in the vacuum vessel to 28 mm Hg. The bulk specific gravity of the fine sand chat shall be determined using the standard cone test for surface moisture as stated in ASTM C128-04a unless otherwise directed by the City Engineer. The Gse of the FRAP material shall be used as aggregate Gsb in volumetric calculations provided that the asphaltic cement content of the FRAP fraction is determined through the use of ASTM D-6307-05 Standard Test Methods for Asphalt Content of Hot Mix Asphalt by the ignition method. The AASHTO Specification shall be used when this specification references the AASHTO number.

Superpave Design and Testing Properties

The Superpave design and testing properties are outlined in Table 1304-1.

Table 1304-1 *- Superpave Required Density (% Theoretical Maximum Specific Gravity, Gmm)*

Property	Condition	Tolerance
$N_{initial}$ 6 Gyrations[1] (7 Gyrations for 82-22 Binder)	Mix Design %, Gmm	85-91%
N_{design} 60 Gyrations[1] (75 Gyrations for 82-22 Binder)	Mix Design %, Gmm	96%
Percent Air Voids, in compacted mixture 0% FRAP	Mix Design Only	4.00%
	Field	3.0-5.0%
Percent Air Voids, in compacted mixture 5-25% FRAP	Mix Design Only	3.70%
	Field	2.8-4.5%
Percent Air Voids, in compacted mixture 26-35% FRAP	Mix Design Only	3.40%
	Field	2.6-4.1%
VEA[2]	Mix Design (0% FRAP)	10%
	Field (0% FRAP)	9.0-11.0%
	Mix Design (5-25% FRAP)	10.30%
	Field (5-25% FRAP)	9.3-11.3%
	Mix Design (26-35% FRAP)	10.60%
	Field (26-35% FRAP)	9.6-11.6%
Ratio of #200 material to % effective asphalt control (Pbc) based on the weigh of the aggregate from the extraction test	Mix Design	0.6-1.2%
	Field (0-25% FRAP)	0.6-1.6%
	Field (26-35% FRAP)	0.5-1.5%
%AC, total mix basis	Field tolerance from most current mix design	+/- 0.4%

[1] Average of two 6" specimens

[2] VEA (Volume Effective Asphalt, %) = VMA - Air Voids

Resistance of Compacted Bituminous Mixture to Moisture Induced Damage

The index of retained strength must be greater than eighty (80) percent as determined by AASHTO T 283-03. One (1) set of tests for each mix design from each plant shall be made by the Contractor's laboratory as the final verification of the plant produced mix design. After a mix design has been produced and verified by AASHTO T 283-03, additional sets of tests shall be made at the Contractor's expense if any of the material sources change during production. One (1) set of tests for each mix produced shall be taken during the initial production each year and for each 10,000 tons produced that year. Sampling frequency shall be adjusted when the Contractor has multiple construction projects within the City of Olathe so that tests are taken every 10,000 tons of production. The City Engineer may take an additional test at the City's expense. Any test that fails will require the Contractor to adjust the Job Mix Formula (JMF) and take additional tests at his expense.

The plant produced mixture at the plant site shall be sampled in accordance with ASTM D 979 or behind the paver using the procedure specified herein. The mixture shall be transported to the laboratory and the theoretical specific gravity shall be determined. The same four (4) hour

cured material and a four (4) inch nominal size mold shall be compacted to 7 $\pm$ 0.5 percent air voids and the specimens prepared for the AASHTO T 283 test. The samples shall be allowed to cool and cure overnight at room temperature and testing shall proceed by determining the thickness and bulk specific gravity. The specimens shall be separated into subsets and preconditioned as specified herein prior to proceeding with the testing as specified in AASHTO T 283.

Composition of the Mix

Asphalt cement shall conform to the requirements of AASHTO-MP 1a-04 Performance Graded Asphalt Binder PG 58-28. The grade of the asphaltic binder shall comply with Sections 1201 and 1202 and shall not be changed without a new mix design submittal. The binder source, specific gravity, mixing and compaction temperature shall be included in the mix design submittal. Each shipment of asphalt to the asphalt plant shall have a bill of lading stating the asphalt cement meets the specifications referenced above. Copies of the bill of lading shall be submitted to the City Engineer. The mix shall contain the anti-stripping agent in accordance with the Approved Materials list -added to the asphalt cement at the rate of 0.75% by weight of the total added asphalt cement and tested by AASHTO T 283.

The total aggregate (coarse aggregate, fine aggregate, and the material passing the No. 200 sieve) shall contain not less than eighty-five (85) percent crushed material. The Coarse Aggregate Angularity for all coarse aggregates including FRAP shall be eighty-five (85) percent or higher. The job mix formula (JMF) shall be within the control points shown in Table 1304-1 and Table 1304-2. It shall be noted that when the gradation of extracted plant produced mix falls outside these limitations for the JMF, the test properties of the mix will be out of specifications.

The Contractor may use FRAP as an aggregate source. FRAP is defined as having two or more stockpiles, where Reclaimed Asphalt Pavement (RAP) is processed into coarse and fine fractions. The fine FRAP stockpile will contain only material passing the ¼ inch screen. The coarse FRAP stockpile will contain milled material retained on the ¼ inch screen and passing the ¾ inch screen. FRAP may be comprised of coarse or fine FRAP or a combination thereof. The maximum combined percentage of FRAP is thirty-five (35) percent. A separate cold feed bin for each stockpile of FRAP shall be used for coarse and fine FRAP. Coarse and fine FRAP shall not be combined in either the stockpile or a cold feed bin. FRAP shall be added to the mix through the RAP collar. RAP shall not be used regardless of mix designation. Recycled asphalt shingles (RAS) are not allowed.

Sources and types of FRAP must be recorded and submitted to the City Engineer upon request. The FRAP used in production shall be similar in composition (extracted gradation and asphalt content) to the source used for design.

The Contractor shall submit a copy of current aggregate quality and consensus tests for aggregates used in the mix. The quality test must have been run within six (6) months of the date of a mix design submission or a volumetric test report.

The combined aggregate shall meet the grading requirements of Tables 1304-2 and 1304-3. The exact gradation shall be determined by the Contractor's laboratory.

Table 1304-2 *- Aggregate for Superpave Asphaltic Concrete Surface Course*

Sieve Size	Percent Passing	
	Minimum	Maximum
19 mm (3/4 inch)	--	100
12.5 mm (1/2 inch)	90	100
9.5 mm (3/8 inch)	80	95
4.75 mm (No. 4)	--	--
2.36 mm (No. 8)	36	48
1.18 mm (No. 16)	--	--
600 µm (No. 30)	--	--
300 µm (No. 50)	--	--
150 µm (No. 100)	--	--
75 µm (No. 200)	2	8

For streets designated service or arterial, fifteen (15) percent of the minus No. 4 sieve material and fifteen (15) percent of the total aggregate shall be chat, crushed sandstone, crushed gravel, crushed steel slag, or crushed porphyry. Rhyolite, basalt, granite, and Iron Mountain Trap Rock are examples of crushed porphyry.

Table 1304-3 *- Aggregate for Superpave Asphaltic Concrete Base Course*

Sieve Size	Percent Passing	
	Minimum	Maximum
19 mm (3/4 inch)	--	100
12.5 mm (1/2 inch)	85	100
9.5 mm (3/8 inch)	75	90
4.75 mm (No. 4)	--	--
2.36 mm (No. 8)	34	44
1.18 mm (No. 16)	--	--
600 µm (No. 30)	--	--
300 µm (No. 50)	--	--
150 µm (No. 100)	--	--
75 µm (No. 200)	2	8

Pre-Construction Test Strips

Test strips for each mix design used shall be constructed by the Contractor off city property at the Contractor's expense. The City Engineer shall observe the sampling and testing. The construction of a test strip within the project limits or at an alternate location within the City of Olathe will only be allowed with the approval of the City Engineer. In that event, asphalt not meeting specification shall be removed at the Contractor's expense.

The Contractor's laboratory shall test the final belt gradation if the plant is a dryer-drum plant or the hot bin material if the plant is a conventional plant, and the feeds shall be adjusted to ensure the plant is producing the gradation of the mix design before hot mix production begins for the tested strip.

Test strips shall contain at least eighty-five (85) tons of asphaltic concrete. A test sample shall be taken behind the paver at eighty (80) tons. The paver shall be set twelve (12) feet wide and at plan depth when the sample is taken. Care shall be taken to prevent foreign material or tack oil into the sample.

If the laboratory test results indicate the mix can be adjusted to meet the properties stated in Section 1304, project paving may begin. However, this must be mutually agreed upon by the Contractor's laboratory, the Contractor, and the City Engineer. Otherwise, another test strip shall be constructed.

Test strips may be waived at the City Engineer's discretion if the mix design has been recently used on other City of Olathe projects. However, all materials must be from the same sources and geological units and the mix must be produced by the same plant.

Verification Testing of the Plant Produced Asphaltic Concrete

The Contractor shall be required to secure, at his expense, the services of an independent testing laboratory approved by the City Engineer to provide verification testing of samples and test results submitted by the Contractor's laboratory. A minimum of one (1) verification test shall be conducted on both the base material and the surface material for each paving project. Additional verification testing shall be as required by the City Engineer. The Contractor's laboratory shall furnish the verification laboratory other items such as the JMF mix gradation, plant setting, the bulk specific gravity of the aggregate and the specific gravity of the asphalt. Laboratories shall compare final test results when the mix is out of specification. The test results shall indicate whether the plant needs adjusting and recommendations shall be provided on correcting the problem.

Production Requirements

All test properties of the mix shall be verified by sampling and testing. The test shall be performed in accordance with Section 1304 and shall indicate the test properties of the mix as provided in Section 1304. In addition, an extraction and gradation test shall be made using the ignition oven.

The properties of the plant produced mix shall be determined using uncompacted mix sampled behind the paver.

Material for the sample shall be from the following locations: one (1) from each side of the placed bituminous mat and one (1) from the center of the mat. A square-point shovel shall be used for taking the sample and for evenly laying material back into the disturbed mat. Care shall be taken to prevent foreign material or tack oil into the sample. The properties shall be determined at N design from the average of two (2), 6-inch nominal size samples gyrated to Nmax. The Contractor's laboratory shall adjust the mix design for material entering the plant to obtain acceptable test properties behind the paver.

When the plant has produced a minimum of two hundred (200) tons, a test shall be taken at least daily or as directed by the City Engineer.

Laboratory test results shall be shown on the test report form "Asphaltic Concrete Test" shown at the end of this specification section. Test results shall be received by the Contractor and the City Engineer within approximately seven (7) hours after the samples are taken. The laboratory shall determine the Percent Voids, VMA and VEA as soon as possible and evaluate in accordance with 1304-I, "Non-Conforming Test Results". **Whenever the Percent Voids or VEA is out of specification the laboratory shall contact the Contractor and the City Engineer immediately.** The Contractor's testing laboratory shall communicate all test results directly to the Contractor and the City Engineer immediately upon completion of the test. Signed checked copies shall be sent to the City Engineer as soon as possible thereafter. Failure to report test results shall result in suspension of paving activities.

Gradation and asphalt content of the mix shall be performed using ASTM D-6307-05 *Standard Test Methods for Asphalt Content of Hot Mix Asphalt* by the Ignition Method and ASTM D 5444-05. The initial temperature setting of the ignition oven shall not exceed 525° C (975° F). If FRAP is used, an additional gradation and asphalt content test shall be performed for the combined FRAP sampled from the FRAP cold feed into the plant.

The test shall also consist of one (1) gradation test ASTM C-136-96a of hot bin material for conventional plants, or total aggregate material from the final feed belt for dryer-drum plants.

NOTE: The result of the gradation test is very important in determining how to adjust the mix. After the gradation or the bitumen content has been adjusted to obtain the properties of the mix, this verified mix design becomes the JMF. The plant settings may have to be adjusted again whenever the gradation of the materials changes. When a change is made it shall be reported on the Superpave Asphaltic Concrete Test Report form.

Non-Conforming Test Results

When the results of the field sampling and testing confirm the delivered mix has failed to meet the required specifications, the asphalt supplier shall be required to make any and all adjustments necessary to regain conformance. Paving operations shall be suspended if the

supplier cannot bring the mix into conformance within an acceptable period of time as decided by the City Engineer. A test strip with test reports indicating the mix conforms to specifications may be required by the City Engineer before paving operations are allowed to resume. A non-conforming asphalt mix will result in corrective action up to and including removal and replacement as decided by the City Engineer.

A new mix design submittal will be required if changes to the mix beyond the specified allowances are necessary to regain conformance.

Mixing Plants

Mixing plants shall meet the requirements of KDOT's latest specification except the mixture discharged from the plant shall not exceed 315°F.

When the aggregate absorption is high, the produced mixture will be tender until the asphalt is absorbed into the aggregate. Therefore, it may be beneficial to silo the mixture at the plant for a time before delivering to the project site when the truck haul is short.

Field Density Requirements

The Contractor is responsible for the development of a compaction procedure that will obtain the required density. The Contractor shall determine the exact amount of rolling coverages needed to obtain density. The ideal density is an average density between ninety-two (92) percent and ninety-four (94) percent of maximum theoretical specific gravity.

The Contractor or the Contractor's laboratory shall obtain samples of the pavement. A minimum of one (1) test, consisting of three (3) cores shall be taken for each tonnage lot represented by a Superpave Asphaltic Concrete test. Lots larger than 1200 tons shall have one (1) test consisting of three (3) cores for each 1000 tons placed or as directed by the City Engineer. The core samples shall be taken at locations throughout the tonnage lot. The locations shall not be previously marked. The core locations shall be marked by the City Engineer after each tonnage lot placement is completed. Cores shall be at least four (4) inches in diameter. Sample holes shall be backfilled by the Contractor using concrete patch material in accordance with the Approved Materials list. The top of the patch shall be sprayed black with paint. The samples shall be tested by the Contractor's laboratory to determine conformance to density and thickness specifications. The City Engineer may require additional samples to be taken at the Contractor's expense if the density is consistently near the lower limits specified.

Density of the compacted mixture shall be determined by tests made on specimens taken from the compacted course in accordance with the requirements of the previous paragraph. The density shall be the average of the three (3) cores resulting in a minimum density of ninety-two (92) percent of maximum Theoretical Specific Gravity of the Superpave Asphaltic Concrete test for the lot. No core shall be less than ninety (90) percent. Core test samples shall be taken within a time frame acceptable to the City Engineer. The Contractor's testing

laboratory shall communicate all test results directly to the Contractor and the City Engineer immediately upon completion of the test.

SUPERPAVE ASPHALTIC CONCRETE TEST (Verified Mix Design)

Description:			
LAB I.D.:		**TIME**	**TONS**
Sample Date:		Belt	
Sample I.D.:		Hot Mix	
Supplier:			

GRAIN SIZE DATA – ASTM D5444, C136, C117

Sieve Size	Belt Sample	FRAP Sample*	Hot-Mix Sample*	Master Grade Limits	Cal. Single Point
19mm (3/4")					
12.5mm (1/2")					
9.5mm (3/8")					
4.75mm (No. 4)					
2.36mm (No. 8)					
1.18mm (No. 16)					
600µm (No 30)					
300µm (No 50)					
15 µm (No 100)					
75µm (No 200)					

*EXTRACTION DATA-ASTM D6307

	Sample	FRAP	Plant Setting	*from uncompacted mat
%AC, total mix basis				

Aggregate Type	%**	Aggregate Type	%**

**total aggregate basis

VOLUMETRIC DATA 6" NOMINAL SIZE Gyratory Specimens

Gyrations (average of 2 specimens) @ 280-290 deg F – AASHTO T312 - 01

For 58-28 binder | Ndes = 60 | Nini = 6

For 82-22 binder N des= 75 N ini = 7

	Sample*	Specifications	
Mix bulk specific gravity @ Ndes, Gmb		--	
%Voids @ Ndes AASHTO T T-169		3.0-5.0 2.8-4.5 2.6-4.1	0%FRAP 5-25%FRAP 26-40%FRAP
%VMA @ Ndes, Gsb basis			
%VEA @ Ndes=%VMA-%Voids		9.0-11 9.3-11.3 9.6-11.6	0-5% FRAP 5-25%FRAP 26-40%FRAP
%Gmm @ Nini		85-91	AASHTO T 166-00
Ratio (-) 75µm (No. 200) to % Eff Binder		0.6-1.6 0.5-1.5	0-25%FRAP 26-40%FRAP
Tensile Strength Ratio, %		80 minimum	AASHTO T 283-03
Max Theoretical Specific Gravity Gmm		--	AASHTO T 209-99(04)
Max Theo. Density, pcf		--	
Effective specific gravity Agg. Gse		--	
Bulk Specific Gravity of Total Agg., Gsb		--	ASTM C128, C127
Specific Gravity of Asphalt, Gb		--	
Shale or shale-like (virgin aggregates only)		1.0% maximum	KT-8

COMMENTS:

1305 MATERIALS FOR HEAVY DUTY PAVEMENT

The requirements of this section shall apply to heavy duty asphaltic concrete surface, leveling course and base for roadways with large volumes of heavy truck traffic at locations specified by the City Engineer.

The total thickness of the heavy duty asphaltic concrete pavement section shall be twelve (12) inches with the bottom six (6) inches consisting of 19 mm Superpave asphaltic concrete base conforming to Section 1304. The first lift of base asphaltic concrete shall be four (4) inches thick and the second lift shall be two (2) inches. The thickness of the leveling course shall be 3-1/2 inches and the thickness of the final surface lift shall be 2-1/2 inches. Both the leveling and surface courses shall be 19 mm Superpave asphaltic concrete conforming to Section 1304 with the following modifications:

- All aggregate shall be virgin material. Recycled materials shall not be permitted.
- The asphalt binder shall be modified from PG 58-28 (with anti-strip) to PG 82-22 (with anti-strip).
- Aggregate gradations shall comply with KDOT SM-19A class A with the exception that a minimum of 2% and a maximum of 8% aggregate shall be retained on the 19mm (3/4 inch) sieve.
- Asphalt will be designed with $N_{ini} = 7$, $N_{des} = 75$, and $N_{max} = 115$

1306 DELIVERY

Release Agent

The use of diesel fuel as a release agent in the bed of haul trucks is strictly prohibited. The release agent shall be a compound specifically designed to allow the asphaltic concrete mix to be dumped from the haul trucks, but shall in no way change or modify the properties of the asphalt cement binder. The Contractor shall submit to the City Engineer a specification of the release agent to be used for this purpose. It shall be the responsibility of the Contractor to inform all drivers hauling the asphalt mix of this requirement.

Transportation of Mix

All haul trucks providing asphalt mix to the project site shall utilize load covers of sufficient size and weight to completely cover the truck bed protecting the upper surface of the asphalt from cooling. Failure to have the load completely covered shall be sufficient cause for rejection of the entire load. The load shall remain covered until the truck is next in line to be unloaded, but in no case shall the load remain uncovered for more than ten minutes before unloading begins. If for any reason there is a delay in unloading, the remaining part of the load shall be recovered until unloading resumes. It shall be the responsibility of the Contractor to inform all drivers hauling the asphalt mix of these procedures prior to starting the work. All bituminous mixtures shall be mixed and then delivered to the project within the mixing and compaction temperature ranges reported on the accepted mix design. Asphalt mixtures having a temperature less than 235°F when dumped into the mechanical spreader will be rejected. The Contractor shall provide a sufficient number of haul vehicles of the proper size, speed, and condition to ensure an orderly and continuous placement operation. The

Contractor shall schedule and route his hauling operation to minimize hauling over newly paved areas.

1307 EQUIPMENT

Material Transfer Device

A self-propelled material transfer device, capable of moving independent of the paver or attached to the paver shall be used for through lanes on arterial streets when directed by the City Engineer. The size of the material transfer device shall be suitable for the type of paving operation performed and will be subject to the approval of the City Engineer. The material transfer device shall be equipped to perform additional mixing of the material, and the material shall be subsequently deposited into the paver at a uniform temperature and consistency. Mobile conveyors, shuttle buggies, material transfer vehicles, materials transfer paver and pick-up devices are considered material transfer devices. Paver hopper inserts shall be required when spillage of the Hot Mix Asphalt (HMA) occurs during transfer of the material.

Mechanical Paving Machines

Bituminous-material spreaders shall be the self-propelled type equipped with hoppers, tamping, or vibrating devices, distributing screws (augers), adjustable screeds operated either manually or automatically, and equipment for heating the screeds and equalizing devices. The spreader shall be capable of spreading hot bituminous mixtures without leaving indented areas, tearing, shoving, or gouging, and capable of confining edge of strips to true lines without use of stationary side forms. The spreader shall be required place the course to the required thickness. It shall also be capable of producing a finished surface conforming to the smoothness requirements specified. Spreaders shall be designed to operate forward at variable speeds and in reverse at traveling speeds of not less than one hundred (100) feet per minute. If an automatic grade control device is used on the spreader for two-lane paving operations, it shall consist of sensing device for control of one end of the screed and a slope-control mechanism for control of the other end of the screed, or a sensing device on each side of the paving machine. Where the paver is used on multiple paving lanes (more than two paving lanes), sensing devices shall be used on each side of the spreader for control of the screed. The slope-control mechanism shall not be used for grade control in multiple paving lane operations. When the Contractor chooses to pave lanes through the project wider than twelve (12) feet, the paver shall be equipped with auger extensions.

Steel-Wheel Rollers

Steel-wheel (drum) rollers shall be self-propelled, two-axle tandem, vibratory type, weighing not less than 20,000 pounds static weight and not less than 150 pounds per inch of wheel. Wheels shall be equipped with adjustable scrapers, water tanks, and sprinkling apparatus for keeping the wheels wet, thereby preventing the bituminous mixture from sticking to the wheels. Rollers shall be capable of reversing direction without backlash. The Contractor shall be responsible to maintain the equipment in a satisfactory condition. Roller wheels with flat and pitted areas or projections that leave marks in the pavement shall not be permitted. A minimum of two (2) steel-wheel rollers (one breakdown and one finish) shall be required with

each paving operation unless otherwise approved by the city engineer. The contractor shall provide one full-time operator for each steel rollers.

Heavy Pneumatic-Tired Rollers

Heavy pneumatic rubber-tired rollers shall be self-propelled and shall consist of two (2) axles on which are mounted an odd number of pneumatic rubber-tired wheels. The roller shall have at least nine (9) pneumatic rubber-tired wheels in such manner that the rear group of wheels will not follow in the tracks of the forward group but spaced to give essentially uniform coverage with each pass. Axles shall be mounted in a rigid frame provided with a loading platform or body suitable for ballast loading. Tires shall be inflated to ninety (90) psi. The surface of the tires shall remain smooth. Construction of the roller shall be such that each wheel can be loaded to a minimum of 1043 kg (2,300 pounds). A pneumatic rubber-tired roller shall be required with each paving operation unless otherwise approved by the city engineer. The contractor shall provide one full-time operator for the pneumatic rubber-tired roller.

1308 PREPARATION

Subgrade

Subgrade preparation for pavement shall be as specified in Section 1200. The Contractor must receive the approval of the City Engineer before covering the subgrade with any pavement.

Road Surface Preparation

When the bituminous mixture is placed on an existing bituminous surface, Section 614.3 (b) (3) of KDOT's *Standard Specifications for State Road and Bridge Construction* shall apply, except that in addition to brooming, a high pressure type water truck, capable of washing all fines, dirt, and debris from the surface, may be required prior to overlaying as directed by the City Engineer. Blowers and brooms shall be power type and suitable for cleaning the surface to be paved.

Equipment compliance with this specification shall be visual observation by the City Engineer at the commencement of washing operations. No direct payment shall be made for this item as it shall be considered subsidiary to other bid items.

Tack Coat

Emulsified Asphalt CSS-1h shall be used for the tack coat. All existing asphaltic concrete surfaces shall receive a tack coat not more than six (6) hours prior to placement of the asphaltic concrete. Surfaces previously tack coated and not covered with new asphaltic concrete for more than six (6) hours shall be re-tacked. The rate of application shall be 0.05 gal/sy to 0.12 gal/sy, or as otherwise directed by the City Engineer. At locations where asphalt is being placed on top of existing concrete pavement or for night work where temperatures warrant, the emulsified asphalt shall be diluted ten (10) percent with water versus the normal fifty (50) percent dilution with water. Tack coat shall not be paid for directly but shall be considered subsidiary to other bid items.

The spray nozzles and spray bar on the distributor truck shall be so adjusted and frequently checked that uniform distribution is ensured. The distribution shall cease immediately upon any clogging or interference of any nozzle and corrective measures taken before distribution is resumed. Hand sprays shall be used in tacking small patches or inaccessible areas that have been missed by the distributor.
The asphalt tack shall be entirely fogged over the base course and therefore requires no sand blot. If, however, it has not been uniformly distributed, sufficient sand shall be spread over the surface to blot up the excess asphalt and prevent it from adhering to construction equipment and vehicles. Prior to laying an intermediate or surface course, all loose or excess sand shall be swept from the base.

The Contractor shall maintain the tack coat treatment and the surface of the sub-base intact until it has been covered by the surface course. Areas that have been damaged by traffic shall be repaired and shall receive applications of tack coat material in compliance with these specifications. The maintenance and repair of the tack coat shall be done at the Contractor's expense. The Contractor shall be responsible for the cost of any clean-up that becomes necessary due to his operations.

1309 PLACEMENT

Placing Requirements

The Contractor shall receive the approval of the City Engineer before placing any asphaltic concrete pavement.

Asphaltic concrete shall be placed in compacted lifts to the depths as indicated on the contract drawings. The maximum lift thickness of compacted asphalt shall not exceed four (4) inches for base courses and two (2) inches for surface courses. A minimum of two (2) leveling courses shall be placed for asphalt pavements with a total thickness of ten (10) inches or greater. A minimum of one (1) leveling course shall be placed for asphalt pavements with a total thickness of less than ten (10) inches. Through lanes shall be paved before left turn lanes and side street intersections. Through lane pavers shall not stop for other areas to be paved.

All mixed material shall be delivered to the paver in time to permit completion of spreading, finishing, and compaction of the mixture during the daylight hours. Night time work on projects will not be permitted unless approved by the City Engineer.

Preventing Material Segregation

The wings of the spreader hopper shall not be emptied between truck loads. The screed auger shall be operated approximately three-fourths (3/4) full and the hopper conveyor shall not be allowed to run out of material during the paving operation. The augers should be running automatically and the vibrating screed should be turned on. The hopper conveyor shall always have approximately six (6) inches of material covering it and not be allowed to run out of material. Whenever the paver is run empty (conveyor exposed), the area behind the paver should be checked for segregation. The Contractor shall be responsible for the repair or

replacement of segregated areas occurring in the asphaltic pavement. The repair or replacement shall be as directed by the City Engineer.

Pavement Joints

Header joints between old and new pavements, between successive day's work, and joints that have become cold because of delay, shall be vertically sawed and tacked. The pavement joints shall be carefully constructed to insure continuous bond between old and new sections of the pavement course. All joints shall have the same texture, density, and smoothness as other sections of the course. The tack shall be overlapped onto the previous pavement one (1) inch to two (2) inches. Contact surfaces of previously constructed pavements, curbs, gutters, manholes, etc., shall be tacked. Surfaces that have become coated with dust, sand, or other objectionable material shall be cleaned by brushing or cut back with an approved power saw as directed by the City Engineer. The surface against which new material is to be placed shall be sprayed with a thin, uniform coat of bituminous material conforming to the requirements of Section 1307. The material shall be applied far enough in advance of placement of the fresh mixture to insure adequate curing. Care shall be taken to prevent damage or contamination of the sprayed surface.

Edges of previously placed pavement that have cooled and are irregular, honeycombed, poorly compacted, damaged, or otherwise unsatisfactory, shall be cut back to expose a clean, sound surface for the full thickness of the course as directed by the City Engineer.

Transverse Joints

The roller shall pass over the unprotected end of freshly placed mixture only when placement of the course is discontinued or when delivery of mixture is interrupted to the extent that unrolled material may become cold. In all cases, the edge of the previously placed course shall be cut back to expose an even, vertical surface for the full thickness of the course. When paving continues, the mechanical spreader shall be positioned on the transverse joint so that sufficient hot mixture will be spread to obtain a joint after rolling which conforms to the required density and smoothness specified herein.

Offsetting Joints

The surface course shall be placed such that longitudinal joints of the surface course will not coincide with joints in the underlying course by approximately nine (9) inches. Care shall be taken to offset longitudinal joints in a manner that the final surface course joint is in the correct location. Transverse joints in the surface course shall be offset by at least two (2) feet from transverse joints in the underlying course.

Special Requirements for Placing Adjacent Pavement Lanes

The Contractor shall be responsible to determine the width of paving lanes ensuring acceptable joint locations prior to beginning the paving operation. A pre-pave coordination meeting will be held to discuss the proposed joint locations and their relationship to any pavement markings that will be placed. Longitudinal pavement joints shall be located so they are no closer than four (4) inches from the nearest edge of lane markings and no further than

eight (8) inches from the nearest edge of the markings unless otherwise approved by the City Engineer. **The Contractor shall be responsible for locating pavement joints outside of areas where vehicle tires will travel.** The Contractor shall be required to suspend paving operations and make any necessary repair including pavement removal if he has failed to locate the pavement joint in the correct location.

In placing each succeeding pavement lane after the initial lane has been spread and compacted as specified, the screed end gate of the mechanical spreader shall overlap the previously placed lane slightly and shall be approximately 1.25 times thicker than the existing compacted lane to allow for satisfactory compaction roll down producing a smooth compacted joint with the specified density. Mixture placed on the edge of the previously placed lane by the paver screed shall be pushed back to the edge of the lane being placed by use of a lute (rake). The pushed back material shall form a ridge on the uncompacted lane along the edge of the previously placed lane. The height of the ridge above the uncompacted strip should be approximately equal to the thickness being allowed for roll down during compaction. These procedures shall be used to facilitate a smooth joint with density. Excess mixture shall be removed and wasted. In no case shall the Contractor waste excess material by broadcasting it over the uncompacted mat.

Compaction of Mixture

The Contractor is responsible for the development of a compaction procedure that meets the density requirements specified. Failure to meet the required density shall be cause for rejection. Replacement of the material shall be at the Contractor's expense. The surface of the placed material shall be corrected if necessary before compaction begins. Compaction of the mixture shall be accomplished using a minimum of two (2) steel-wheel rollers and one (1) pneumatic rubber-tired roller as specified above unless otherwise approved by the city Engineer.

The speed of the rollers shall be slow enough at all times to avoid displacement of the hot mixture. Displacement of the mixture resulting from reversing the direction of the roller or from any other cause shall be corrected at once by raking or removing and replacing fresh mixture when necessary. Alternate passes of the roller shall be varied slightly in length. During rolling, the wheels of steel-wheel rollers and plates of vibrating plate compactors shall be moistened to prevent adhesion of the mixture to the wheels or plates, but excess water shall not be permitted. Tires of heavy pneumatic rollers shall be moistened with soapy water when required to prevent mixture from sticking to tires during rolling. Rollers shall not be permitted to stand on finished courses until the courses have thoroughly cooled. The minimum number of rollers shall be adequate to obtain the specified density. Places inaccessible to rollers shall be thoroughly compacted with hot hand-tampers or vibrating plate compactors.

Rollers shall not travel faster than three (3) mph. Steel-wheeled rollers shall not be used in the vibratory mode except for initial breakdown rolling. Rolling shall continue until the required density has been achieved.

The following information provides general guidelines for acceptable rolling procedures but may vary from the specific procedure developed by the Contractor:

Breakdown rolling- Breakdown rolling shall be as close behind the paver as possible. The breakdown roller shall be a steel-wheeled vibratory roller. The vibratory mode shall be used on the first forward pass and may be used in subsequent passes either forward or back. The vibratory mode should be set at maximum frequency and minimum amplitude. The unconfined edge or low side edge of the paving lane shall be broken down first. The other edge shall be broken down second and the middle shall be broken down last. Delays in rolling freshly spread mixture shall not be permitted.

As part of the break-down rolling and immediately after the break-down roller completes its first passes, the longitudinal joint shall be pinched to ensure compaction. The breakdown roller in the vibratory mode shall lap over the joint approximately six (6) inches onto the previously placed and compacted lane. The pneumatic rubber-tired roller shall make at least one (1) complete pass (forward and backward) operated on the hot lane with the four-wheeled axle forward and the front outside tire as close as possible to the previously placed lane. After the pneumatic rubber-tired roller rolls the joint, it shall make at least one (1) pass over the rest of the mat and then drop back to its intermediate rolling. The steel-wheeled roller in static mode shall immediately smooth out the pneumatic rubber-tired roller marks.

Intermediate rolling- The pneumatic rubber-tired roller shall be used as an intermediate roller; however, it shall also roll closely behind the breakdown roller. The pneumatic rubber-tired roller shall always be kept moving in order to keep its tires warm. The rubber-tired roller shall roll the same pattern as the breakdown roller. The rubber-tire roller should stay the thickness of the lift away from the free edge of the pavement.

Finish rolling- The second steel-wheel roller shall be used as a final finish roller. Finish rolling shall start when the mat has cooled down 20° to 40° below the intermediate rolling (approximately 225°F plus or minus). The steel-wheel roller in static mode shall immediately smooth out the rubber-tire roller marks using the same pattern making the same coverage as the breakdown roller. Finish rolling should be completed by the time the asphalt cools to 150°F.

1310 TESTING

Refer to Section 1305 for testing asphalt on service and arterial streets. Refer to Section 8005 for all other asphalt testing.

1311 WEATHER LIMITATIONS

Placement of hot-mix asphalt shall comply with the temperature limitations shown in Table 1310-1 unless otherwise approved by the City Engineer. When the ambient temperature falls below 55°F, precautions shall be taken to compact the mix before it cools too much to obtain the required density. In no case shall successive lifts of asphalt be placed until the previous lift has cooled to 175°F or less.

Table 1310-1 *- Asphalt Placement Temperature Limitations*

Paving Course[1]	Min. Air Temperature (°F)	Subgrade Temperature (°F)
Surface	55	60
Base	40	45

[1] Applicable to all lift thicknesses

1312 SURFACE SMOOTHNESS

The surface course, upon completion of final rolling, shall be smooth and true to grade and cross-section. When a 12-foot straightedge is laid on the surface parallel with the centerline, the surface shall not vary more than 1/8 inch from the straightedge. When the 12-foot straightedge is laid on the surface transverse to the centerline between the crown and edge of pavement, the surface shall not vary more than 1/4 inch from the straightedge. Testing for plan grade conformance and surface smoothness shall be performed by the Contractor in the presence of a representative of the City Engineer. The Contractor shall be required to perform profilograph measuring of the pavement smoothness, at his expense, if so directed by the City Engineer. Low or defective areas shall be immediately corrected by cutting out the faulty areas, replacing them with fresh hot mixture and compacting the areas to conform to the remainder of the pavement. The Contractor may be allowed to perform diamond grinding as an alternative repair method when approved by the City Engineer.

1313 PROTECTION

The Contractor shall protect all sections of newly compacted base and surface courses from traffic until they have properly cooled, or as directed by the City Engineer. The Contractor shall be responsible for the repair or replacement of any asphalt surface that has been damaged.

SECTION 1400 - PORTLAND CEMENT CONCRETE PAVEMENT

1401 SCOPE

This section governs the furnishing of all labor, equipment, tools and materials, and the performance of all work necessary to construct Portland Cement Concrete Pavement.

1402 MATERIALS

Except as modified herein, all materials used for construction of Portland cement concrete pavement shall conform to the requirements stipulated in applicable sections of these *Technical Specifications for Public Improvement Projects*.

Concrete

The concrete for the use in construction of Portland cement concrete pavement shall be classified as KCMMB-4K and mix designs shall be approved by the Kansas City Metro Materials Board prior to use.

Reinforcing Steel

Bars: Bars shall be Grade 60 conforming to ASTM A615 and A996.

Welded Steel Wire Fabric: Fabric shall conform to ASTM A185.

Supporting Elements: Representative samples of supporting elements shall be approved by the City Engineer prior to their use in the project.

Epoxy Coating

All reinforcing shall be epoxy coated unless specifically waived by the approved plans. Epoxy coating for bars and dowel bars shall conform to ASTM A775 or ASTM A934. Epoxy coating for welded steel wire fabric shall conform to ASTM A884, Type 1, with Class A coating thickness.

Expansion Joints

Expansion joints shall be formed with pre-formed non-extruding, resilient expansion joint filler which shall include the following: cork, self-expanding cork, sponge rubber, cork rubber and bituminous fiber. These materials shall meet the requirements of ASTM D994, D1751 or D1752.

Joint Sealing Compound

Joint sealing compounds shall conform to ASTM D3405.

Curing Membrane

Portland cement concrete curing material must be approved by the City Engineer prior to application. The cure shall be Type 2, white-pigmented liquid membrane type and shall conform to AASHTO M 148.

1403 CONSTRUCTION DETAILS

Portland cement concrete pavement shall be constructed to the configuration, lines and grades shown on the approved plans and Standard Details.

Grading and Subgrade Preparation

All excavation or embankment required shall be in accordance with Sections 1100 and 1200 of these Technical Specifications.

Forms

All forms shall be in good condition, clean and free from defects. Forms shall not vary more than 1/4 inch in horizontal and vertical alignment for each ten (10) feet length.

Material and Size: Forms shall be made of metal or wood and shall have a height equal to or greater than the prescribed edge thickness of the pavement slab.

Strength: Forms shall be of such cross-section and strength, and properly secured, to resist the pressure of the concrete when struck off, vibrated and finished.

Installation: Forms shall be set true to line and grade, supported through their length and joined to restrict movement in any direction.

Preparation: Forms shall be cleaned and lubricated prior to each use and shall be designed to permit removal without damage to the new concrete.

Slip-Form Paving

A self-propelled slip-form paving machine may be used in lieu of forms. The machine must be equipped with mechanical internal vibrators, and be capable of placing the Portland cement concrete pavement to the correct cross-section, thickness, line and grade within the allowable tolerances.

1404 JOINTS

Joints shall be formed at right angles to the alignment of the pavement and to the depths and configuration specified by the Standard Details or as modified by the approved plans, unless otherwise approved by the City Engineer.

Expansion Joints

Expansion joints shall be placed at all locations where shown on the approved plans and Standard Details or as directed by the City Engineer.

General: Expansion joints shall extend the entire width of the pavement and from the sub-grade to one inch below the surface of the pavement. Expansion joints shall be formed by one (1) piece of one (1) inch thick preformed joint filler. Under no circumstances shall any concrete remain in place across the expansion joint.

Stability: Expansion joints shall be secured in such a manner that they will not be disturbed during the placement, consolidation and finishing of the concrete.

Dowels: If expansion joints are to be equipped with dowels, they shall be of the size and type specified, and shall be firmly supported in place by a dowel basket. The basket shall be installed to hold the center line of the joint assembly perpendicular to the center line of the slab. The dowels shall be positioned parallel to the slab surface for vertical alignment and parallel to the center line of the slab for horizontal alignment. One half of each dowel shall be thoroughly coated with hard grease or other approved bond breaker, to prevent the concrete from bonding to that portion of the dowel. As an option, a dowel sleeve of the dimensions shown on the approved plans or Standard Details may be used in lieu of grease. Dowels shall be epoxy coated.

Contraction Joints

Longitudinal and transverse contraction joints shall be of the type, dimensions and spacing shown on the approved plans or Standard Details. Contraction joints shall be cut by means of wet sawing with an approved concrete saw.

All joints shall be sawed during the initial curing period. The Contractor shall appropriately schedule sawing operations to prevent both joint raveling and uncontrolled cracking of the pavement. Material created by sawing shall be removed from the pavement before it has had time to dry or set.

The Contractor shall remove and replace any concrete that has uncontrolled cracking at his expense.

Construction Joints

Longitudinal and transverse construction joints shall be placed as shown on the approved plans or as required by the Contractor's construction procedure. Joint configuration shall conform to the dimensions shown on the approved plans or Standard Details.

Longitudinal Construction Joints: Longitudinal construction joints of the type shown on the approved plans and Standard Details shall be placed between adjacent paving lanes or where the curb and gutter is not poured monolithically with the pavement slab.

Transverse Construction Joints: Transverse construction joints of the type shown on the approved plans and Standard Details shall be located where concrete placement operations are suspended for more than thirty (30) minutes or until the concrete has begun set. No construction joint shall be placed within ten (10) feet of an expansion, contraction or other construction joint.

Tiebars: Tiebars shall be of deformed steel of the dimensions specified by the approved plans and Standard Details. Tiebars shall be supported in the proper position and at the

specified spacing and be firmly secured so as not to be disturbed by the construction procedure. The tiebars shall be free from dirt, oil and grease, which could impair bond of the steel with the concrete. Tiebars shall be epoxy coated.

1405 PLACING, FINISHING, CURING AND PROTECTION

Concrete shall be furnished in quantities required for immediate use and shall be placed in accordance with the requirements of Section 2000 of these Technical Specifications and as specified herein.

Concrete Placement

Prior to placement of the concrete pavement, all debris and foreign material shall be removed from the inner surfaces of the forms, and all forms and subgrade properly moistened. All required reinforcement and other special metal parts shall be properly and firmly set into position to restrict movement during placement operations. No concrete shall be placed without the approval of the City Engineer.

The concrete shall be placed between the forms in such a manner that segregation will not occur. Lateral displacement of the concrete will not be permitted. The concrete shall be poured to the required depth and width in successive batches and in a continuous operation without the use of intermediate forms or bulkheads.

The concrete shall be thoroughly vibrated along the forms, expansion joints and longitudinal joints. The vibrator shall not be allowed to contact the subgrade or dislodge the joints. Attachments on finishing machines to vibrate the concrete adjacent to forms and longitudinal joints will be permitted, provided satisfactory results are attained. The vibrating shall be sufficient to produce a smooth pavement edge, but shall not cause segregation. Honeycomb in the pavement may be cause for rejection of the pavement.

Care shall be taken in the distribution of the concrete to deposit a sufficient volume along the outside form lines so that the curb section can be consolidated and finished simultaneously with the slab.

No concrete shall be placed around manholes or other structures until they have been adjusted to the required grade, alignment and cross slope. All utility appurtenances shall be boxed out and isolated using expansion joint material. The minimum size of a boxed out section shall be two (2) feet by two (2) feet.

Concrete shall not be allowed to extrude below the forms.

Concrete Finishing

The pavement shall be struck off and consolidated with a mechanical finishing machine or by hand-finishing methods.

When a mechanical finishing machine is used, a depth of at least two (2) inches of concrete shall be carried in front of the strike-off screed for the full width of the slab. The finishing machine shall be provided with a screed which will consolidate the concrete by pressure. The concrete shall, through the use of this machine, be brought to a true and even surface, free from rock pockets, with minimal passes of the machine. The edge of the screed along the curb line may be notched out to allow for sufficient concrete to form the integral curb. Hand-finishing tools shall be kept available in the event the finishing machine becomes inoperable.

When hand finishing is used, the pavement shall be struck off and consolidated by a vibrating screed to the lines and grades shown on the plans. When the forward motion of the vibrating screed is stopped, the vibrator shall be shut off and shall not be allowed to idle on the concrete. Internal mechanical vibration shall be used along all formed surfaces.

Longitudinal Floating: After the concrete has been struck off and consolidated, it shall be further smoothed by means of a mechanical longitudinal float or by a longitudinal hand float. If a longitudinal hand float is used, it shall be operated from foot bridges spanning the pavement and shall be worked with a wiping motion parallel to the centerline, and passing from one side of the pavement to the other. Movement ahead along the centerline of the pavement shall be in successive advances of not more than 1/2 of the length of the float. The float shall not be less than twelve (12) feet in length and six (6) inches in width, and shall be properly stiffened and provided with handles at each end. Excess water and laitance shall be removed from the surface of the pavement. This operation may be eliminated if specified tolerances can be attained by other approved methods.

Additional water shall not be used to aid in the floating operation, unless otherwise approved by the City Engineer.

Straight edging: While the concrete is still plastic, the slab surface shall be tested for smoothness with a 10-foot straight edge swung from handles three (3) feet longer than one-half the width of the slab. The straight edge shall be placed on the surface parallel to the centerline of the pavement and at not more than five (5) foot intervals transversely. After each test, the straight edge shall be moved forward one-half its length and the operation repeated. Irregularities shall be corrected by adding or removing concrete. All disturbed places shall be smoothed with a float not less than three (3) feet long and not less than six (6) inches wide. The smoothness of the repaired surface shall be verified with a ten-foot straight edge. The final pavement surface shall be free of depressions in which water will stand.

Edging: Before final finishing is completed and before the concrete has taken its initial set, the edges of the slab and curb shall be finished with an edger of the radius shown on the approved plans or Standard Details.

Final Surface Finish: The final surface finish shall be either grooved or broomed as directed by the City Engineer. A burlap drag shall be utilized ahead of the grooving operation. The drag shall be at least three (3) feet in length and wide enough to cover the entire lane of pavement, and shall be kept clean and saturated while in use. It shall be laid on the surface of the pavement and dragged in the direction in which the pavement is being poured. The grooving operation shall be done in a neat and uniform manner. A hard bristle broom shall be used for broom finishing. The broom shall be kept clean and shall provide a uniformly textured surface. The direction of the grooving or brooming operation, either transverse or longitudinal, shall be determined by the City Engineer. The curb shall have a broomed finish.

The final surface of the concrete pavement and curb shall have a uniform gritty texture free from excessive harshness and true to the grades and cross section shown on the plans. The City Engineer may require changes in the final finishing procedure as required to produce the desired final surface texture.

Curing

Curing shall conform to the requirements set forth in Section 2000 with the exception that water proof paper, or polyethylene sheeting, shall not be acceptable as curing methods for concrete pavement. The use of straw or burlap for curing shall be as approved by the City Engineer.

The concrete shall be cured prior to taking set. If a liquid curing membrane is used, it shall be applied according to the manufacturer's directions, except the rate of application will be at least one (1) gallon per one hundred and fifty (150) square feet. A nozzle producing a uniform mist pattern shall be used on all spray equipment when applying the liquid curing membrane.

All exposed surfaces shall be cured if a slip form paving machine is used or if the forms are removed from hand poured concrete pavement within a period of seventy-two (72) hours.

Protection

The Contractor shall, at his own expense, protect the concrete work against damage or defacement until the project has been accepted by the City Engineer. Concrete pavement which is not acceptable to the City Engineer because of damage or defacement, shall be removed and replaced, or repaired to the satisfaction of the City Engineer, at the expense of the Contractor.

All vehicular traffic shall be prohibited from using the new concrete pavement until the proper strength has been achieved. The concrete pavement shall not be opened for light traffic for a period of not less than seventy-two (72) hours after placement, and the after concrete has attained a minimum compressive strength of 3,000 psi and 75% of the mix design strength. The pavement shall not be fully opened to traffic for a period of not less than one hundred and twenty (120) hours, and after the concrete has attained a minimum compressive strength of 3,500 psi and 80% of the mix design strength. If high early strength concrete is used, the

pavement may be opened to all types of traffic when the concrete has attained a compressive strength of 3,500 psi and 80% of the mix design strength.

Temperature Limitation
Concrete work shall proceed in accordance with the temperature requirements established in Section 2000.

1406 BACKFILL

A minimum of twenty-four (24) hours shall lapse before forms are removed and five (5) days shall lapse before pavement is backfilled, unless otherwise approved by the City Engineer.

Backfill shall be placed and compacted in accordance with Sections 1100 and 1200 of these Technical Specifications.

The Contractor shall be responsible for repairing any damage to the existing pavement to the satisfaction of the City Engineer.

1407 JOINT SEALING

All joints shall be sealed with an approved joint sealer applied in accordance with the manufacturer's directions and the City of Olathe's Technical Specifications and Design Criteria for Public Improvement Projects. The joints shall be sealed within seven (7) days of the placement of the concrete and prior to the opening of the pavement to traffic.

The joints shall be thoroughly cleaned by sand-blasting the dry joint in two (2) passes, one for each face prior to the placing of the joint material. Any residual sand, as well as dust and dirt deposited by wind and traffic, shall be blown out of the joint and away from the adjacent pavement using a high-pressure air blast prior to placing the joint material.

1408 CONCRETE CURB AND CURB AND GUTTER

Concrete curb and curb and gutter will be constructed in accordance with Section 2100 and as shown on the approved plans, unless otherwise approved by the City Engineer. The options available for concrete curb are as listed below and detailed in Standard Details.

Integral curb
Integral curb shall be constructed immediately following the finishing operation unless otherwise shown on the approved plans. The curb construction shall not lag the pavement construction to a point that will cause a "cold joint."

Steel curb forms shall be required to form the backs of all curbs, unless otherwise approved by the City Engineer.

The concrete shall be sufficiently spaded to secure adequate bond with the paving slab and eliminate all voids in the curb.

Curbs shall be constructed to the specified cross section as shown on the Standard Details.

The finished surface of the curb and gutter shall be checked by the use of a 10-foot straightedge and corrected if necessary. Where proposed grades are less than one (1) percent, and while the concrete is still plastic, the slope of the gutter should be checked with a 4-foot level.

Separate Curb and Gutter with Tiebars

Separate curb and gutter may be placed prior to placing the remaining pavement using tiebars. Tiebars 5/8 inches (5/8") in diameter and 24 inches (24") long shall be cast in the curb and gutter at 30-inch centers as shown on the Standard Details. Tiebars shall be epoxy coated.

Separate Curb and Gutter with Keyway

Separate curb and gutter may be placed prior to placing the remaining pavement using a keyway. A keyway of the configuration and dimensions shown on the Standard Details shall be cast in the curb and gutter section.

1409 CLEANUP

The Contractor shall be responsible for the removal of excess dirt, rock, broken concrete, concrete splatters and overspray from the construction area.

1410 SURFACE TOLERANCES

Concrete pavement shall have a surface tolerance in all directions of 1/8 inch in twelve (12) feet when checked with a 12-foot straightedge. The Contractor shall be required to perform profilograph measuring of the pavement smoothness, at his expense, if so directed by the City Engineer.

1411 THICKNESS TOLERANCES

The thickness of the pavement section shall conform to the pavement thickness specified. The thickness of the pavement shall be measured by coring. Where pavement thickness is deficient, compensation may be made at an adjusted unit price approved by the City Engineer, or the pavement shall be removed and replaced at the expense of the Contractor.

Unless specified otherwise, thickness coring shall be performed by an approved materials testing service at the expense of the Contractor. The cores shall be a minimum of two (2) inches in diameter and shall be taken at random locations within each lane of pavement as approved by the City Engineer. A minimum of one (1) core per every 1,000 feet of lane width shall be taken. The stagger spacing between initial cores in adjacent lanes shall be a minimum of 100 feet.

The transverse limits of pavement removal shall be from the outside edge of the curb and gutter (curb and gutter with tie bars or keyway may remain if in good condition) to a longitudinal joint. The longitudinal pavement removal limits shall extend beyond each side of the deficient core sample to a point where no portion of the exposed pavement is more than

0.2 inch deficient. In no case shall less than five (5) linear feet of pavement be removed, and if less than ten (10) feet of acceptable pavement remains between the section that has been removed and a transverse contraction, expansion, or construction joint, the Contractor shall remove the pavement to the joint.

SECTION 2000—CONCRETE CONSTRUCTION

2001 SCOPE

This section covers all cast-in-place concrete, including reinforcing steel, forms, finishing, curing and other appurtenant work. The requirements of this section shall also apply to pre-cast structures intended for use in the City of Olathe, unless otherwise approved by the City Engineer.

2002 GENERAL

Concrete shall conform to the standards and specifications established by the Kansas City Metro Materials Board (KCMMB). If KCMMB concrete is not specified, Kansas Department of Transportation (KDOT) concrete designated Grade 3.0 AE and/or Grade 4.0 AE shall be used. Prior to opening any concrete construction to light traffic, the concrete shall achieve a minimum of 75% of the mix design strength. Concrete construction shall achieve 80% of the mix design strength prior to opening to full traffic.

2003 MATERIALS

All material used in the manufacture of concrete shall conform to the following:

KCMMB Concrete Mixes

All materials proposed for use in KCMMB approved concrete mixes shall be approved by KCMMB prior to use.

KDOT Grade 3.0 AE and Grade 4.0 AE Concrete

Materials used for KDOT Grade 3.0 and Grade 4.0 concrete shall conform to the requirements of Sections 400, 1100, 1400, 2000, and 2400 of the *Standard Specifications for State Road and Bridge Construction* (latest edition), except as modified herein.

Cement

KDOT Specification 2001.2b. PLC/Type IL and III Portland cements conforming to AASHTO M 85 with exceptions.

Water

KDOT Specification 2401.

Fine Aggregate

KDOT Specification 1102.2c. Type FA-A, except that artificial or manufactured sand will not be acceptable.

Coarse Aggregate

KDOT Specification 1102.2a. Certification by an independent testing laboratory that the aggregates used were obtained from an approved source and identifying the name and location of the quarry and bed number shall be filed, at the Contractor's expense, with the City Engineer.

Curing Membrane
Type 2-White Pigmented compound, AASHTO Designation M148.

Air-Entraining Agent
AASHTO M 154

Admixtures
ASTM C494
ASTM C1017 for plasticizing admixtures

Reinforcing Steel
ASTM A615; Bars, Grade 60, Beam stirrups & column ties, Grade 40

Welded Wire Fabric
ASTM A185, and AASHTO Designation M 55

2004 MIX DESIGNS

KCMMB Mixes

The Contractor shall submit a KCMMB approved mix design to the City Engineer for review and approval before any concrete is scheduled for placement. Mix designs shall be submitted for each combination of materials and differing proportions of mixes and water/cement ratios. Admixtures for water reduction, set acceleration or set retardation may be shown as optional provided the mix design shows the allowable application rates or dosages for each optional admixture. Mix designs should include strength, proportions of all materials, gradations of all aggregates, unit weight at the design air content, slump and allowable slump range.

The design water/cement ratio shall not exceed 0.44. The minimum water/cement ratio shall be 0.25.

Air entrainment shall meet the requirements set forth in the current ASTM C260 specifications. The field measured percentage of air content by volume shall be 6.5% plus or minus 1.5%. All concrete mixes shall be designed for 6.5% air entrainment.

KDOT Grade 3.0 AE and Grade 4.0 AE Mixes

The Contractor shall submit a mix design to the City Engineer for approval before any concrete is scheduled for placement. The mix design shall include data on proposed use, design strength, concrete mix proportions, maximum water/cement ratio, slump range, percentage of air entrainment, chemical admixtures and the fine and coarse aggregate gradation. Mix designs shall be submitted for each combination of materials and differing proportions of mixes and water/cement ratios. Adjustments made to an approved mix design shall require approval by the City Engineer. Failure to obtain mix design approval by the City Engineer prior to concrete placement may be cause for removal of the concrete at the Contractor's expense.

2005 CONCRETE MIX DESIGNATIONS

Table 2005-1 illustrates the concrete mix design requirements for each type of construction project. The concrete mix design requirement for project types not listed in the table shall be as approved by the City Engineer. KCMMB approved high-early strength concrete mixes may be used when approved by the City Engineer. The Contractor shall be required to submit the high-early strength concrete mix design to the City Engineer for approval prior to concrete placement.

Table 2005-1 *- Mix Design Requirement per Project Type*

Type of Project	KCMMB 4K	KDOT Grade 4.0 AE	KDOT Grade 3.0 AE
Sidewalks	✓		
Curb and Gutter	✓		
Gutter Section of Drive Approaches	✓		
Driveway Approaches	✓		
Integral Sidewalks and Retaining Walls	✓		
Storm Sewer Structures		✓	
Curb and Area Inlet Tops	✓		
Sanitary Sewer Manholes		✓	
Inverts, Aprons and Collars			✓
Concrete Pavement	✓		
Traffic Signal Pole Bases & Controller Foundations	✓	✓	
Street Light Pole Bases & Controller Foundations	✓	✓	

2006 LIMITING REQUIREMENTS

All concrete shall be within the allowable slump range shown on the approved mix design. In no case shall the water/cement ratio of concrete delivered to the site exceed the water/cement ratio shown on the approved mix design. Concrete with a water/cement ratio exceeding the design water/cement ratio will be rejected.

The Contractor must receive approval from the City Engineer before utilizing optional admixtures in the KCMMB approved mix design. The admixtures must be within the dosage limits specified. A revised slump range will be required if the addition of the admixture causes the slump to fall outside of the range shown on the original approved mix design. Admixtures not shown in the approved mix designs for KDOT Grade 3.0 and Grade 4.0 will not be allowed

without approval of the City Engineer. The approval of the City Engineer will be required before admixtures are added to the concrete after the truck has left the batch plant.

The mix design requirement for KDOT Grade 3.0 AE and Grade 4.0 AE concrete mixes shall conform to Table 401-A1 in the KDOT *Standard Specifications for State Road and Bridge Construction*.

Table 2006-1 indicates the acceptable minimum strengths for the various types of concrete.

Table 2006-1 *- Mix Design Compressive Strength Requirements*

Mix Design	7 Day Strength (psi)	28 Day Strength (psi)
KDOT 3.0 AE	2,250	3,000
KDOT 4.0 AE	3,000	4,000
KCMMB 4K	3,000	4,000

Concrete that does not meet the 28-day minimum compressive strength shall be removed and replaced at the Contractor's expense.

2007 MIXING AND DELIVERY

Concrete shall be furnished by an acceptable ready-mixed concrete supplier and shall conform to ASTM C94.

The consistency of concrete shall be suitable for placement conditions, and the slump shall be uniform.

All concrete delivery tickets shall include the plant name, design water/cement ratio, batch weights per cubic yard, total batched weight of all materials for quantity delivered, time batched, design slump, water withheld (2 gallons per cubic yard maximum), allowable slump range, moisture correction for aggregates and dosages of all approved admixtures. Precast concrete manufacturers shall keep concrete delivery tickets on file for one year. Certifications for the precast concrete shall be provided when the product is delivered to the job site. Concrete tickets for colored concrete shall include the specified federal standard color code.

Ready-mix trucks shall reset the drum revolution counter to zero before batching. Concrete shall be mixed in quantities required for immediate use. Concrete shall be discharged without delay and shall be of the consistency and workability required for the job. The rate of discharge of the plastic concrete from the mixer drum shall be controlled by the rotational speed of the drum with the discharge gate fully open. Concrete shall not be used once it has developed an initial set.

Adding water to the concrete shall not be permitted, except when concrete is delivered in truck mixers. A maximum of two (2) gallons of water per cubic yard may be withheld from the load at the batch site, and if needed, added at the construction site to control the slump as necessary to meet the specified requirements. The need for additional water shall be determined as soon as possible after the load has arrived at the construction site. The adjustment shall be made to the entire load to ensure the water/cement ratio has not been exceeded. After additional water is added, the drum or blades shall be turned an additional twenty (20) to thirty (30) revolutions at mixing speed. The amount of water added at the construction site shall not exceed the amount withheld at the batching plant. Adding water shall be under the City Engineer's supervision, and shall be permitted no more than one (1) time per load and only after the initial revolutions at mixing speed have been completed. Calibrated water measuring devices shall be used for dispensing water. In no case shall the water/cement ratio exceed the design water/cement ratio. Concrete that is not within the specified slump limits at the time of placement shall not be used.

The concrete shall be delivered to the site and discharged within the maximum time allowed in Section 2008, unless otherwise approved by the City Engineer. The time will begin with the initial mixing of cement and water at the batch plant. Non-agitating equipment shall not be used for transportation of concrete.

2008 PLACEMENT

The limits of each concrete placement shall be approved by the City Engineer prior to concrete delivery. All concrete within such limits shall be placed in one continuous operation.

All forms, reinforcements and embedments shall be secured in proper position, and shall be free of all dirt, mud, water and debris prior to delivery of the concrete. Bonding surfaces shall be cleaned of all foreign material and shall be free from laitance. Concrete shall not be placed on frozen subgrade or in excavations which have not been dewatered.

Concrete shall be placed within forty-five (45) minutes of mixing operations, with the exception that the City Engineer may extend the period to ninety (90) minutes dependent upon weather conditions.

Concrete shall be placed in a manner that prevents segregation of the materials, and reinforcing steel shall be properly placed and secured to prevent displacement. During and immediately after placement, concrete shall be thoroughly vibrated to produce a solid mass. Vibrators shall not be used to move the concrete laterally.

Chutes equipped with baffle boards or in short lengths that reverse the direction of flow shall be used for steep slopes. Chutes shall not be made of aluminum.

Concrete shall not be dropped from a height greater than five (5) feet, unless confined by chutes or pipes. Each part of the form shall be filled by depositing the concrete as near to the

final position as possible. After initial set of the concrete, the forms shall not be jarred and no strain shall be placed on the projecting reinforcement.

2009 COLD WEATHER CONCRETE

Unless authorized in writing by the City Engineer, concrete mixing and placement operations shall be discontinued when the descending ambient air temperature reaches 35°F, and shall not be resumed until the ascending ambient air temperature reaches 35°F. Under no circumstances shall concrete placement continue when the air temperature is less than 25°F.

When concrete work is authorized during cold weather, the aggregates may be heated by methods approved by the City Engineer prior to being placed in the mixer. Frozen ingredients or ice shall not be placed in the mixer. The temperature of the concrete shall be not less than 60°F and not more than 80°F at the time of placement. No concrete shall be placed on frozen subgrade. Sudden cooling of concrete shall not be permitted. Concrete damaged by cold weather conditions shall be removed and replaced at the Contractor's expense.

When the ambient air temperature is expected to drop below 35°F, a sufficient supply of insulated blanketing material shall be used to cover the concrete maintaining a minimum temperature of 40°F as measured on the surface. The concrete shall be maintained at the minimum temperature of 40°F for a period of four (4) days. An approved moisture barrier such as wet burlap or plastic sheeting shall be placed on the concrete prior to placement of the blanketing material.

2010 HOT WEATHER CONCRETE

The provisions of this section shall apply to all concrete work which is done when the ambient air temperature is above 80°F at the time of placement.

The temperature of the concrete, when placed, shall not be high enough to cause excessive loss of slump, flash set or cold joints. In no case shall the temperature of the concrete, when placed, exceed 90°F. Forms, reinforcing and subgrade surfaces shall be wetted immediately before placement. In all cases, if the temperature of the concrete at time of placement is 90°F or above, the concrete will be rejected.

When the air temperature exceeds 90°F and as soon as practicable without causing damage to the surface, all exposed concrete shall be kept continuously moist by means of fog sprays, wet burlap, cotton mats or other means acceptable to the City Engineer. This cooling with water shall be in addition to the membrane curing compound. The initial sealing membrane shall be applied within five (5) minutes of completing the finishing operation.

2011 CURING AND PROTECTION

Concrete shall be protected against loss of moisture and rapid temperature changes for at least four (4) days after placement. A white-pigmented liquid curing compound meeting ASTM C-309, type 2, class A shall be applied after finishing operations have been completed and immediately after the free water has left the surface. The surface of the work shall be

completely coated and sealed with a uniform layer of the curing compound at a rate of not less than one (1) gallon per 150 square feet. The compound shall not be thinned and shall remain agitated to prevent settlement of pigment. On surfaces where forms are removed prior to the end of the specified curing period, the entire exposed surface shall be coated at the specified rate of coverage. If rain falls on the newly-coated surface before the film dries sufficiently to resist damage, or if the film is damaged in any other way, the Contractor shall apply a new coat of curing compound to the affected area. Other methods of curing shall be as approved by the City Engineer.

For stamped concrete median islands, parkways and roundabouts where colored concrete is specified, a clear, non-yellowing, liquid cure and seal compound meeting ASTM C-1315, Type 1, Class A, shall be applied to the surface. Unless otherwise directed by the Engineer, cure and seal compounds shall be applied the next day after finishing when all surface moisture has disappeared. In all other instances when colored or decorative concrete is specified, cure and seal or seal, as recommended by the manufacture of the decorative concrete system. The surface shall be free of dirt and debris prior to application of the cure and seal. A low-pressure spray, roller or brush shall be used to apply the liquid and shall be applied uniformly without puddles. Multiple thin coats shall be applied, rather than a heavy coat.

2012 FORMS

Forms shall be designed to produce concrete in accordance with the shape, lines and dimensions shown on the approved plans. They shall be mortar-tight and shall be braced to maintain the desired position, shape and alignment during and after concrete placement.

Forms may be constructed of wood or metal and shall be designed to permit removal without damaging the concrete. Forms for all exterior exposed surfaces, which will be visible after backfilling, shall be prefabricated plywood panel forms, job-built plywood forms or forms that are lined with plywood or fiberboard. Decorative form liners in accordance with the Standard Details shall be used for retaining walls located along arterial roadways and at all other specified locations. Forms shall be coated with an approved light oil to prevent adhesion and shall be thoroughly cleaned and re-oiled before re-use.

Form removal shall be in accordance with Section 710 the KDOT *Standard Specifications for State Road and Bridge Construction*.

2013 FINISHING FORMED SURFACES

Fins and other surface projections shall be removed from all formed surfaces except exterior surfaces that will be in contact with backfill. Surfaces to be dampproofed shall have fins removed and tie holes filled, but no additional finishing will be required.

Tie holes in all formed surfaces shall be cleaned, wetted and filled with non-shrinking grout. Tie-hole patches shall be left flush, sound, smooth, and shall match the texture and color of the adjacent concrete.

Unless otherwise specified in the approved plans, all exposed edges shall be beveled by using triangular molding with three-fourths inch (3/4") sides.

2014 NON-CONFORMING OR DAMAGED CONCRETE

Any concrete not in conformance with the approved plans, or damaged prior to acceptance of the project by the City Council, shall be removed and replaced by the Contractor at his expense. Patching shall only be permitted if approved by the City Engineer. Surface defects such as ridges and bulges may be removed by grinding with the approval of the City Engineer.

Honeycombed and other defective concrete that does not affect the structural integrity of the structure shall be chipped out and filled with a non-shrink, non-metallic grout with a minimum 28-day compressive strength of 5,000 psi or a similar material approved by the City Engineer. Prior to placement of the grout, the surface of the affected area shall be thoroughly cleaned of all loose and foreign material and shall be coated with an epoxy bonding agent.

Concrete repair work shall be performed in a manner that will not damage adjacent concrete nor interfere with the thorough curing of surrounding concrete. Repair work shall be adequately cured and protected from further damage.

2015 REINFORCEMENTS

Metal reinforcement shall be protected by the thickness of concrete indicated on the approved plans. The thickness of concrete over the reinforcement, unless otherwise specified, shall be as outlined in Table 2015-1.

Table 2015-1 *- Minimum Concrete Cover of Reinforcement*

Location of Reinforcement	Minimum Cover (inches)
Surfaces where concrete is deposited directly against the ground	3
Formed surfaces exposed to ground, water or weathering	2
Beams, girders and columns not exposed to ground, water or weathering	1 1/2
All other surfaces	1

Reinforcing steel shall be accurately placed and positioned on supports, spacers, hangers or other reinforcing steel as approved by the City Engineer, and shall be secured in place with wire ties or suitable clips. The clear distance between bars in parallel locations shall not be less than the minimum dimension of the following:

- one and one-half (1½) times the diameter of the bars
- one and one-half (1½) times the nominal size of the coarse aggregate
- two (2) inches

Splices in reinforcing steel will not be permitted at points of maximum stress. Reinforcing steel splices at points other than those shown on the approved plans, shall be approved by the City

Engineer. Welding or tack welding of reinforcement shall not be permitted. Spliced bars shall be placed in continuous contact throughout the length of the splice and shall be securely tied together.

Metal reinforcement shall be free from rust, scale or other contaminants that will reduce the bond.

2016 CONSTRUCTION JOINTS

Construction joints shall be made at the locations and to the configurations shown on the approved plans, unless otherwise approved by the City Engineer.

2017 EXPANSION AND CONTRACTION JOINTS

Expansion and contraction joints shall be at locations indicated on the approved plans, unless otherwise approved by the City Engineer.

Contraction joints shall consist of planes of weakness created by forming or cutting grooves in the surface of the concrete. Formed grooves shall be made by depressing an approved tool or device into the plastic concrete. Sawed joints shall be constructed by sawing through the surface of the concrete with an approved concrete saw. Sawing of the joints shall begin as soon as the concrete has hardened sufficiently to prevent tearing and raveling.

Expansion joints shall be formed with pre-formed expansion joint filler of the non-extruding and resilient types, including cork, self-expanding cork, Polypropylene Closed-Cell, sponge rubber, cork rubber and bituminous fiber. Expansion joint materials shall meet the requirements of ASTM D994, D1751 and D1752.

2018 REINFORCED CONCRETE BOX FORMING SEQUENCE

Wall forms may be placed the day following the placement of the bottom slab as long as the slab is protected during the form setting operation. The placement of concrete for the walls shall not occur prior to the fifth (5^{th}) day after placing the bottom slab. Top forms may be placed with wall forms if the walls and top are to be monolithic construction; otherwise, top forms shall not be placed until the third (3^{rd}) day after pouring the walls. The placement of concrete for the top shall not occur prior to the fifth (5^{th}) day after placing the walls (for base to top shoring) or until the walls have reached their design strength for slab forms shored by the walls. Wall forms shall remain in place a minimum of two (2) days after the walls are poured. Supports for the top slab shall be left in place according to the schedule shown in Section 2012.

The above guidelines for placing forms for reinforced concrete boxes are based on the use of standard forming procedures and with the use of concrete containing no admixtures to achieve high early strength. Variations in forming techniques and/or the use of high early strength concrete shall only be allowed if approved by the City Engineer.

SECTION 2100 – CONCRETE CURB, CURB AND GUTTER, SIDEWALK AND DRIVEWAY ENTRANCES

2101 SCOPE

This section covers concrete curb, curb and gutter, sidewalk and driveway entrances, including reinforcing steel, forms, joints, finishing, curing and other appurtenant work.

2102 GENERAL

All construction covered in this section shall conform to the requirements of Section 2000. All improvements shall be constructed to the lines, grades and cross-sections shown on the approved plans and Standard Details. All curb construction shall be performed prior to placement of pavement or sidewalk, except when the curb is placed on the base asphalt, unless otherwise approved by the City Engineer.

2103 MATERIALS

All materials included in this work shall conform to the requirements of Section 2000.

2104 GRADING AND SUBGRADE PREPARATION

All excavation required in the grading and subgrading preparation shall be considered as "Unclassified Excavation" as defined in Section 1100. All grading and subgrade preparation shall be in conformance with Sections 1100 and 1200.

2105 FORMS

All forms shall be in good condition with not more than one-fourth (1/4) inch variation in horizontal and vertical alignment for each ten (10) feet in length. The forms shall have adequate strength and bracing to obtain an acceptable finished product.

A slip-form machine equipped with electronic controls may be used in lieu of forms. The machine shall be equipped with mechanical internal vibrators, and shall be capable of placing the finished curb to the cross-section, line and grade shown on the plans.

2106 EXPANSION AND CONTRACTION OR CONSTRUCTION JOINTS

Expansion and contraction or construction joints shall be formed at right angles to the alignment of the curb in accordance with the Standard Details, unless otherwise specified by the City Engineer.

The Contractor shall perform sawing and jointing operations in a manner that prevents uncontrolled cracking of the concrete. The Contractor shall be responsible for the removal and replacement of any concrete that has developed uncontrolled cracking.

Contraction joints shall be constructed by sawing the curb to a minimum depth of one and one-fourth (1 ¼) inches at a spacing of ten (10) feet. The width of the joint shall not exceed three-eighths (3/8) of an inch. Hand-tooling of the contraction joints may be permitted with

the approval of the City Engineer. Hand-tooled contraction joints must conform to the sawed-joint dimension requirements.

2107 FINISHING

Additional water shall not be used to aid in the finishing operation, unless otherwise approved by the City Engineer. Additional concrete shall not be added to concrete that has taken initial set. Finishing shall be performed as follows:

Curb and Gutter

The curb shall be shaped to the required cross-section as soon as possible after the concrete has been placed in the forms. The surface of the curb shall be floated with a wood or metal float and broom finished. A one-quarter (¼) of an inch radius shall be tooled on the exposed edges of the curb. Brooming shall be perpendicular to the alignment of the curb. The finished curb shall be uniform in appearance, and shall be in conformance with the specified lines, grades and configurations shown on the approved plans.

Sidewalk and Driveway Entrances

After the concrete has been thoroughly consolidated and leveled, the surface shall be floated with a wood or metal float and broom finished. The broom finish shall be perpendicular to the centerline of the sidewalk. All exposed edges shall be rounded with an edger with a one-quarter inch (¼") radius. The edges and joints of the sidewalk and driveway shall be straight and neat in appearance. The Contractor shall be responsible for picture-framing at locations determined by the City Engineer. The finished surface shall be uniform in color and free of voids.

2108 PROTECTION

The Contractor shall, at his expense, protect the concrete work against damage or defacement of any kind until the project has been accepted by the City Council.

Concrete items which are not acceptable to the City Engineer shall be removed and replaced, or repaired to the satisfaction of the City Engineer.

2109 OPENING TO TRAFFIC

Residential drive approaches shall not be opened to traffic until the concrete is at least seventy-two (72) hours old and has attained a minimum compressive strength of 3,000 psi and 75% of the mix design strength. Commercial drive approaches shall not be opened to traffic until the concrete is at least one hundred and twenty (120) hours old and has attained a minimum compressive strength of 3,500 psi and has attained 80% of the mix design strength. If high early strength concrete is used, the drive approaches may be opened to traffic when the concrete has attained a compressive strength of 3,500 psi and has attained 80% of the mix design strength.

2110 REINFORCEMENT (Curb and Gutter)

Reinforcement for concrete curb and gutter shall be as designated in the Standard Details. When the curb and gutter is constructed on an asphaltic concrete base with a minimum thickness of three (3) inches, no reinforcement shall be required, unless otherwise determined by the City Engineer.

2111 REINFORCEMENT (Other)

Reinforcement for all other work shall be as shown on the approved plans or Standard Details.

SECTION 3000 - SANITARY SEWERS

3001 SCOPE

This section covers all labor and materials for the construction of sanitary sewer mains including all manholes, pipe encasements, service connections and appurtenances.

3002 GENERAL

When reference is made to a standard specification (ASTM, AWWA, etc.), the specification referred to shall be understood to mean the latest revision of said specification except as otherwise noted in the contract documents.

3003 MATERIALS

Contractor shall be required to use the materials shown on the City of Olathe Approved Materials List unless otherwise specified or approved by the City Engineer. The Approved Materials List is available on the City of Olathe public website at www.olatheks.org.

Ductile Iron Pipe – Gravity Sewer Mains (Per City Engineer Approval Only)

Pipe

All ductile iron pipe shall meet the requirements of ANSI/AWWA C 150/A21.50 and ANSI/AWWA C 151/A21.51 and shall be of the thickness class specified herein or shown on the Drawings. The minimum thicknesses allowed are Special Class 50 and 51. If Standard Pressure Classes pipe is provided, the thickness of the pipe shall equal or exceed the wall thickness of a Special Class 50 and 51, except as shown on the Drawings.

Joints

Mechanical: Mechanical and push-on joints for pipe and fittings shall conform to the requirements of ANSI/AWWA C111/A21.11.

Flanged: Flanged joints for ductile iron pipe and fittings shall conform to the requirements of ANSI/AWWA C115/A21.15. The minimum thicknesses allowed for flanged pipe shall be Special Class 53.

Gaskets: Gaskets shall be neoprene or other synthetic rubber material, except when the gasket is anticipated to come in contact with petroleum based products in which case oil-resistant Nitrile (Buna-N) gaskets shall be used. Natural rubber gaskets will not be acceptable.

Restraining Systems: All pipe shown on the Drawings to be restrained joint shall employ one of the restraining systems included in the approved materials list. Restrained joints incorporating steel gripping wedges in rubber gaskets will not be allowed.

Restraining Systems for Field Cuts: For field cuts on 24-inch diameter pipe and less, one of the restraining systems included in the approved materials list. Larger diameter pipes shall be installed as recommended

by the City Engineer.

Fittings — Fittings shall be in accordance with ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53 and shall have a pressure rating of not less than that specified for the pipe. Fittings used with ductile iron pipe shall be ductile iron or cast iron. Fittings for pipe with push-on joints shall have either mechanical joints or push-on joints. All fittings shown on the Drawings to have restrained joints shall employ one of the restraining systems specified in Paragraph 2.02.B.3.d of this Section. Restrained joints incorporating steel gripping wedges in rubber gaskets will not be allowed.

Coatings — Pipe and fittings shall be furnished with exterior bituminous coating conforming to ANSI/AWWA C 151/A 21.51.

Linings — Pipe and fittings shall have a hydrogen sulfide resistant interior lining of either Protecto 401 Ceramic Epoxy as manufactured by Induron Coatings, Inc. or PolyBond Plus as manufactured by American Ductile Iron Pipe. Lining shall be installed and field cuts shall be repaired as recommended by the manufacturer.

Encasement — All ductile iron pipe and fittings shall be wrapped with a seamless polyethylene tube encasement, ANSI/AWWA C105/A21.5, LLD-8 mil or HDCL-4 mil. All lumps of clay, mud, cinders, etc. shall be removed from the pipe prior to installing the polyethylene tube encasement. Where ductile iron pipe is embedded or encased in concrete, the polyethylene tube shall be installed over the pipe for 5 feet either side of each end of the concrete encasement.

Polyvinyl Chloride (PVC) Pipe – Gravity Sewer Mains

Pipe — Pipe shall be seamless. Pipe material shall conform to ASTM D1784 and shall have a minimum cell classification of 12454B, 12454C, 12364A, or 13364B. Pipe diameters less than eighteen (18) inches shall be SDR 26 and conform to ASTM D3034. Pipe diameters eighteen (18) inches and larger shall be PS115 and conform to ASTM F679 or F794.

Joints — All gasketed joints shall be compression, bell and spigot push-on conforming to ASTM D3212 and ASTM F477. Lubricant shall be as recommended by the pipe manufacturer.

Fittings — Molded fittings defined as tee connections suitable for assembly to six (6) inch diameter house or building sewers shall be fittings molded of PVC materials conforming to ASTM D1784. All fittings shall utilize

elastomeric seals and shall be suitable for use with the PVC pipe specified.

Polyvinyl Chloride (PVC) Pipe – Low Pressure Sewer Mains

Pipe — Pipe shall be SDR 21 and conform to ASTM D2241.

Joints — Pipe shall have integral bell and gasket joint design meeting the requirements of ASTM D3139 and F477. Solvent weld pipe joints shall meet ASTM D2672 and solvent cements shall meet ASTM D2564.

Fittings — Molded fittings shall be molded of PVC materials conforming to ASTM D2241 for SDR 21 or ASTM D1785 for Schedule 80 PVC. All fittings shall utilize elastomeric seals and shall be suitable for use with the PVC pipe specified.

High Density Polyethylene (HDPE) Pipe – Gravity Sewer Mains (For Pipe Bursting Only)

Pipe — Pipe shall be manufactured from a PE 3408 resin listed with the Plastic Pipe institute (PPI) as TR-4. The resin material will meet the specifications of ASTM D3350 with a cell classification of PE 345464C. Pipe shall have a manufacturing standard of ASTM F714. Pipe shall be DPS DR 13.5 unless otherwise specified on the plans.

Fittings — Butt Fusion: Fittings shall be PE3408 HDPE, cell classification of 345464C as determined by ASTM D3350. Butt fusion fittings shall have a manufacturing standard of ASTM D3261. Fabricated fittings are to be factory manufactured. All fused joints shall be de-beaded and debris removed from the main.
Electrofusion Couplings and Restrains: Couplings shall be PE3408 HDPE, cell classification of 345464C as determined by ASTM D3350. Electrofusion couplings shall have a manufacturing standard of ASTM F1055.
All fittings and couplings shall have the same pressure rating as the pipe unless otherwise specified on the plans. HDPE butt fusion installers must be qualified with training from the pipe distributor or manufacturers' representatives.

Cured In Place Pipe (CIPP)

Cured in place pipe (CIPP) shall only be allowed as an alternative to pipe replacement at locations approved by the City Engineer.

Fabric — CIPP lining material shall consist of one or more layers of absorbent non-woven felt fabric capable of absorbing the resin and withstanding the installation pressures and curing temperatures. The tube should be compatible with the resin system used. Any

plastic film applied to the tube on what will become the interior wall of the finished CIPP shall be an impermeable, flexible membrane which is compatible with and contain the resin system used.

Resin — The resin system shall be a corrosion resistant polyester, or vinyl ester, or epoxy and catalyst system.

Minimum lining thickness is outlined in Table 3003-1.

Table 3003-1 *- Minimum CIPP Lining Thickness*

Original Pipe Diameter (inch)	**Minimum CIPP Thickness** (mm)	**Design Criteria** (inch)
8-12	5.8	0.23
15	7.6	0.30
18	6.8	0.27
24	8.7	0.34
30	10.8	0.43

The cured liner shall conform to ASTM D790 for the minimum structural standards. Liner tube and resin shall also meet the requirements of ASTM F1216, ASTM D5813, ASTM F1743 and any project specific criteria.

3004 ALIGNMENT

Piping shall be installed to the grades indicated on the drawings using laser beam equipment and surveying instruments.

The following sag tolerances will be acceptable on sanitary sewer installations:

- For 8-inch and 12-inch diameter pipe with slopes below one and a half percent, a maximum sag of ten (10) percent of the pipe area and no more than two sags of ten (10) percent of the pipe area between structures.
- For all pipes with a diameter larger than 12-inches, sags shall be evaluated by the Engineer on a case-by-case basis. The City Engineer shall have final determination if the sag will be acceptable.
- For any sags not meeting acceptable criteria as outline above, backfall slope is not allowed at any point in the pipe installation. Remove and replace, otherwise repair, any sections of non-conforming pipe at no additional cost to the City.

3005 HANDLING

Pipe and fittings shall be handled in a manner which prevents damage and ensures the delivery and installation in a sound and acceptable condition. Hooks shall not be permitted to contact joint surfaces. Damaged pipe shall be removed from the site.

3006 CLEANING

The interior of all pipe and fittings shall be thoroughly cleaned before installation and shall be kept clean until the work has been accepted. All joint contact surfaces shall be kept clean until the joint is completed.

Whenever pipe installation has stopped, the open end of the pipe must be closed by using a pipe plug to prevent trench water, gravel, earth, or any other foreign object from entering the pipe. In no case will removal of sewer plug be permitted and water allowed to enter the sewer. Contractor may be required by the City Engineer to remove all water from the trench before continuing installation.

3007 LAYING PIPE

Lateral displacement of the pipe is not acceptable. Pipe shall not be installed with water in the trench or under unsuitable weather.

Pipe installation shall begin at the lowest elevation with bell ends facing the upstream, unless otherwise approved by the City Engineer.

3008 JOINTING

All joint preparation and jointing operations shall comply with the instructions and recommendations of the pipe manufacturer. Immediately before joints are pushed together, all joint surfaces shall be coated with the lubricant furnished with the pipe.

3009 TEMPORARY PLUGS

Provide and install watertight plugs as manufactured by pipe supplier. Secure plugs in place in a manner to facilitate removal when required to connect pipe.

Mechanical plugs, braced with a 4x4 timber wedged against the opposite wall of the manhole, shall be installed at the downstream end (connection with existing line) on all sanitary sewer extension projects under construction, and shall be verified by the Contractor at the completion of each working day. 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 ground water or foreign material until work is resumed.

3010 SERVICE CONNECTIONS

Tees shall be installed for all new sanitary sewer services. Tapping saddles shall only be allowed on existing sewer mains with the approval of the City Engineer.

3011 CONCRETE ENCASEMENT

See Section 3 of the City of Olathe *Design Criteria for Public Improvement Projects* (DC3) and applicable Standard Details.

3012 WATER LINE CLEARANCES

See Section 3 of the City of Olathe *Design Criteria for Public Improvement Projects* (DC3) and applicable Standard Details.

3013 SEWER MANHOLES

Manhole construction shall comply with all of the applicable requirements of Section 3100 of the City of Olathe *Technical Specifications for Public Improvement Projects*.

3014 LOW PRESSURE SEWER SYSTEMS (LPSS)

Low pressure sewer systems shall only be allowed with approval of the City Engineer. Design of the LPSS shall be in accordance with the Olathe *Design Criteria for Public Improvement Projects (DC3)*.

3015 ACCEPTANCE TEST

Each reach of sewer shall meet the requirements of the following acceptance tests. All defects shall be repaired and re-tested to the satisfaction of the City by and at the expense of the Contractor

Infiltration Test

An infiltration test will be required when the sewer line is below the ground water level. The amount of water leaking into the sewer shall be measured, and it shall not be more than fifty (50) gallons per day per mile of pipe, per inch nominal diameter.

Air Test

Contractor shall perform a low pressure air test for pipe between successive manholes. The pipe between manholes shall be sealed with suitable plugs. One of the plugs shall have a positive on-off valve and suitable means for readily disconnecting it at the control panel. A second orifice in the plug shall be used for constantly reading the internal pressure of the pipe. This orifice shall be continuously connected to a pressure gauge capable of measuring up to 10 psi. The gauge shall have minimum divisions of 0.10 psi and shall have an accuracy of $\pm$0.04 psi.

The testing methods and air leakage rates shall conform to the requirements of ASTM F-1417-92 or the latest revision thereof, except as modified herein. Each reach of sewer pipe between manholes shall be tested after completion of the installation of the pipe, appurtenances and the backfill of the sewer trench. Internal air pressure shall be monitored so that it will not exceed 9.0 psig.

Determine the rate of air loss using the time-pressure drop method. Slowly introduce air into the section of pipe to be tested until the air pressure is raised to approximately 4.0 psig and the section of pipe is stabilized. As discussed previously, disconnect the air supply and decrease the pressure to 3.5 psi before starting the test. Determine the time required for the pressure to drop from 3.5 psi to 2.5 psi and compare this interval to the required time to decide if the rate of air loss is within the allowable minimum times required by pipe diameter as shown in Table 3015-1.

If the pressure drops 1.0 psi before the appropriate time shown in Table 3015-1, the air loss rate shall be considered excessive and the test section fails. If the test section fails, leaks shall be repaired and the line shall be retested to the requirements of this test method. Rubber

clamp-on type repair couplers will not be an acceptable method of repair. Solid repair sleeves shall be used on all new construction. Prior to acceptance, all constructed sewer lines shall satisfactorily pass the low pressure air test.

The air test may be stopped if no pressure loss has occurred during the first fifty (50) percent of the calculated testing time. If any pressure loss or leakage has occurred during the first fifty (50) percent of the testing period, the test shall continue for the entire test duration as outlined below, or until failure.

Plugs should not be removed until all air pressure has been released.

Example of how to use Table 3015-1:
What should the required test time be for a 1.0 psig pressure drop in 327 feet of 8-inch diameter pipe between manholes?

Solution:
The exact time is easily calculated by using Table 3015-1. Since 327 feet exceeds the 298 feet length associated with the minimum test time for an 8-inch pipeline, the fourth column in Table 3015-1 is used to calculate the required test time as follows:

$$T = 1.520 \times L = 1.520 \times 327 = 497 \text{ seconds}$$

Therefore, the required test time for a 1.0 psig pressure drop is 497 seconds, or 8 minutes and 17 seconds.

Table 3015-1 *-Minimum Duration of Air Test Required for Maximum 1.0 psi Pressure Drop*

Pipe Diam. (in)	Minimum Duration (min)	Length for Min. Duration (ft)	Duration for Longer Length (sec*L)	Specified Time for Length (L) Shown (min)							
				100 (ft)	150 (ft)	200 (ft)	250 (ft)	300 (ft)	350 (ft)	400 (ft)	450 (ft)
8	7.34	298	1.520	7.3	7.3	7.3	7.3	7.6	8.9	10.1	11.4
10	9.26	239	2.374	9.3	9.3	9.3	9.9	11.9	13.8	15.8	17.8
12	11.20	199	3.418	11.2	11.2	11.4	14.2	17.1	19.9	22.8	25.6
15	14.10	159	5.342	14.1	14.1	17.8	22.3	26.7	31.2	35.6	40.1
18	17.00	133	7.692	17.0	19.2	25.6	32.1	38.5	44.9	51.3	57.7
21	19.50	114	10.470	19.5	26.2	34.9	43.6	52.4	61.1	69.8	78.5
24	22.40	99	13.674	22.8	34.2	45.6	57.0	68.4	79.8	91.2	102.6
27	25.30	88	17.306	28.8	43.3	57.7	72.1	86.5	101.0	115.4	129.8
30	28.20	80	21.366	35.6	53.4	71.2	89.0	106.8	124.6	142.4	160.2
33	31.10	72	25.852	43.1	64.6	86.2	107.7	129.3	150.8	172.3	193.9
36	34.00	66	30.768	51.3	76.9	102.6	128.2	153.8	179.5	205.1	230.8

In areas where ground water is known to exist, a one-half inch diameter capped pipe nipple approximately ten (10) inches long is to be installed through the manhole wall on top of one

of the sewer lines entering the manhole. This installation is to be done at the time the sewer line is constructed. Immediately prior to the performance of the line acceptance test, the ground water level shall be determined by removing the pipe cap, blowing air through the pipe nipple into the ground to clear it, and then connecting a clear plastic tube to the pipe nipple. The tube shall then be held vertically and a measurement of height in feet of water shall be taken after the water height has stabilized in the tube. The height in feet shall be divided by 2.3 to establish the pounds of pressure to be added to all readings. All pressure sewage force mains shall have hydrostatic pressure and leakage tests performed prior to acceptance. All tests shall conform to AWWA C600 procedures except as modified herein. The test pressure and leakage allowed shall be determined by the Design Engineer and approved by the City Engineer. The test shall be conducted after line installation and trench backfilling is complete.

The test shall be performed separately in segments between sectionalizing valves and a test plug, or between test plugs. Test segments shall be selected so that adjustable seated valves are isolated for individual checking. Contractor shall furnish and install test plugs at no additional cost to the City, including all required anchors, braces and other devices to withstand hydrostatic pressure on the lugs. Any damage to public or private property caused by failure of the plugs shall be the responsibility of the Contractor. The fill rate of the line shall be limited to the available venting capacity.

If any of the above tests fail to meet the above prescribed requirements, the test shall be repeated as necessary after all leaks and defects have been repaired.

Deflection Test

A deflection test shall be required on all installations involving flexible or semi-rigid pipe after said pipe has been laid and backfilled. The maximum allowable deflection shall not exceed five (5) percent of the pipe's actual internal diameter as measured in the field. The deflection test shall consist of guiding a device of the appropriate size for the pipe involved to accurately measure any deflection in the pipe. The device to be used shall be approved by the City Engineer prior to its use. Attention is directed to the fact that the pipe's nominal diameter is greater than the actual internal diameter of the pipe. Lamping will not be approved as a substitution for deflection testing.

Upon completion of the testing, all piping showing a deflection greater than five (5) percent shall be excavated, replaced, backfilled and retested to the satisfaction of the City Engineer.

Video Camera Inspection

Sewer line installations shall be inspected by closed circuit television (CCTV) at the Contractor’s expense to verify alignment, deflection, and workmanship to check for a smooth, structurally sound, straight, round main. A high quality internal color video recording shall be provided by the contractor showing the pre-construction conditions of all sewer mains scheduled for replacement and the post-construction conditions of all sewer mains involved in the work, including new sewers, rehabilitated sewers, replaced sewers, and any restored connections. All post-construction CCTV inspection shall take place after

all testing of the sewer line is complete.

The camera shall be moved through the pipe at a uniform rate, stopping when necessary to ensure proper documentation of the pipe conditions. In no case shall the camera travel at a rate faster than thirty (30) feet per minute. The camera shall be moved through the line by means which do not obstruct camera view or interfere with proper documentation of the sewer conditions. The camera shall pause as it approaches a service so that the connection between the pipe and the service can be evaluated. The lens can then rotate to display the interior of the service. The service inspection should identify any visible roots, cracks, or capped risers.

Inspection of the sewer line segments shall be performed using a color camera specifically designed and constructed for the method of inspection performed. Units shall have either an automatic or remote focus or iris controls, and the complete systems shall be operable in conditions of one hundred (100) percent humidity. The Contractor shall have the necessary camera skids, floats, and rafts available to allow inspection of lines in a manner acceptable to the Engineer under live flow conditions and designed for the size of pipe being televised. The complete video system (camera, lens, lighting, cables, monitors, and recorders) shall be capable of producing a picture quality acceptable to the Engineer, and if unsatisfactory, the equipment shall be removed and no payment shall be made for unsatisfactory inspections.

A pan and tilt viewing camera with the ability to view into the service laterals shall be used for 8” services lines and larger. A mini-camera may be utilized where necessary if the 8” camera setup is blocked. Each service lateral or tap shall be inspected to determine operational status and condition of the piping at the mainline connection.

The Contractor shall provide and have on site, heavy cleaning and root cutting equipment for use during CCTV inspection. The Contractor shall include the cost for heavy cleaning and root cutting in their bid proposal. Blowers shall be used to clear suspended moisture or fog in pipes prior to inspection.

Lighting shall be suitable to allow a clear picture of the entire periphery of the main sewer pipe. Lighting shall operate in a manner to provide adequate light for clear inspection and minimize glare no matter what angle of the camera lens. The lighting shall be built into the unit so the lamps remain aligned with the lens.

When possible, work should start from the upstream manhole. When an obstruction prevents the camera from passing the entire segment, document the defect(s) that do not allow the camera to pass, move to the other manhole (typically the downstream manhole), create new inspection, and inspect as much of the pipe as possible.

When the flow in the upstream manhole of the line segment being inspected is above the maximum allowable level for television inspection the flow shall be reduced. The depth of flow shall not exceed the levels show below for the respective sizes, as measured in the

manhole at the time of inspection:

Pipe Diameter (in)	Max Flow Depth (% of Diameter)
≤10	20
12-24	25
≥27	30

The project internal video shall be performed by a qualified commercial or individual company who is familiar with closed circuit television (CCTV) inspection equipment and is Pipeline Assessment Certification Program (PACP) certified by the National Association of Sewer Service Companies (NASSCO). The inspection shall conform to PACP standards and the standards in this document. When PACP and this document conflict, this standard in this document shall be used.

The CCTV inspection shall be completed from manhole to manhole, and include the interior of the manhole and invert. Electronic media records shall be kept by the Contractor. Digital photographs of the pipe conditions and all defects shall be taken by Contract. Both electronic media and digital photographs shall clearly show the location, by distance in 1/10 of a foot from the manhole center, in relation to an adjacent manhole of each PACP observation and/or defect. PACP defect codes shall be recorded on the electronic media. Transparent information must appear on the viewing screen at all times. This information shall contain the site number, full date, continuous footage, and upstream and downstream manhole numbers. All pipe conditions and service connections with addresses shall be noted at the appropriate locations. Each line shall be recorded on a separate file with the upstream and downstream manhole numbers in the filename.

PACP coding standard shall be used for all observation except as expressly identified below:

- Abandoned Inspections
    - If the length of pipe cannot be inspected, document the defect or defects that do not allow the camera to pass in addition the Miscellaneous Survey Abandoned (MSA) code. Use this method instead of documenting the reason for the abandoned inspection in the comment field. The only time it is appropriate to put the reason in the MSA comment is getting pulled off the job and when the inspection could have otherwise been continued.
- Significant and unexplained changes in turbulence:
    - A case where flow turbulence changes significantly but there is not visual indicator why (i.e. presumably a large rock or broken/hole below the water line). To document this, add a Miscellaneous General Observation (MGO) with “Rapids” in comments.

The Contractor shall provide deliverable with external hard drive that contains:

- PACP export database, including:
    - Electronic media recordings, including all inspections associated with the project.

- Inspection logs, containing upstream and downstream manhole, street address, date, pipe diameter, direction of inspection, pipe material, line footage, lateral and observation locations, and digital photos of defects and their respective severity, PACP scoring for each line segment, and a graphic depicting the sewer line segment and showing the location and direction of lateral connections, defects, material changes, etc.

The City will review submittals for quality. Any deliverables not acceptable shall be corrected and resubmitted by the Contractor at no additional charge to the City. If additional inspections are required, the Contractor shall reschedule unacceptable inspections five days after being notified or a mutually agreed upon alternative schedule.

City will complete a second video of the sewer pipe prior to the expiration of the two (2) year maintenance bond. If any repairs are required during the two (2) year maintenance period, the Contractor will be required to video all repaired sections of pipe to verify corrections. Unacceptable defects include, but are not limited to, infiltration, displacement at joints, intrusion of foreign material, service taps entering at the wrong angle, sags outside acceptable limits as defined by these specifications, or cracked, broken, distressed or out of round pipe.

3016 BORING WITH CASING PIPE

Casing pipe shall conform to the requirements of Section 4019 and applicable Standard Details unless otherwise specified or approved by the City Engineer.

SECTION 3100 - SANITARY SEWER MANHOLES

3101 SCOPE

This section covers standard, drop and special sanitary sewer manholes. Manholes shall be constructed of reinforced concrete complete with covers, fittings and other appurtenances in accordance with the Standard Details, unless otherwise approved by the City Engineer.

Only manholes which are required to have outside pipe and fittings for dropping sewage into the lower line will be designated as drop manholes. Inside drop manholes where the incoming line discharges directly into the manhole and which do not require special fittings will be considered standard manholes.

3102 MATERIALS

Contractor shall be required to use the materials shown on the City of Olathe Approved Materials List unless otherwise specified or approved by the City Engineer. The Approved Materials List is available on the City of Olathe public website at www.olatheks.org. The acceptable materials for manhole construction are outlined in Table 3102-1.

Table 3102-1 *- Sanitary Sewer Manhole Construction Materials*

Item	Acceptable Material
Pre-Cast Concrete Manhole	Circular reinforced precast concrete shall conform to ASTM C478
Concrete	Per Section 2000, KDOT 4.0 AE (4,000 psi minimum)
Minimum Wall Thickness	Per Section 3103
Openings	Manhole/pipe connectors shall be cast into the manhole wall
Manhole/Pipe Connectors	Flexible gaskets shall conform to ASTM C923
External Joint Sealant	Adhesive tape shall conform to ASTM C877 Type III self-shrinking butyl rubber
External Coating	Liquid asphalt coating conforming to ASTM D41 and ASTM D449 Type 1
Protective Manhole Liner	Epoxy or polyurethane coating shall conform to ASTM D638, D658, D790, D792, D2240, D4060 and D7234
Castings	In accordance with ASTM A48 with asphalt varnish coating applied at the foundry

3103 STANDARD MANHOLES

All manholes shall be constructed in accordance with the Standard Details and requirements found herein. Manholes shall be precast unless otherwise specified or approved by the City Engineer. Precast bases shall be poured monolithically with the walls of the bottom manhole section. Concrete used for poured-in-place bases for doghouse manholes shall conform to

Section 2000. Manholes may be constructed with either eccentric or concentric cones unless otherwise approved by the City Engineer.

Precast concrete manholes shall have a wall thickness not less than one-twelfth (1/12) of inside diameter plus one (1) inch or five (5) inches, whichever is greater. Precast concrete sections shall be inspected when delivered and all cracked or otherwise visibly defective units rejected. Excessive air pockets or cracks on either the interior or exterior surface of the precast sections shall be cause for rejection.

A pipe to manhole connector using an ASTM C923 resilient device that provides a flexible watertight seal for pipes, including services, entering and exiting pre-cast concrete manholes shall be cast-in place at the time of manufacture by the pre-cast concrete manhole manufacturer.

3104 CASTINGS

All manhole covers shall be cast with the City of Olathe logo as shown in the Standard Details.

Any manhole downstream of a low-pressure sewer system or a lift station discharge shall be required to install the composite manhole frames and lids. These castings will be required for the first 5 (five) manholes downstream of the connection. Additionally, composite frames and lids are required on any sanitary sewer manhole, where the sewer main is 15-inch or larger in diameter.

All manhole frames and covers installed within the 100-year floodplain shall be anchored to the manhole through the frame assembly, and all adjustment grade rings with not less than four 3/4-inch diameter anchor bolts shall have a minimum of four (4) inches of embedment into the concrete manhole.

3105 MANHOLE STEPS

All manholes shall be formed and cast without steps. Steps cannot be cut-off and patched.

3106 GRADE RINGS

Manholes shall be fitted with an adjustment ring(s) to support the manhole frame and cover to the specified final elevation, as needed. A maximum of three (3) rings will be accepted. These adjustment rings shall have a maximum of nine (9) inches of vertical adjustment. When field adjustments exceed nine (9) inches, precast concrete manhole sections shall be used to provide finished grade elevation. Contractor shall use angle grade rings to match finished pavement grade for manholes located in paved areas. Installation of adjustment rings shall be per manufacturer's recommendations.

Grade rings shall be as shown on the Approved Materials List. Concrete grade rings shall not be allowed.

3107 CONSTRUCTION

Manhole inverts shall be constructed of KDOT Grade 3.0 AE concrete conforming to Section 2000.

In no case shall the invert section through a manhole be greater than that of the outgoing pipe. The shape of the invert shall conform exactly to the lower half of the pipe it connects. Side branches shall be connected with as large of a radius of curvature as practicable. All inverts shall be troweled to a smooth clean surface.

Circular precast sections shall be provided with a mastic gasket or preformed flexible joint to seal joints between sections. The space between connecting pipes and the wall of precast sections shall be closed by a water-tight manhole pipe connector. Mortar shall not be placed in the open space on the outside of the manhole where the resilient connector penetrates the manhole wall. When the concrete invert fill is installed on the inside of the manhole, fill shall not be placed in the space on the top half of the pipe where the resilient connector penetrates the manhole wall.

All manholes under construction shall be covered in an appropriate manner to prevent entry of any storm water runoff, trench water, sand, earth or any other foreign substances at any time during construction or while the manhole is unattended.

3108 DAMP-PROOFING AND EXTERNAL JOINT SEALING

The exterior surface of all manholes shall be shop-coated with 14 mils dry film thickness of liquid asphalt coating.

Adjustment ring(s) and manhole joints below grade shall be sealed with self-shrinking butyl rubber joint wrap. The manhole surface to be covered shall be free of dirt, sharp points and moisture. The wrap shall be applied according to the manufacturer's recommendations, and shall cover the joints between all sections and the entire surface of the adjustment rings, with overlap onto the manhole of four (4) to six (6) inches.

3109 STUBLINES

Stublines for future connections shall be provided in manholes at the locations shown on the approved construction plans.

3110 CONNECTIONS TO EXISTING MANHOLES AND SEWERS

Connections to Existing Manholes

A pipe to manhole connector using an ASTM C923 resilient device that provides a flexible watertight seal for pipes entering and exiting manholes shall be installed by the Contractor from outside the manhole. All openings to accommodate these connectors shall be core drilled with approved equipment. No service line taps to existing manholes shall be allowed unless approved by City Engineer.

Connections to Existing Sewer Lines

Manholes installed over existing sewer lines (doghouse manholes) are not allowed. A new precast manhole and replacement of the existing sewer pipe to the first joint in all directions shall be required for cutting into an existing sewer line. If a doghouse manhole is approved by the City Engineer, the opening around the existing pipe shall be closed with an approved water-stop gasket and approved non-shrink cementitious mortar.

3111 ACCEPTANCE TESTING

Vacuum tests shall be conducted on all newly constructed manholes, existing manholes that have been repaired or restored or manholes constructed over existing sewers. Vacuum tests shall meet the requirements of ASTM C1244 except as modified herein.

Manholes shall be completely backfilled, up to and including the casting, before the vacuum testing begins. All lift holes shall be plugged with a non-shrinking mortar, as approved by the City Engineer. The Contractor shall plug all pipes connected to the manhole using pneumatic plugs. The pneumatic plugs should be placed into the pipe after the inside surface has been cleaned. Air shall be introduced into the plugs to 25 psig. Bracing can be used to ensure that the plugs are not pulled into the manhole during vacuum testing. After the manhole has been properly prepared, the vacuum tester shall be installed. The test head shall be placed on top of the casting or fit inside the casting in a manner which incorporates the casting and all adjustment and adaptor rings into the vacuum test. The vacuum pump shall be connected to the outlet port with the valve open. The outlet valve shall be closed after a vacuum draw of 10 inches of Mercury (Hg) has been obtained. The test shall pass if the vacuum maintains a minimum of 9 inches of Hg. in a time greater than one minute. If the manhole fails, the Contractor shall locate the leak and make proper repairs and then re-test.

A visual inspection will be performed for each manhole by the City Engineer after the manhole has met the requirements of the vacuum test and is considered in its final state. The inspection shall determine the completeness of the manhole. Any defects identified shall be repaired to the City Engineer's satisfaction.

SECTION 4000 – PIPELINE EXCAVATION, BEDDING AND BACKFILL

4001 SCOPE

This section covers the excavation, trenching, boring, bedding, backfilling and other appurtenant work required for underground pipeline installations.

4002 GENERAL REQUIREMENTS

Excavation work shall be performed in a safe and proper manner with appropriate precautions being taken against all hazards. Excavations shall provide adequate working space and clearances. In no case shall excavation faces be undercut.

Excavations for manholes and similar structures shall provide sufficient clearance for exterior work such as pipe installation and wrapping of manhole section joints.

Backfilling during freezing weather shall not be permitted, unless otherwise approved by the City Engineer. No backfill material shall be installed on frozen surfaces, nor shall frozen materials, snow or ice be placed in any backfill.

4003 CLASSIFICATION OF EXCAVATED MATERIALS

When specifically indicated in the approved plans, classification of excavated materials will be made as follows:

Rock: In accordance with Section 1102.

Earth: All material not classified as rock.

4004 CLEARING

The Contractor shall clear all areas necessary for access, storage of pipeline materials and construction of the pipeline and appurtenant structures in conformance with Section 1005.

4005 DEWATERING

The Contractor shall provide and maintain adequate dewatering equipment to remove and dispose of all surface and ground water entering excavations and trenches. Dewatering operations shall continue throughout embedment preparation until the pipe installation is completed and no damage from hydrostatic pressure, flotation or other cause will result.

All excavations for trenches, which extend down to or below groundwater, shall be dewatered by excavating adjacent to the trench. The dewatering excavation shall lower the groundwater elevation to twelve (12) inches or more below the bottom of the trench.

Surface water shall be diverted or otherwise prevented from entering excavated areas or trenches to the greatest extent practicable without causing damage to adjacent property.

The Contractor shall be responsible for maintaining any pipe utilized for drainage purposes, and all such pipes shall remain clean and free of sediment.

4006 SHEETING AND SHORING

Sheeting and shoring shall conform to the requirements of Section 1108.

4007 ALIGNMENT AND ELEVATION

Alignment and elevation of each pipeline shall be maintained as shown on the approved plans.

4008 MINIMUM COVER (WATER MAINS AND SERVICE LINES)

Where pipe grades or elevations are not definitively fixed by the approved plans, trenches shall be excavated to a depth sufficient to provide a minimum depth of backfill covering the top of the pipe of forty-two (42) inches in unpaved areas and forty-eight (48) inches in paved areas. Greater pipe cover depths may be necessary on vertical curves or to provide necessary clearance beneath existing pipes, conduits, drains, drainage structures or other obstructions encountered at normal pipe grades. Measurement of pipe cover depth shall be made vertically from the outside top of pipe to finished ground or pavement surface elevation.

4009 STABILIZATION

Trench bottoms which become unstable during construction operations shall be stabilized, at the expense of the Contractor. Stabilization shall be achieved using crushed rock or other suitable material as necessary to provide a firm and stable base. Not more than one-half (1/2) inch depth of mud shall be allowed to remain on the stabilized trench bottom when the granular pipe bedding is installed.

4010 TRENCH EXCAVATION

The Contractor shall not open more trench in advance of laying pipe than is necessary to expedite the work. One hundred-fifty (150) feet shall be the maximum length of open trench on any line under construction. The Contractor shall backfill all open trenches by the end of the work day, except as necessary for inspection or continuation of the work.

Except where alternate methods of construction are shown on the approved project plans, all trench excavations shall be open cut from the surface, unless otherwise approved by the City Engineer.

The Contractor shall be responsible for the safety of the excavation, which shall comply with all OSHA regulations pertaining to trench safety. All open trenches shall be provided with adequate protective devices.

4011 LIMITING TRENCH WIDTHS

Trenches shall be excavated to a width which will provide adequate working space and pipe clearances for proper pipe installation, jointing and embedment. Rock encountered during excavation shall be removed to provide a clearance of six (6) inches below and on each side of

all pipes. These distances are minimum clear distances which will be permitted between any part of the pipe and any part, projection or point of such rock.

Cutting trench banks on slopes to reduce earth load to prevent sliding and caving will be permitted only in areas where the increased trench width will not interfere with surface features or encroach on right-of-way limits. Slopes shall not extend lower than one (1) foot above the top of the pipe.

Trench widths below an elevation of one (1) foot above the exterior top of the installed pipe shall be not less than fifteen (15) inches nor more than twenty-four (24) inches greater than the nominal outside diameter of the pipe.

4012 UNAUTHORIZED TRENCH WIDTHS

Where the width of the lower portion of the trench exceeds the widths permitted in Section 4011 of these specifications, special pipe embedment shall be used as determined by the City Engineer at the expense of the Contractor.

4013 MECHANICAL EXCAVATION

The use of mechanical equipment shall not be permitted in locations where its operation could cause damage to trees, buildings, culverts or other existing property, utilities or structures above or below ground.

Mechanical equipment used for trench excavation shall be capable of excavating the trench to the depth, width and alignment required to install the pipeline in accordance with the approved plans and Standard Details. Undercutting the trench sidewall to obtain clearance will not be permitted.

4014 ARTIFICIAL FOUNDATIONS IN TRENCHES

As directed by the City Engineer, the Contractor shall over excavate and stabilize the trench with suitable material to provide a stable foundation. All concrete or other foundations shall be installed as directed by the City Engineer. Compensation for extra excavation, concrete or other foundations, except where provided by contract unit prices, shall be made in accordance with the contract provisions for extra work.

4015 PIPE EMBEDMENT

The pipe shall be laid in a flat-bottom trench which has been graded and shaped to provide continuous support along the full length of the pipe and pipe joints. Blocking of the pipe will not be permitted. It shall be permissible to slightly disturb the finished subgrade surface by withdrawal of pipe slings or other lifting tackle.

After each pipe has been graded, aligned, placed and jointed on the bedding material, sufficient pipe embedment material shall be deposited and compacted under and around each side of the pipe to hold the pipe in proper position and alignment during subsequent pipe jointing and embedment operations.

Embedment material shall be deposited and compacted uniformly and simultaneously on each side of the pipe to prevent lateral displacement. Spreading and compacting of the embedment material above the top of the pipe shall be done in a manner that does not damage or compromise the shape of the pipe.

Granular material used for embedment shall meet KDOT Standard Specification Section 1107, PB-2 gradation. The embedment material shall not contain clay lumps or organic matter.

Water Mains

Bell holes shall be excavated in the bottom of the trench to provide ample working space and ensure proper pipe support. No part of the bell shall be in contact with the trench bottom.

Granular embedment material is required for all pipe installations, including rock excavations, and shall conform to the Standard Details.

Sanitary Sewers

Granular embedment material conforming to the Standard Details is required for all pipe installations. Granular embedment material shall completely envelope all sanitary sewer mains, service connections and lateral lines (to the right-of-way).

Bell holes shall provide adequate clearance for tools and methods used for pipe installation. No part of any bell or coupling shall be in contact with the trench bottom, trench walls or granular embedment at the time the pipe is jointed.

Groundwater barriers shall be provided to impede the conveyance of groundwater along the pipe at approximately the midpoint of the pipe when the distance between manholes exceeds 280 feet. Groundwater barriers for sewer lines shall be flowable fill consisting of one four (4) feet long, impervious plug spanning the full width and depth of the trench. The flowable Fill shall have a maximum 28-day compressive strength of 100 psi and conform to KDOT Standard Specification Section 843 for Low-Strength Mixture. The 4-foot groundwater barrier shall not be located within a proposed street.

Storm Sewers

Pipe embedment for storm sewers shall conform to the Standard Details.

4016 TRENCH BACKFILL

The requirements of this section refer to the portion of the trench that is located above the embedment material.

Future Street Crossings

All future street crossings, from back of the curb to back of the curb, shall be backfilled with PB-2 as measured from the top of pipe embedment to the bottom of the future subgrade.

PB-2 Granular material used for embedment and backfilling shall meet KDOT Standard Specification Section 1107.

Existing Street Crossings

All existing street crossings, from four (4) feet back of the curb to four (4) feet back of the curb, shall be backfilled with flowable fill from the top of pipe embedment to the bottom of street patch and shall conform to standard detail 70-1. The flowable fill shall have a maximum 28-day compressive strength of 100 psi and conform to KDOT Standard Specification Section 843 for Low-Strength Mixture.

All Other Locations

Compacted backfill shall be required for the full depth of the trench above the embedment at all other locations unless otherwise specified or directed by the City Engineer. The backfill material for trenches located within the right-of-way shall be compacted to ninety-five (95) percent of maximum density at optimum moisture. Trenches located outside of the right-of-way or other paved areas shall be compacted to ninety (90) percent of maximum density at optimum moisture unless otherwise specified or directed by the City Engineer.

At the option of the Contractor, compacted backfill may be job-excavated material or graded gravel unless otherwise specified or directed by the City Engineer. Job-excavated material may be used for compacted trench backfill when the job-excavated material is finely divided and free from debris, organic material, cinders or other corrosive material. Job-excavated material may contain rubble and detritus from rock excavation, stones, and boulders but none shall be placed within three (3) feet of the top of the pipe or in the upper eighteen (18) inches of the trench. The material resulting from rock excavation may be placed in the remaining area of the trench providing the material is of sufficient gradation to prevent future trench settlement. Job-excavated material used for trench backfill shall be approved by the City Engineer prior to use.

Compact masses of stiff clay or other consolidated material more than one (1) cubic foot in volume shall not be permitted to fall more than five (5) feet into the trench unless cushioned by at least three (3) feet of backfill material placed above the top of the pipe.

Backfill shall not be placed when material contains frost, is frozen or a blanket of snow prevents proper compaction. Backfill shall not contain waste material, organic material or debris of any kind.

The top portion of the backfill beneath established sodded areas shall be finished with at least six (6) inches of topsoil corresponding to, or better than, the adjacent topsoil. Topsoil shall be approved by the City Engineer prior to placement, and unless otherwise directed, shall be material previously excavated and stockpiled for that purpose during excavating and grading operations. Grades on areas to receive topsoil shall be established and maintained as a part of the grading operations. Immediately prior to spreading topsoil, the surface shall be

loosened by discing or scarifying to a depth of two (2) inches to permit bonding of the topsoil to the underlying surface.

4017 STRUCTURE BACKFILL

Backfill around structures shall be compacted to ninety-five (95) percent of maximum density at optimum moisture, unless otherwise approved by the City Engineer. Granular material conforming to KDOT Standard Specification Section 1107 Aggregates for Backfill, PB-2, shall be used to backfill structures located within the street to four (4) feet back of the curb unless otherwise specified or approved by the City Engineer. Weep holes for storm sewer structures shall not be obstructed with impervious backfill.

Material for soil backfill shall be composed of earth only and shall contain no wood, grass, roots, broken concrete, stones, trash or debris of any kind. The backfill material shall require the approval of the City Engineer prior to placement, and shall not be deposited or compacted in water.

Backfilling of structures shall not occur prior to three (3) days after form removal or until the concrete has attained design strength in accordance with Section 2000.

4018 DENSITY TESTING

At the option of the City Engineer, in-place field density testing to determine compliance with specified compaction requirements may be performed using a nuclear moisture-density measuring device. If, as a result of this field testing, the City Engineer determines that further compaction is required, the Contractor shall revise his compaction procedures to obtain the results specified or remove and replace the backfill material with flowable fill.

4019 BORED CASING PIPE INSTALLATION

Steel casing for bored and jacked construction shall have a smooth wall and minimum yield strength of 35,000 psi, conforming to ASTM A-139. Casing pipes installed under railroads and highways shall conform to the jurisdictional agency's requirements. All other casing installations shall be Grade A. Steel casing pipe shall have welded joints in accordance with AWWA C-206 and shall have minimum wall thickness as indicated in Table 4019-1.

Table 4019-1 *- Steel Casing Pipe Wall Thickness*

Casing Diameter (inch)	Minimum Wall Thickness without Exterior Coating (Inch)
14 and under	0.188
16	0.188
18	0.250
20	0.281
22	0.281
24	0.281
26	0.312
28	0.312
30	0.312
32	0.344
34	0.344
36	0.344
38	0.344
40	0.375
42	0.375
44	0.438
46	0.438
48	0.438
50	0.500
52	0.500
54	0.500
56	0.500
58	0.500
60	0.500
62	0.625
64	0.625
66	0.625
68	0.750
70	0.750
72	0.750

Boring and jacking operations shall be performed by experienced crews using a rotary type boring machine. The casing shall be jacked into place as the boring proceeds. Earth displaced by the installation of the casing shall be removed through the interior of the casing by hand, auger or other acceptable means. There shall be no voids between the earth and the exterior of the casing. Any voids that do occur shall be filled by pressure grouting with a grout mix approved by the City Engineer. The steel casing shall be cleaned of all debris after its installation is complete. Alternate methods of boring for casing pipe shall not be performed without the approval of the City Engineer.

Casing spacers with plastic runners shall be secured to the barrel of the pipe with metal bands in such a manner to support the weight of the pipe along its full barrel length on the skids without any of the weight supported by the pipe bell, and in such a manner as to properly position the carrier pipe to the specified elevation and alignment. Stainless steel casing spacers with plastic skids shall be as specified on the Approved Materials List. The location of the spacers on the carrier pipe shall be determined by the Design Engineer and as recommended by the spacer manufacturer. End seals shall be used at each end of the casing and shall be the single-piece pull over, synthetic rubber type, using stainless steel bands.

4020 DRAINAGE MAINTENANCE

Trenches across roadways, driveways, walks, or other trafficways adjacent to drainage ditches or water courses shall not be backfilled prior to completion of backfilling the trench on the upstream side of the trafficway. Bridges and other temporary structures required to maintain traffic across such unfilled trenches shall be constructed and maintained by the Contractor. Water shall not accumulate in unfilled or partially-filled trenches. All material deposited in roadway ditches or other water courses crossed by the line of trench shall be removed immediately after backfilling is completed and the original section, grades and contours of ditches or water courses shall be restored. Surface drainage shall not be obstructed longer than necessary.

4021 PROTECTION OF TRENCH BACKFILL IN DRAINAGE COURSES

Where trenches are constructed in ditches or other water courses, backfill shall be protected from surface erosion. When the grade of the ditch exceeds one (1) percent, ditch checks shall be installed. Unless otherwise shown on the drawings or directed by the City Engineer, ditch checks shall be concrete. Ditch checks shall extend not less than two (2) feet below the original ditch or water course flowline for the full bottom width, at least eighteen (18) inches into the side slopes and shall be at least twelve (12) inches thick.

4022 DISPOSAL OF EXCESS EXCAVATED MATERIALS

Except as otherwise permitted, all excess excavated materials shall not be disposed on the project site.

Excess earth from excavations located in unimproved property shall be distributed directly over the pipe trench and within the pipeline right-of-way to a maximum depth of six (6) inches above the original ground surface elevation. The excess material shall be graded to a uniform surface without obstructing drainage at any point. Wasting of excess excavated material in the above manner will not be permitted where the trench crosses or is within a railroad, public road or highway right-of-way. The disposal of waste and excess excavated materials, including hauling, handling, grading and surfacing shall be a subsidiary obligation of the Contractor and no separate payment will be made therefore.

4023 SETTLEMENT

The Contractor shall be responsible for all settlement of backfill, fills and embankments which occur within two (2) years of time after final acceptance of the work.

A suitable maintenance bond in an amount approved by the City Engineer shall be furnished to the City of Olathe by the Contractor guaranteeing the maintenance of the construction under which the contract was performed. Said bond shall remain in effect for two (2) years from the date of final acceptance by the City Council.

The Contractor shall repair settlement deficiencies within thirty (30) days after notice from the City Engineer.

SECTION 4100 - BLASTING

4101 GENERAL

Blasting shall be performed only by experienced personnel in accordance with the recommendations of the Association of General Contractors (AGC) Manual of Accident Prevention in Construction and OSHA regulations. In locations where flying rock may be present, additional overburden shall be ready for use and/or in place before denotation. All trenching operations utilizing explosives shall be suitably backfilled to prevent any flying rock endangerment to persons or property. The use of these procedures does not relieve the Contractor of responsibility for damage to life and property.

The Olathe Fire Department, Community Risk Reduction Section, is the "authority having jurisdiction" regarding the storage, handling, use and control of explosives. All permits for this use will be issued by the Fire Department. Any work within the public right-of-way will also require a right-of-way permit from the Infrastructure Department.

Blasting activities, operations, materials and agents shall conform to Olathe Municipal Code, Title 16 and the specifications contained herewith, whichever is more stringent. Blasting will not be permitted within eighty (80) feet of any building structure.

All blasting operations shall be conducted under the direction of a Kansas certified blaster. Evidence of blaster certification shall be carried by blasters or shall be on file at the Fire Department during blasting operations. A blaster and at least one other person shall be present at the firing of a blast. Persons responsible for blasting operations at a blasting site shall, as a minimum, conform to the criteria as outlined.

Contractor shall be responsible for all damage caused by his blasting operations and shall be responsible for responding to all complaints. Suitable methods shall be employed to confine all materials lifted by blasting within the limits of the excavation or trench. All rock which cannot be handled and compacted as earth shall be kept separate from other excavated materials and shall not be mixed with backfill or embankment materials except as specified or directed.

4102 PREBLASTING SURVEY

At least thirty (30) days before initiation of blasting, the Surveyor shall notify, in writing, all residents and owners of dwellings or other structures located within area scaled distance of 35 $ft/lbs^{1/2}$ from the blast site of the intent to conduct a preblast survey. The Fire Marshal may identify alternate preblast survey distances.

The Surveyor shall promptly conduct a preblast survey of the dwellings or structures and prepare a written report of the survey. An updated survey of any additions,

modifications, or renovations shall be performed by the Surveyor if requested by the Contractor or Fire Marshal.

The Surveyor shall determine the condition of the dwelling or structure and shall document any existing damage and other physical factors that could reasonably be affected by the blasting. The Surveyor shall examine the interior as well as the exterior of the structure and shall document any damage by means of photographic or video methods. Structures such as pipelines, cables, transmission lines, cisterns, wells, and other water systems warrant special attention; however, the assessment of these structures may be limited to surface conditions and other readily available data. The interior of the existing sanitary sewer pipes and manholes shall be surveyed by means of a permanently recorded closed circuit video camera prior to blasting operations and after blasting has been concluded in the area of the existing sewer.

All surveys shall be completed by the Surveyor before the initiation of blasting. All surveys shall be conducted by a third party, regularly engaged in performing preblast surveys.

4103 PUBLIC NOTIFICATION

Before blasting is started, the Contractor shall inform all residents within a radius of 1,500 feet of the blasting location by means of printed information sheets.

4104 WARNING SYSTEM

Contractor shall provide suitable warning by siren or whistle prior to all blasts.

4105 OVER-BLASTING

The requirements presented herein shall not relieve the Contractor from the responsibility to avoid disturbing earth or rock beyond indicated and specified lines and levels.

4106 NOTIFICATION

Contractor shall notify the owner of all gas, water, and petroleum pipe lines in any area where blasting will be utilized. A representative of the pipeline owner shall be granted access to be present to observe preparations and blasting.

4107 TECHNICAL ASSISTANCE

When necessary, the Fire Marshal may require additional technical assistance which will be provided at the Contractor's expense.

4108 BLASTING SCHEDULE

Contractor shall conduct blasting operations at times approved by the Fire Marshal and the City Engineer, and announced in the blasting schedule.

All blasting shall be conducted between 8:30 a.m. and 4:30 p.m, Monday through Friday. Blasting may be allowed on Saturday with the approval of the Fire Marshal. Blasting on Sunday is prohibited. The Fire Marshal or the City Engineer may specify more restrictive time periods for blasting.

4109 WARNINGS AND ACCESS CONTROL

Contractor shall provide all adequate warnings necessary to ensure a safe blasting site is maintained at all times.

Warnings and all-clear signals of different character or pattern that are audible within a range of 1,000 feet from the point of the blast shall be given.

Access shall be controlled to prevent livestock or unauthorized persons from entering the blasting area until an authorized representative of the Contractor has reasonably determined that no unusual hazards, such as imminent slides or un-detonated charges, exist.

4110 CONTROL OF ADVERSE EFFECTS

Blasting shall be conducted to prevent injury to persons, damage to public or private property outside the permit area, adverse impacts on any underground mine, and change in the course, channel, or availability of surface or ground water outside the permit area.

Contractor shall conduct monitoring to ensure compliance with the air overpressure standards. Air overpressure shall not exceed limits specified in NFPA 495 as adopted and amended in Olathe Municipal Code Title 16. If necessary to prevent damage, the Fire Marshal can specify lower maximum allowable air blast levels than those listed in this section for use in the vicinity of a specific blasting operation.

Contractor shall be responsible for seismic monitoring of all blasts. A seismographic record including both particle velocity and vibration-frequency contained in the blasting records shall be provided for each blast. The method for the analysis of the predominant frequency contained in the blasting record shall be approved by the Fire Marshal. Contractor shall maintain the record and make it available to the Fire Marshal when requested.

Ground vibration shall not exceed limits specified in NFPA 495 as adopted and amended in Olathe Municipal Code Title 16. The maximum allowable ground vibration can be reduced by the Fire Marshal below the limits otherwise provided by this section, if determined necessary to provide damage protection or public safety.

4111 RECORDS OF BLASTING OPERATIONS

Contractor shall retain a record of all blasts for at least three (3) years. Upon request, copies of these records shall be made available to the Fire Marshal for inspection. Such records shall contain the following data:

A. Name of the contractor conducting the blast.
B. Location, date, and time of the blast.
C. Name of the licensed blaster conducting the blast.
D. Identification, direction, and distance, in feet, from the nearest blast hole to the nearest dwelling, public building, school, church, community or institutional building outside the permit area, except those described herein.
E. Weather conditions, including those which may cause possible adverse blasting effects.
F. Type of material blasted.
G. Sketches of the blast site.
H. Diameter and depth of holes.
I. Types of explosives used.
J. Number of holes and delays.
K. The maximum weight of explosives detonated in an 8-millisecond period.
L. Initiation system.
M. Type and length of stemming.
N. Seismographic and air blast records, shall include:
    1. Type of instrument, sensitivity, and calibration signal or certification of annual calibration;
    2. Exact location of instrument and the date, time and distance from the blast;
    3. Name of the person and firm taking the reading;
    4. Name of the person and firm analyzing the seismographic record; and
    5. The vibration and/or air blast level recorded.

4112 BLASTER

The blaster shall be trained and knowledgeable in all necessary blasting applications. The blaster shall be licensed by the State of Kansas and shall be responsible for obtaining all necessary permits required for blasting operations.

SECTION 5000 – STORM SEWERS

5001 SCOPE

This section covers all labor, materials and equipment required for the complete installation of storm sewers and appurtenances. The work shall consist of storm sewer construction in accordance with these specifications and in conformity with the lines and grades shown on the approved plans. The term "Storm Sewer" shall refer to pipes, box culverts, vegetated or rock lined channels, junction boxes and inlets.

Reinforced Concrete Pipe (RCP) shall be used within the Right-of-Way (ROW). The RCP shall extend to the inlet structures located on both sides of the street crossing.

High Density Polyethylene (HDPE) pipe shall be allowed only outside the Right-of-Way. Corrugated Metal Pipe (CMP) shall not be permitted for any public storm sewer improvements.

5002 MATERIALS

Reinforced Concrete Pipe (RCP)

Reinforced concrete pipe (RCP) shall conform to the following minimum requirements:

- Round Pipe: ASTM C 76, Class III, Wall B, with Single Off-Set Joint conforming to ASTM C 443. Type R4-Confined Groove Joint conforming to ASTM C 443 shall be used where required by the City Engineer.
- Elliptical Pipe: ASTM C 507, Class HE-III
- Arch Culvert Pipe: ASTM C 506, Class A-III

The Contractor may be required to supply pipe exceeding these minimum requirements as stipulated in the approved plans.

Flexible gaskets conforming to ASTM C 1619 shall be required for all round pipe.

Mastic joints shall be required on all pipe that is not round. The mastic joint compound shall be a homogeneous blend of bituminous material, inert filler, and suitable solvents or plasticizing compounds thoroughly mixed at the factory to a uniform consistency suitable for sealing joints of concrete pipe. The compound shall conform to the following:

Bitumen, soluble in CS_2, percent by weight, minimum……45%
Ash, percent by weight……15-50%
Penetration, standard cone, 150g, 5 seconds,
25° C trowel grade, bulk type……..110-250mm

High Density Polyethylene Pipe (HDPE)

High density polyethylene (HDPE) corrugated pipe with an integrally-formed smooth interior wall shall conform to the requirements of AASHTO Designation M-294, Type S. Pipe. HDPE fittings shall be made of polyethylene compounds which meet or exceed the requirements of ASTM D 3350.

Polypropylene Pipe (PP)

Polypropylene pipe (PP) corrugated pipe with an integrally-formed smooth interior wall shall conform to the requirements of ASTM F2736 for pipe diameters between fifteen (15) inches and thirty (30) inches. PP pipes with diameters greater than thirty (30) inches shall conform to ASTM F2764. Fittings and connections shall conform to ASTM D3212 and gaskets shall conform to ASTM F477.

5003 INSTALLATION

This specification applies to the installation methods of both RCP and HDPE pipe.

Handling and Protection

All pipe shall be protected during installation against shock and free fall, and shall be installed without damage due to improper handling. Damaged pipe shall be removed from the site and replaced with new pipe at the Contractor's expense.

Grade Control

The alignment and elevation of the pipe shall conform to the requirements of the approved plans. The Contractor shall be responsible to remove and replace, at his cost, any pipe that does not meet the approval of the City Engineer.

Laying

The laying of pipe in graded trenches shall commence at the lowest point, with the bell end orientated upgrade. All pipe shall be laid with ends abutting in accordance with the line and grade indicated on the approved plans.

Pipes shall not be trimmed unless approved by the City Engineer. Pipes having defects may be utilized in areas where trimming is required, upon approval by the City Engineer.

Bedding

The pipe embedment shall conform to the requirements of Section 4000 and applicable Standard Details.

Jointing

Prior to making pipe joints, all surfaces shall be clean and dry. Lubricants, primers, adhesives and other substances shall be compatible with the jointing material recommended or specified.

All bell and spigot ends of RCP shall be primed prior to the application of the bitumastic material, if mastic joints are specified. A sufficient amount of bitumastic joint sealant shall be

used to completely fill the annular space with some excess. The outside surface of the joint shall be wiped with additional bitumastic sealer to ensure a complete seal.

Flexible gaskets shall be placed around the spigot and rolled into place as the joint is assembled. O-ring gaskets shall be recessed in the groove on the spigot and confined by the bell after the joint is assembled. Lubrication shall be applied as recommended by the manufacturer.

Joint Openings

Round pipe shall have rubber gasketed joints in accordance with ASTM C 1628-19, C 443-21. In laying pipe, the maximum joint opening shall not exceed the manufacturer recommendations, or the following table, whichever is less.

Pipe Size Maximum Joint Opening
12"-24" 1/4"
30"-54" 1/2"
60”-72” 3/4"
78” and larger 1/8”/ft of equivalent

The above maximum openings are for the purpose of compensating for minor irregularities in the manufacture of the pipe joints. The pipe is to be laid to line and grade so that the sections are pushed completely home at least one point around the circumference of the joint, without spalling the concrete. Permissible openings may exist at other points around the circumference of the pipe.

In laying pipe, the maximum rubber gasket joint pull and deflection shall not exceed the manufacturer recommendations.

Backfilling

Pipe backfilling shall conform to the requirements of Section 4000.

Post Installation/Construction Video

Once installation and backfill of the proposed storm sewer has been completed and all grading over and around the storm sewer is completed, the Contractor shall be responsible for closed circuit television (CCTV) at the Contractor’s expense for each run of storm sewer pipe, less than 60 inches in diameter, to verify that the segment of pipe is in sound, stable condition and that no failures have occurred during construction. The storm sewer system as well as it’s upstream and downstream structures shall be carefully inspected to determine alignment, grade variations, separated joints, location and extent of any deterioration, breaks, obstacles, obstructions and debris, structure connections, inlet frames and structure walls and floors. Obstructions and debris (including sediment) shall be removed prior to CCTV inspection at the contractor’s expense. Inspection of the storm line segments shall be performed using a color, pan and tilt viewing camera specifically designed and constructed for the method of inspection performed. The complete video system (camera, lens, lighting, cables, monitors,

and recorders) shall be capable of producing a picture quality acceptable to the Engineer. The development and delivery of this video shall be considered subsidiary to other bid items.

The project internal video shall be performed by a qualified commercial or individual company who is familiar with closed circuit television (CCTV) inspection equipment and is Pipeline Assessment Certification Program (PACP) certified by the National Association of Sewer Service Companies (NASSCO). The inspection shall conform to PACP standards and the standards in this document. When PACP and this document conflict, this standard in this document shall be used. The Contractor shall provide deliverable with external hard drive that contains electronic media recordings, including all inspections associated with the project.

5004 INLETS AND JUNCTION BOXES

Reinforced concrete storm sewer structures shall conform to the Standard Details. Concrete used in the structures shall have a minimum 28-day compressive strength of 4,000 psi and shall meet the requirements of Section 2000. Concrete cover over steel reinforcement shall be not less than 1-1/2 inches for tops, walls and floors. The concrete shall be vibrated in a manner that prevents segregation. Small surface voids shall be grouted as directed by the City Engineer.

Inlet tops shall be cast-in-place construction. The elevation of curb inlet tops shall be established by the Contractor's surveyor placing fill marks on the installed storm sewer inlet box when the Contractor elects to pour the curb inlet tops prior to curb and gutter placement. Fill marks will not be required if curb inlet tops are poured after the curb and gutter has been completed. The concrete mix used for curb inlet tops shall conform to the requirements of Section 2000. The inlet tops shall be broom finished and picture-framed. The inlet tops shall be doweled to the walls of the structure. Where sidewalks abut an inlet, tie bars shall be installed as shown on the applicable Standard Details. Variations may be made only with the approval of the City Engineer. Contractor shall install "No Dumping, Drains to Stream" markers per City requirements. The City will provide the markers and the Contractor will supply approved adhesive for installation. Wire brushing and cleaning of the concrete surface will be required prior to application of the adhesive.

The floors of all inlets and junction boxes shall have inverts. Inverts shall be constructed of concrete conforming to the requirements of Section 2000. Inverts shall be shaped to match the lower half of the connecting pipe and smoothly direct water flow to the outlet pipe. The invert shall be troweled to a smooth finish.

Underdrain shall be installed at all sump inlets. Underdrain shall extend 10' beyond both sides of the inlet in accordance with City of Olathe Standard Detail 50-10.

The methods of excavation and backfilling for inlets and junction boxes shall conform to the requirements of Section 4000 and the Standard Details.

All inlets, pipes, and junction boxes shall be free of any accumulation of silt, debris or foreign matter of any kind at the time of final inspection.

5005 REINFORCED CONCRETE BOX CULVERTS

Construction and backfilling of reinforced concrete box culverts shall be done in conformance with the *KDOT Standard Specifications for State Road and Bridge Construction* unless otherwise specified or approved by the City Engineer.

Shop drawings for all precast box culverts shall be approved by the Design Engineer and provided to the City Engineer.

5006 HEADWALLS, WINGWALLS, AND ENDWALLS

Construction and backfilling of headwalls, wingwalls, and endwalls shall be done in conformance with the *KDOT Standard Specifications for State Road and Bridge Construction,* unless otherwise specified or approved by the City Engineer.

5007 END SECTIONS

End sections shall be installed according to all applicable Specifications, Standard Details and the approved plans. Precast concrete end sections may be used in place of cast-in-place concrete structures with the City Engineer's approval. RCP end sections shall be used for HDPE outfalls, unless otherwise approved by the City Engineer.

5008 RIPRAP

Material used for riprap shall conform to Section 1100 of the *KDOT Standard Specifications for State Road and Bridge Construction*, unless otherwise specified or approved by the City Engineer. The Design Engineer shall provide riprap calculations verifying riprap sizing.

Riprap shall consist of durable field or quarry stones, and shall be free from earth, soapstone, shale, shale-like or other easily disintegrated material that will decrease the durability of the material.

Riprap shall be placed at the locations and to the dimensions shown on the approved plans in accordance with the specified requirements.

Riprap shall be graded as necessary to form a dense blanket. The finished surface shall be even and conform to the lines, grades and sections on the approved plans. Riprap shall be placed to a minimum depth of twice the maximum stone diameter with a minimum depth of eighteen inches (18").

Voids created by larger pieces of riprap shall be filled with smaller pieces of stone. No voids shall extend directly through the riprap to the subsurface. The riprap shall be placed in rows perpendicular to the center line of the ditch.

When grouted stone riprap is indicated, the voids between stones shall be filled with grout consisting of one (1) part Portland cement and three (3) parts fine aggregate with sufficient

water to form a plastic mix. The grout shall be poured and broomed into the spaces until they are completely filled.

5009 RESTORATION OF SURFACE CONSTRUCTION

The restoration of concrete and asphalt pavement, gravel surfacing, walks, drives, curbs, and other surface construction removed or damaged during the progress of the work covered by this section shall conform to the applicable provisions of Section 7000 of these specifications.

SECTION 6000 - WATER LINES

6001 SCOPE

This section covers all labor and materials for the construction of water lines including all thrust blocks, plugs, valves, pipe encasement, valve boxes, hydrants, connections to existing mains and other appurtenant work.

The City is not responsible for locating constructed waterline improvements until the Project Completion Certificate (PCC) has been approved by the City Council. The Contractor is responsible for locating and protecting the waterline and appurtenances from damage until the project is accepted by the City Engineer.

All products to be used in contact with potable water shall be NSF 61 certified.

All products shall be NSF 372 certified to comply with the Reduction of Lead in Drinking Water Act, effective 2014.

6002 PIPE AND FITTINGS

The manufacturer of any material or equipment shall provide certification, in duplicate, to the City Engineer, indicating that their product meets these Standard Specifications and applicable AWWA standards. The certification shall be shipped with the product and be available to the City Engineer prior to installation.

Ductile Iron Pipe and Fittings

Unless otherwise shown on the drawings, ductile iron pipe shall be push-on type. Design of the joint shall permit deflection of up to five (5) degrees per joint after assembly. Gaskets shall be neoprene or other synthetic rubber. Natural rubber will not be acceptable. All pipe and joints shall be installed according to the manufacturer's recommendations. Use of flex couplings is not allowed.

The ductile iron pipe shall conform to American Water Works Association (AWWA) C151. The minimum pressure class for ductile iron pipe shall conform to Table 6002-1, unless otherwise approved by the City Engineer. Fittings shall be cast from ductile iron in accordance with AWWA C110 or C153, 250 psi pressure rating.

Table 6002-1 *- Minimum Pressure Classification for Ductile Iron Pipe*

Pipe Diameter (inch)	Minimum Pressure Class (psi)
3 thru 12	350
14 thru 20	250
24	200
30 thru 64	150

Restrained joint pipe shall be push-on type and shall be used where shown on the approved plans and shall be installed in accordance with the recommendations of the pipe manufacturer. Each restrained joint shall be capable of resisting the thrust of the pressures to be applied.

Restrained joint fittings shall be either push-on type or mechanical joint and shall be used where shown on the approved plans and shall be installed in accordance with the recommendations of the pipe manufacturer. Each restrained joint shall be capable of resisting the thrust of the pressures to be applied.

The inside of all ductile iron pipes shall be double lined with cement mortar, per AWWA C104. The cement mortar shall conform to ASTM C150, ASTM C595 Type IS or IL. All ductile iron pipe shall be furnished with an exterior bituminous coating in conformance with AWWA C151.

All ductile iron water mains and fittings shall be encased in (1) layer of 8-mil polyethylene film and tape and shall conform to AWWA C105 with all ends sealed and visually inspected.

Polyethylene tubular or sheet encasement shall be free of tears, breaks and defects. The film shall be linear low-density and shall be manufactured from virgin polyethylene material conforming to AWWA C105.

Polyethylene tape shall be 1-1/2-inch wide, plastic-backed adhesive tape. Duct tape or other tape not specified on the Approved Materials List shall not be used, unless otherwise approved by the City Engineer. Installation shall be as described in AWWA C105.

Any cuts, tears, punctures or damage to the polyethylene encasement shall be repaired using adhesive tape or a short length of polyethylene sheet wrapped around the pipe to cover damaged area and secured in place.

Backfill material shall be free from cinders, refuse, boulders, rocks, stones or other material that could damage the film, and placed in accordance with the Standard Details.

High Density Polyethylene (HDPE) Pipe

HDPE pipe shall be Ductile Iron Pipe Size (DIPS) with a minimum wall thickness of Dimension Ratio (DR) of 11. The HDPE pipe shall be manufactured from PE 4710 resin, comply with AWWA C906, and have a cell classification of 445574C in accordance with ASTM D3350.

Each length of pipe shall be clearly marked at intervals of 5 ft. or less with the manufacturer's name and trademark; nominal size of pipe and dimension ratio; standard material code designation; product standard and pressure rating; and NSF approval. Each length of pipe

shall be coded with a stripe along the entire outside length of the pipe, 120 degrees apart, by co-extrusion or impregnation. The color of the stripes shall be blue to signify potable water.

HDPE fittings shall be manufactured of molded HDPE meeting the requirements of AWWA C906. Mitered or field fabricated fittings will not be allowed. The DR and cell classification of the fittings shall be the same as the piping.

Pipe and fitting joints shall be thermal butt fusion welded above-ground in accordance with ASTM D3261 and the recommendations of the pipe manufacturer. The fusion machine operator shall be certified in electro and butt fusion welding and use of the fusion machine. Interior weld beads shall be carefully removed after fusion welding each pipe joint.

Pipe shall be installed in accordance with ASTM D2774 and as recommended by the manufacturer. Connections to ductile iron pipe or fittings, or other pipe materials, shall be made with suitable fittings.

6003 TRACER WIRE AND MARKING TAPE

Underground tracer wire, electronic locate markers and marking tape shall be installed to enable detection of all HDPE water mains.

Tracer wire used in open cut applications shall be 12 AWG copper clad steel with a 30 mil HDPE jacket and a minimum break load of 450 lbs. Tracer wire used in horizontal directional drilling applications shall be 12 AWG copper clad steel with a 45-mil blue HDPE jacket and a minimum break load of 1,150 lbs. Tracer wire for pipe bursting applications shall be 3/16" stainless steel with a 45 mil HDPE jacket and a minimum break load of 3,700 lbs.

The tracer wire system must be installed as a continuous single wire. Looping of the tracer wire is not allowed. All mainline tracer wires must be interconnected where tees and crosses are installed. Approved connectors shall be used at these locations and where any other splicing is allowed. Splicing is not allowed on the main line for directional drilling and pipe bursting applications.

The tracer wire shall be attached to the side of the watermain at approximately the 3 o'clock position with tape or tie-wraps.

The tracer wire shall be accessible at valve boxes and water meter pits for service connections. Enough tracer wire is required in each valve box or meter pit to extend the wire a minimum of two feet above finished grade.

City staff will perform a post-construction locate to verify the tracer wire is working as intended. This will be done prior to the issuance of the Project Completion Certificate.

In addition, electronic locate markers shall be attached to water service lines at the connection to the main at every water service connection and attached to water mains at all tees and bends. Locate balls shall be blue with a minimum frequency of 145.7 KHZ. Electronic locate markers shall be surveyed with GPS locations and documented in the project as-builts so that they may be included in the City's GIS records.

Underground marking tape shall be installed 2 feet above the water main along the length of the water main. The marking tape shall be minimum 3.5 mil polyethylene, a minimum of 3 inches in width, blue, and shall have black lettering stating, "Caution Buried Waterline Below." Lettering shall be printed on the tape at 20 to 30-inch intervals.

6004 RESILIENT SEATED GATE VALVES (3 thru 12 inches)

The type, size and location of valves shall be indicated on the approved plans. For working pressures from zero to 200 psi, valves shall be resilient seated, non-rising stem and conform to the requirements of AWWA C509.

The gate valves shall be fully encapsulated with resilient wedge disc, unobstructed waterway, counter-clockwise opening and designed for a working pressure of 200 psi. Valves shall be ductile iron conforming to ASTM A395 or A536. Bronze for internal working parts, including stems, shall not contain more than 2% aluminum nor more than 7% zinc, in accordance with ASTM B763 Alloy C99500, except that stem bronze shall have a minimum tensile strength of 60,000 psi, a minimum yield strength of 30,000 psi, and a minimum of 12% elongation in 2-inches. O-ring seals and Type 304 or 316 stainless steel body bolts conforming to ASTM F593 shall be provided by the Contractor. A 2-inch AWWA operating nut for buried installations and a hand wheel for aboveground or in vault installations shall be provided.

Interior and exterior surfaces of gate valves shall have a factory applied, minim average dry film thickness of 8 mil, fusion-bonded epoxy coating in conformance with AWWA C504.

Valve ends shall be push-on type conforming to AWWA C111 except where flanged ends are required in exposed or above-ground applications. The end flanges of flanged gate valves shall be compatible with the connecting piping as required by AWWA C110.

All valves shall be provided with manual operators equipped with a wrench nut conforming to the requirements of AWWA C509.

The direction of rotation of the wrench nut to open the valve shall be to the left (counterclockwise). Each valve body or operator shall have cast thereon the word "*Open*" and an arrow indicating the direction to open.

All exposed bolts and nuts below grade that connect the pipe to the valve, shall be 316 stainless steel, with a hexagonal head, ANSI B18.2.2, heavy semi-finished pattern. All fasteners shall be coated with a medium consistency coal tar.

6005 BUTTERFLY VALVES (16 inches or Larger)

Butterfly valves shall be of the rubber-seat, tight-closing type and shall be tested and certified with the valve actuator installed on the valve in accordance with AWWA C504.

All butterfly valves and operators shall be protectively coated and conform to AWWA C504. All interior ferrous surfaces, including contiguous flange faces, shall be protectively coated. Interior and exterior surfaces shall have an epoxy coating confirming to AWWA C550 to a minimum dry-film thickness of 8 mil and shall be "holiday" free.

All exposed bolts and nuts below grade that connect the pipe to the valve, shall be 316 stainless steel, with a hexagonal head, ANSI B18.2.2, heavy semi-finished pattern. All fasteners shall be coated with a medium consistency coal tar.

6006 TAPPING SLEEVES AND VALVES

Tapping sleeves shall be of Type 304 stainless steel construction with two half sleeves and flanged outlet. Sleeve halves shall be bolted together with 304 stainless steel bolts and nuts. Tapping valves shall have 304 stainless steel nuts and bolts. Gaskets shall completely surround the pipe to be tapped and be the same length as the sleeves. Gaskets shall be Styrene Butadiene Rubber (SBR) conforming to ASTM D2000. Flanged outlet shall be flat faced conforming to ANSI B16.5, Class 250. Tapping machines and cutting tools which have been specifically designed for the type of pipe to be tapped shall be used for all pipe connections.

Water service connection and inspection details are located in technical specification section 6200.

6007 VALVE COATINGS

All ferrous metal surfaces of valves and accessories, both interior and exterior, shall be shop-painted with fusion-bonded epoxy coating that meets or exceeds all applicable requirements of AWWA C550 Standard and is certified by ANSI/NSF 61.

Lining and coating shall be 100% solids, thermosetting, fusion-bonded, dry powder epoxy resin in accordance with the Approved Materials List. Epoxy lining and coating shall meet or exceed the requirements outlined in Table 6007-1.

Table 6007-1 *- Epoxy Lining and Coating Requirements*

Item	Requirement
Hardness (minimum)	Barcol 17 (ASTM D2583) Rockwell 50 ("M" Scale)
Abrasion Resistance (minimum)	1,000 cycles: 0.05 gram removed 5,000 cycles: 0.115 gram removed ASTM D1044, Tabor CS 17 wheel, 1,000 gram weight
Adhesion (minimum)	3,000 psi (Elcometer)
Tensile Strength	7,300 psi (ASTM D2370)
Penetration	0 mil (ASTM G17)
Adhesion Overlap Shear, 1/8-inch steel plate, 0.010 glue line	4,300 psi (ASTM D1002)
Impact (minimum)	100 inch-pounds (Gardner 5/8-inch diameter tap)

6008 AIR RELEASE AND VACUUM RELIEF VALVES

Combination air release and vacuum relief valve assemblies shall be installed in the locations indicated on the drawings. Each valve assembly shall be installed complete with appurtenant piping and valves as specified or shown, but the assembly will normally be operated in the manual mode.

Combination air release and vacuum relief valves shall be of the integral type with a valve assembly which functions as both a vacuum relief valve and an air release valve. Relief valves shall be sized for each situation but shall be a minimum two (2) inch inlet connection.

The valves shall be designed for a water working pressure of 250 psi and all working parts shall be brass or stainless steel.

Shutoff valves shall be provided in the piping to each combination air release and vacuum relief valve assembly. Shutoff valves shall be solid wedge gate valves. The end of the two (2) inch vent shall be provided with 24-mesh, non-corrodible screen. A precast concrete vault shall be positioned at an air release location conforming to the Standard Details.

6009 VALVE BOX ASSEMBLY

All buried valves shall be installed in 2-piece adjustable screw type valve boxes. Valve boxes shall be suitable for the depth of cover required by the drawings. Valve boxes shall be made of gray cast iron, ASTM A48, Class 35, conform to the Standard Details, minimum of five (5) inches in diameter and shall have a minimum thickness of 3/16-inch at any point. Covers shall have cast thereon the word "*Water*."

Valves and valve boxes shall be set plumb. Each valve box shall be placed directly over the valve it serves, with the top of the box brought flush with the finished grade. After being placed in the proper position, gravel backfill shall be filled in around each valve box and thoroughly tamped on each side of the box up to within twelve (12) inches of finished grade.

Each valve box shall be marked with a fiberglass marking stake, furnished and installed by the Contractor, identifying it as a City of Olathe water valve. Identification markers are available for sale through the City of Olathe, Public Works Department.

6010 FIRE HYDRANTS

Fire hydrants shall be ductile iron cast and shall be furnished with a six (6) inch auxiliary gate valve. The fire hydrants shall be pressure rated for a minimum 150 psi working pressure and 300 psi test pressure. Hydrants shall be traffic models with breakaway flange or coupling. Fire hydrants shall conform to AWWA C502. Table 6010-1 summarizes the fire hydrant requirements.

Table 6010-1 *- Fire Hydrant Requirements*

Item	Requirement
Type of Shutoff	Compression
Size of Hydrant	5.25 inches
Inlet Connection	6 inches
Outlet Nozzles	2-2.5 inch hose and 1-4.5 inch pumper
Outlet Nozzle Threads	ANSI B26
Direction to Open	Counterclockwise
Stem Seals	O-ring
Drain Outlet	Required
Paint System	Hydrant elbow, nozzle section, bonnet, weather shield, break flanges and nozzle caps shall be powder coated for corrosion protection. Coating shall be free of VOCs and shall be applied by the Manufacturer.
Weather Cap on Operating Nut	Required

Hydrants shall be restrained joint and furnished with all joint gaskets required for installation. Hydrants shall be set so that at least the minimum pipe cover is provided for the branch supply line. Each hydrant shall be set on a concrete foundation at least twelve (12) inches square, six (6) inches thick and shall be suitably anchored. Hydrants shall be installed using a maximum of one (1) vertical pipe extension. Extensions greater than eight (8) feet below finished grade shall require upsizing the extension one (1) nominal pipe diameter.

Hydrant drainage shall be provided by installing at least ½-cubic yard of ¾-inch rock around the hydrant and below the top of the hydrant supply pipe.

Fire hydrant installations shall conform to the Standard Details. All hydrants shall stand plumb. The pumper-nozzle shall be aligned perpendicular to the major thoroughfare.

The hydrant barrel and shoe shall be secured using 316 stainless steel nuts and bolts. All exposed nuts and bolts below the ground level shall be 316 stainless steel and wrapped with polyethylene material, hexagonal, ASME B18.2.1, heavy semi-finished pattern. All fasteners shall be coated with a medium consistency coal tar.

Immediately before installation of a hydrant, the following operations shall be performed:

- The hydrant shall be thoroughly inspected.
- The hydrant interior shall be thoroughly cleaned.
- The hydrant shall be opened and closed as many times as may be necessary to determine if all parts are in proper working order, with valves seating properly and the drain valve operating freely.
- The packing gland shall be checked to determine if the packing is in place and the gland nut is properly tightened.

6011 CORPORATION STOPS AND SADDLES

One-inch corporation stops utilized for venting of waterlines during filling or disinfection and sampling shall be furnished by the Contractor for tapping by the City. The number and location of the corporation stops shall be as determined by the Contractor. Disinfection and sampling shall confirm to AWWA C651 standards. After disinfection and testing of the waterlines, the corporation stops shall be removed, and a suitable plug installed in each opening. Removal of corporation stops and installation of plug should be inspected by the City Engineer.

Saddles shall not be allowed for taps smaller than 1½-inch. Saddles shall be certified to meet AWWA C800 Standards. Straps shall be Type 316 stainless steel, with fully entrapped gaskets. The service saddles shall have a ductile iron body per ASTM A536. Anti-Seize shall be applied to the threads of the type 316 stainless steel nuts and bolts prior to installation.

6012 FLUSHING ASSEMBLIES

Only as approved by the City Engineer.

6013 FLANGED DUCTILE IRON PIPE

Flanged ductile iron pipe and fittings shall not be used in a buried application and shall only be used where approved by the City Engineer. Flanges on ductile iron fittings shall conform to AWWA C110 or ASME B16.42 Class 150 with a minimum rated working pressure of 250 psi. Bolts shall be 316 stainless steel, chamfered or rounded ends projecting 1/4- to 1/2-inch beyond the outer face of the nut which shall be ASTM A307, hexagonal, heavy semi-finished

pattern. Gaskets shall conform to ASTM D1330, Grade I, red rubber, ring type, 1/8-inch thick. Threaded flanges shall be solid back, flat faced, Class 125 per AWWA C115.

The pipe end and flange face shall be machine-finished in a single operation. Flange faces shall be flat and perpendicular to the pipe centerline and shall not be field fabricated.

Care shall be taken to prevent any excessive bending or flexing of the gasket. Creased or damaged gaskets shall be rejected and removed from the job site. The manufacturer's recommended bolt-tightening sequence shall be followed. Bolt insulating sleeves shall be centered within the insulation washers so that the insulating sleeve is not compressed and damaged. One flange shall be free to move in any direction while the flange bolts are being tightened. Bell and spigot joints shall not be packed or assembled until all flanged joints affected thereby have been tightened.

6014 HANDLING

Pipe, fittings, and accessories shall be handled in a manner that will ensure installation in a sound, undamaged condition. Equipment, tools and methods used in unloading, reloading, hauling, and laying pipe and fittings shall be such that the pipe, pipe coating and fittings are not damaged. Hooks inserted in ends of pipe shall have broad, well-padded contact surfaces. Under no circumstances shall pipe or accessories be dropped or dumped into the trench.
Pipe and fittings in which the cement lining has been broken or loosened shall be replaced at the expense of the Contractor. Where the damaged areas are small and readily accessible, the Contractor may be permitted to repair the lining. The City Engineer shall make the final decision regarding the integrity of the cement lining.

Damaged pipe coatings will be cause for rejection. All rejected pipes shall be replaced, with new pipe, at the Contractor’s expense.

6015 CUTTING PIPE

Cutting shall be done in a neat manner, without damage to the pipe or to the cement lining. Cuts shall be smooth, straight, and at right angles to the pipe axis. After cutting, the end of the pipe shall be dressed with a file to remove all roughness and sharp corners.

6016 CLEANING

The interior of all pipe and fittings shall be thoroughly cleaned of foreign material prior to installation and shall be kept clean until the work has been accepted. Before jointing, all joint contact surfaces shall be wire brushed if necessary, wiped clean and kept clean until jointing is completed.

6017 INSPECTION

Pipe and fittings shall be carefully examined for cracks and other defects immediately before installation. Spigot ends shall be examined with particular care since they are vulnerable to damage from handling. All defective pipe and fittings shall be removed from the site.

6018 ALIGNMENT

Deflections from a straight line or grade shall not exceed the tolerances stipulated in AWWA C600.

Either shorter pipe sections or fittings shall be installed where required by the alignment or grade.

6019 DEAD END LINES

Fire Hydrants shall be installed at the end of all water mains which will have a future six (6) inch and larger water main extension, and at all other dead end lines in accordance with the Standard Details.

6020 CONNECTIONS TO EXISTING WATER MAINS

Connections to existing water mains shall not be allowed for new water main extension projects until all testing and disinfection requirements have been met and the connection has been approved by the City Engineer.

Contractor shall furnish and install the fittings necessary for connections between new water mains and existing water mains. The fittings shall be as indicated on the approved plans, unless otherwise authorized by the City Engineer. When the fittings consist of tapping sleeves and valves, the Contractor shall perform the actual tapping operation of the mains. The City Engineer shall provide the inspection of the Contractor's tapping procedure on all projects.

No connections to existing mains shall be started without prior approval of the City Engineer, and each connection with an existing main shall be made at a time and under conditions which will least interfere with service to customers.

When water supply is to be shut-off, the Contractor shall adhere to City of Olathe Waterline Shut-Down and Notice procedure, which is available at olatheks.org. Contractor must follow procedure to meet specification requirements. City personnel will not perform or allow shut down unless procedure is followed.

6021 SEWER LINE CROSSINGS

See Section 6 the City of Olathe *Design Criteria for Public Improvement Projects* (DC6) and applicable Standard Details.

6022 RESTORATION OF SURFACE CONSTRUCTION

See Section 7000 of these specifications.

6023 BORING WITHOUT CASING PIPE

Borings for water main construction without a casing pipe shall only be permitted with the approval of the City Engineer.

6024 INTENTIONALLY LEFT BLANK

6025 BORING WITH CASING PIPE

Casing pipe shall have a minimum diameter as shown on the Standard Details. The casing shall conform to the requirements of Section 4019.

6026 PRIVATE FIRE LINES

Private fire lines shall conform to the City of Olathe *Design Criteria and Specifications for Public Improvement Projects*. All piping located between the point of connection and the building shall be ductile iron pipe.

A Double Check Detector Assembly (DCDA) shall be required and shall conform to AWWA C510, with a minimum rated working pressure of 175 psi. Two (2) independently acting, spring loaded check valves; two resilient seated gate valves with outside stem and yoke; and four, fully ported, bronze ball valve test cocks. The main check valves shall be constructed for servicing without removing the assembly from the line. The main line valve bodies and covers shall be constructed of ductile iron conforming to ASTM A536 Grade 65-45-12 with bronze trim conforming to ASTM B584 Alloy C83600.

If the fire line connection to the public main is located with 100 feet of the building, measured along the fire line, the DCDA may be located inside the building, otherwise the DCDA shall be installed within a vault as shown in the Standard Details.

SECTION 6100 – TESTING and DISINFECTION

6101 GENERAL

This section covers hydrostatic pressure testing, leakage testing, disinfection and flushing of all new mains and appurtenances. All waterlines installed shall be tested as specified herein.

All testing work shall be done in the presence of the City Engineer. The Contractor shall notify the City at least two (2) working days prior to testing.

Temporary discharge piping shall be provided for discharge of test water at a suitable location. Discharge of test water into sanitary sewers shall not be permitted.

6102 TESTING EQUIPMENT AND FACILITIES

The Contractor shall provide all necessary equipment, materials and facilities required for testing.

The Contractor shall provide a backflow device approved by the City Engineer for flushing activities.

Test pressures shall be applied by means of a force pump capable of maintaining the required pressure for the duration of each test.

The pressure gauge used shall be calibrated and acceptable to the City Engineer.

All defective pipe, fittings, valves, pipe joints and other materials shall be removed and replaced with approved material at the expense of the Contractor.

6103 PRESSURE AND LEAKAGE TESTING OF DUCTILE IRON WATER MAINS

Pressure and leak testing shall meet the requirements set forth in the latest edition of KDHE'S *Policies, General Considerations and Design Requirements for Public Water Supply Systems in Kansas*.

The hydrostatic pressure during testing shall be 150 PSI and in no case, shall the test pressure exceed the pressure rating for the pipe, valves and appurtenances. Test pressure shall be maintained for a minimum of 2 hours.

Leakage measurements shall not be started until test pressures have sufficiently stabilized. The Contractor shall furnish and install a water meter for testing on the pressure supply piping of the force pump.

Allowable loss for the minimum 2-hour test shall be computed as follows:

For DIP:

$$L = \frac{SD(P^{0.5})}{148{,}000}$$

L = Allowable leakage, in gallons per hour
S = Length of pipe tested, in feet
D = Nominal diameter of the pipe, in inches
P = Average test pressure during the leakage test, in pounds per square Inch (gauge) (PSIG)

Line leakage shall be the total amount of water introduced into the line as measured by the meter during the leakage test.

The test pressure shall be restored whenever it drops 5 psi. A calibrated recorder shall be used during the test and the results of the test shall be provided to the City Engineer. The amount of water needed to re-pressurize the line shall be measured each time re-pumping is required.

In the event that the system contains pipe of more than one size, the allowable leakage shall be calculated separately for each segment of pipe and then summed to obtain the total allowable leakage from the entire system.

6104 PRESSURE AND LEAKAGE TESTING OF HDPE WATER MAINS

Pressure and leak testing of HDPE water mains shall be in accordance with ASTM F2164 and the manufacturer's recommendations. The Contractor shall furnish a calibrated water meter for the purpose of measuring the water introduced into the line where required.

The hydrostatic pressure during testing shall generally be 150 PSI and in no case shall the test pressure exceed the pressure rating for the pipe, valves and appurtenances. If the temperature of test section is greater than 80 degrees Fahrenheit, the test pressure shall be multiplied by the factors shown in Table 6104-1.

Table 6104-1 – Elevated Temperature Multiplier

Test Section Temperature (◦F)	Test Pressure Factor
≤ 80	1.00
≤ 90	0.90
≤ 100	0.80
≤ 110	0.75
≤ 120	0.65
≤ 130	0.60
≤ 140	0.50

The maximum test duration, including time to pressurize, time for initial expansion, time at test pressure, and time to depressurize shall be less than 8 hours.

6105 DEFECTS

All joints in piping shall be watertight and free from visible leaks during the prescribed leakage test and throughout the duration of the two (2) year maintenance period.

Leaks in mechanical joints shall be repaired by dismantling, cleaning, realigning gland and gasket and re-bolting. The gland bolts shall not be tightened beyond the allowable torque limits.

Wrap-around bands shall not be used for repairs.

6106 DISINFECTION

Materials, methods and procedures for disinfection work shall conform to the requirements of the latest revision of AWWA C651, *Standard for Disinfecting Water Mains,* except as modified herein.

General

Water in reasonable amounts for proper completion of flushing or disinfection work shall be furnished at existing fire hydrants at the Contractor's expense. The Contractor shall furnish all necessary labor, pipe, hose, nozzles and tools. The Contractor shall schedule testing at least two (2) working days prior to testing. The City Engineer shall determine the flowrate and duration of each withdrawal from the distribution system.

All hydrants and valves involved in the disinfection operation shall be bagged by the Contractor as "Out of Service".

When required by the City Engineer, the Contractor shall submit a detailed outline of the proposed procedure, including a sequence of operations, the method of filling and flushing disinfected lines and the means for disposing of wasted water.

Disinfection

The pipelines shall be disinfected by the continuous feed method. The chlorine feed shall be proportional to the rate of flow into the pipe so that the entering water contains at least 25 mg/L of chlorine. The chlorine solution shall be retained in the pipeline for at least twenty-four (24) hours and the free chlorine residual at the end of the period shall equal to or greater than 10 mg/L.

Prior to flushing the line, a test shall be conducted to verify the chlorine residual. Such test shall be performed by the City Engineer using the DPD (N, N Diethyl-1, 4 Phenlenediamine) method in accordance with EPA approved methodology (Standard Method 4500-Chlorine-G). The Contractor shall dispose of chlorine and flushing water in a proper manner at no cost to the City. The Contractor shall prevent the chlorine solution from entering the supply system during the disinfection process. The Contractor shall ensure a flushing outlet is open at all times during the pumping process to prevent pressure from building in the line being disinfected.

Prior to flushing the pipe of chlorinated water, the discharge environment shall be inspected. Sodium bisulfite or an approved equal neutralizing chemical shall be applied to the chlorinated discharge to assure thorough neutralization of the chlorine residual in environmentally sensitive discharge locations in accordance with the latest revision of AWWA C655. The chlorinated water shall be neutralized and the free chlorine shall be non-detectable unless the City Engineer deems dechlorination is not necessary.

During disinfection, all valves and hydrants shall be operated to ensure that all appurtenances are disinfected. During final flushing operations, valves shall be manipulated in such a manner that the chlorine solution will not flow back into the supply line.

Following the successful disinfection process, the disinfection corporation shall be removed and replaced with a brass plug. Saddles shall not be allowed.

Flushing

All flushing work shall be done in the presence of the City Engineer. All flushing and sampling must be completed utilizing a combination blowoff and sampling tap in accordance with Standard Details. The Contractor shall notify the City Engineer at least twenty-four (24) hours in advance of the flushing operation.

Flushing of waterline and appurtenances, after the disinfection process, shall be performed with a minimum velocity of at least three (3) feet per second. All flushing shall be performed after the hydrostatic test is completed and accepted.

Below is Flushing Table 3 from AWWA C651 for Continuous-Feed Method of Chlorination.

Table 3 Required flow and openings (either taps or hydrants) to flush pipelines at 3.0 ft/sec (0.91 m/sec) (40 psi [276 kPa] residual pressure in water main)*

Pipe Diameter		Flow Required to Produce 3.0 ft/sec (approx.) Velocity in Main		Size of Tap Used, *in. (mm)*			Number of Hydrant Outlets	
				1 (25)	1½ (38)	2 (51)		
in.	*(mm)*	*gpm*	*(L/sec)*	Number of Taps Required on Pipe†			2½-in. (64-mm)	4½-in. (114 mm)
4	(100)	120	(7.4)	1	—	—	1	1
6	(150)	260	(16.7)	—	1	—	1	1
8	(200)	470	(29.7)	—	2	—	1	1
10	(250)	730	(46.3)	—	3	2	1	1
12	(300)	1,060	(66.7)	—	—	3	2	1
16	(400)	1,880	(118.6)	—	—	5	2	1

*With a 40-psi (276-kPa) pressure in the main with the hydrant flowing to atmosphere, a 2½-in. (64-mm) hydrant outlet will discharge approximately 1,000 gpm (63.1 L/sec); and a 4½-in. (114-mm) hydrant outlet will discharge approximately 2,500 gpm (160 L/sec).

†Number of taps on pipe based on 3.0-ft/sec discharge through 5 ft (1.5 m) of galvanized iron (GI) pipe with one 90° elbow.

Bacteriological Tests

After chlorine solution has been flushed out of the line, and before the line is placed in service, samples shall be collected by the City Engineer to confirm the presence or absence of coliform organisms. The samples shall be collected and tested in accordance with EPA sampling and preservation techniques.

Flushing of the waterline between two consecutive bacteriological testing samples shall not be allowed except for a minimum amount to flush the sampling taps. Two consecutive sets of acceptable samples, taken at least 24 hours apart, shall be collected from the new main. At least one set of samples shall be collected from every 1,200 ft. of the new water main, plus one set from the end of the line and at least one set from each branch. The test results shall be provided to the City Engineer and the Contractor. These initial tests shall be made at no cost to the Contractor. A certified testing laboratory may be used if approved by the City Engineer.

If initial disinfection testing fails, the new main may be flushed and shall be re-tested. If the second set of tests also fails, the main shall be disinfected and flushed until

satisfactory test results are obtained. All disinfection, repetitive testing and sampling costs incurred shall be at the expense of the Contractor.

6107 CUTTING INTO EXISTING WATERMAINS

If the trench is wet, liberal quantities of hypochlorite shall be applied to the open trench to reduce the risk of contamination.

When connections of pipe equal to or less than 20-feet in length are made to an existing system, the exposed pipe and fitting interiors shall be sprayed or swabbed with a minimum 1% chlorine disinfection solution.

When connection length is greater than 20-feet, the piping shall be assembled aboveground and shall meet the requirements of Section 6106. Between the time of satisfactory bacteriological samples and installation, the ends of the piping must be sealed or capped.

SECTION 6200 - WATER SERVICE CONNECTIONS

6201 GENERAL

The Contractor shall supply all materials, labor and equipment necessary for water service connection as indicated on the plans. This shall include excavation for tapping of the main, boring of road crossings, backfilling and resodding of the established lawns. The City will furnish all meters at the cost identified in the Schedule of Fees.

The Contractor shall notify the City of the intent to perform this work a minimum of forty-eight (48) hours in advance of water service outages and shall notify any customers that will be affected twenty-four (24) hours in advance of water service disruption. City crews shall operate all necessary valves to assist in the main tap, when necessary. For further information on water taps please see the Water Taps Policies and Procedures.

Water services will not be allowed for any parcels outside the City Limits without prior approval from the City Engineer.

6202 WATER MAIN TAPS

All taps 2" and smaller shall be made by the City of Olathe Utility Department. Taps larger than 2" shall be made by an approved contractor and shall be inspected by the City. All larger taps shall be approved by the City Engineer and paid for by the applicant. Dry tapping of water mains will not be allowed. Contractor shall not schedule tapping of water service until pressure and bacteriological testing have met City and State requirements.

Taps will not be made if any points of access that are not safe or fall outside OSHA standards.

All tap locations must have an address clearly visible from the street prior to tapping the main.

Taps shall not be performed when the temperature is at or below 32° F or during inclement weather. All taps and water meters shall be protected from freezing. If damage caused by freezing, replacement is required at the expense of the Contractor.

Any irrigation or other taps made on the customers service line should be a minimum of three (3) feet outside the water meter pit on the customers service line. Any connections made less than three (3) feet of the water meter pit will be disconnected and replumbed at the contractor's expense.

6203 SEPERATION REQUIREMENTS

Minimum separation between water service taps shall be three (3) feet. Unless approved by the City Engineer, all services shall be perpendicular to the main with no services originating from a fire hydrant or fire service line.

The following separation distances between the water service line and other utilities are required unless variations are approved by the City Engineer.

Table 6203-01-Utility Separation

Utility	**Separation Requirement**
Gas service line	5 feet
Sewer connection (horizontal)	10 feet
Sewer connection (vertical)	2 feet
Power main or service	5 feet
Telecommunications	5 feet
Water main joint/bell	3 feet
Storm Sewer*	1 foot

*A storm sewer must have 54 inches or more of cover to allow the service line to be placed above it. Exceptions to this will be considered on a case-by-case basis by the City Engineer.

6204 METER LOCATION

Water meters shall be set at the property line, unless otherwise approved by the City Engineer.

Meter pits shall not be in driveways, walkways, ADA ramp or cast in concrete. Installations requiring traffic rated rings and lids shall be approved by City Engineer.

6205 MULTIPLE SERVICES

A duplex may either be served by two service line main taps and two meters, or one main (1" service) tap and two meters with both meters installed in one-meter pit. Each dwelling must have their own water meter. One meter for multiple buildings shall not be allowed.

A 4-plex shall be served either by two service lines (minimum of 1" or larger) that branched into two meters per service line (4 meters total) or serviced individually with a total of 4 service lines.

6206 BACKFLOW PREVENTION

When necessary, a backflow preventer must meet the International Plumbing Code, 15.08, for installation and design requirements currently adopted by the City of Olathe.

The owner of the building being served shall be responsible for all testing and maintenance of the backflow preventer.

6207 SERVICE LINES

Copper service lines shall be one continuous line of Type "K" seamless soft copper tubing with no intermediate coupling between the corporation stop and the meter setter. All services shall be encased in polyethylene encasement covering a minimum of three (3) feet including the corporation stop.

All connections to the copper tubing shall be made with compression type couplings. No field or shop soldered connection will be permitted. All soldered fittings shall be factory soldered using silver solder.

The water service line shall be installed in a separate ditch from the other utility service lines.

Service lines from main to meter shall be a minimum ¾-inch. For one (1") inch or larger meters, the service line shall be equal to the size of the water meter.

Contractor shall excavate and expose the water main prior to tapping. Appropriate warning devices, fencing or barricades shall be provided and maintained by the Contractor.

The maximum width of the trench extending from a point one (1) foot above the top of the service line to the bottom of the trench shall be one (1) foot.

Cutting trench banks on slopes to reduce earth load, prevent sliding and prevent caving will be permitted only in areas where the increased trench width will not interfere with surface features or encroach on right-of-way limits. If sloping the trench back is not feasible, a trench box will be required in a trench that is five (5) feet or greater in depth or if the trench is unstable.

The minimum cover for service lines in shall be forty-two (42) inches, measured from the finished grade. The maximum depth of for a service line shall be limited forty-eight (48) inches unless otherwise approved by the City Engineer.

Pavement crossings shall be made by means of boring, pushing or tunneling. Unless otherwise approved by the City Engineer, all street borings shall be forty-eight (48) inches below the finished grade. Only one service can be run through each bore under a street.

No fitting shall be installed under pavement unless approved by the City Engineer.

Water service lines shall not be placed within a casing under street crossings.

Backfill shall be compacted immediately after placement of the service line. Uncompacted meter pits shall not exceed eight (8) locations. Backfill shall be in accordance with Section 4000.

6208 RESIDENTIAL (5/8" through 1") INSTALLATIONS

The water meter and corporation stop for 5/8" and 1" services shall be provided by the City. Contractor shall supply appurtenant materials required to install the meter. If the water main is HDPE, the contractor shall have a certified fuser to fuse the saddle onto the water main. The City Engineer shall be present for the fusion of the saddle.

The meter face must be between 18" and 22" from the finish grade to reduce the chance of freezing and allow easy access for maintenance.

All service lines must have a 6” to 8” gooseneck from the tap and must remain in contact with the ground. PB-2 backfill must be placed around the looped section.

6209 RESIDENTIAL AND COMMERCIAL (1 ½” and 2”) INSTALLATIONS

The City supplies the water meter for 1 ½” and 2" and performs the tap. Contractor shall supply all appurtenant materials, including the corporation stop and saddle. If the water main is HDPE, the contractor shall have a certified fuser to fuse the saddle onto the water main. The City Engineer shall be present for the fusion of the saddle.

The meter face must be between 18" and 22" from the finish grade to reduce the chance of freezing and allow easy access for maintenance.

Gooseneck piping must be rodded or blocked sufficiently to prevent the bends from slipping.

6210 COMMERCIAL AND INDUSTRIAL (3” and larger meter) INSTALLATION

Plan Submittal

Plans, shop drawings and material specifications for all work shall be submitted to the City Engineer for approval prior to construction. Plans shall include the location of proposed work, location of property lines and the location of other existing or proposed utilities.

Materials

The following chart indicates the minimum lay length based on meter size. The lay length is summing of the meter, flanged adapter, and plain end by flanged end pipe lengths. AWWA Manual M6 provides more installation guideline for large meter.

Table 6210-01: Meter Lay Lengths

Water Meter	
Meter size	Minimum lay length
3 in	48 in
4 in	50 in
6 in	62 in
8 in	67 in

All piping shall be DIP (Ductile Iron Pipe) sized. All valves and fittings within the meter pit shall have flanged ends. A flanged adapter shall be used on the outlet end of the water meter. All valves and fittings outside the meter pit shall be connected using mechanical joints.

Pipe supports shall be installed to support the pipe as needed. Under no condition shall there be more than three (3) fittings between supports. The supports shall be galvanized, or stainless-steel construction fastened to a concrete footing with a locking nut.

Tapping sleeves shall be designed for a minimum working pressure of 200 psi and shall be flanged outlet type and provided with mechanical joints and end gaskets at each end. All connections shall have polyethylene encasement in accordance with Section 6000.
Anchoring pipe shall be factory fabricated from Class 54 Ductile Iron pipe.

METER VAULT DESIGN

Meter vaults are not to be covered or placed in a driveway/traffic area.

The vault lid must be removable and have 4 recessed lifting eyes placed approximately two feet from each corner to ensure the lid can be removed for maintenance. The lid shall be sealed with a butyl sealant to prevent water seepage. The City of Olathe Nicor lid should be placed directly over the meter and an additional 36" access lid for vault entry in accordance with Standard Detail 62-6C

Table 6210-02: Water Meter Vaults

Water Meter		Meter Vault General Dimensions	
Meter Size	Minimum Lay Length	Minimum Inside Length of Meter Vault	Minimum Inside Width of Meter Vault
3 in	48 in	8.2 ft	4.4 ft
4 in	50 in	8.8 ft	4.4 ft
6 in	62 in	10.6 ft	4.7 ft
8 in	67 in	11.5 ft	5.2 ft

6211 INSPECTION

All materials and workmanship shall be subject to inspection and testing by the City. Defective material and workmanship shall be repaired or replaced as directed by the City Engineer. The Contractor shall furnish all materials necessary for all testing.

A hydrostatic test shall be performed prior to making a connection. A hydrostatic test shall be conducted and must hold 150 psi or 1.5 times the operating pressure, whichever is greater, for a minimum of two (2) hours prior to connection. The City will have a representative available for the test.

All public and private property damaged by the applicant during service installation will be restored by the Contractor at no cost to the City.

6212 SALVAGE MATERIALS

All usable items salvaged from the existing distribution system, including fittings, valves, meters, etc., shall be field-cleaned and transported by the Contractor to the City's designated storage yard and shall remain the property of the City.

SECTION 7000 - RESTORATION OF SURFACE CONSTRUCTION

7001 SCOPE

This section covers restoration of concrete and asphalt pavement, gravel surfacing, sidewalks, drive approaches, curbs, and other features removed or damaged during construction.

7002 GENERAL

All pavement or other features which are removed or damaged beyond the construction limits during the progress of the work shall be restored to original or better condition by the Contractor, at his expense, unless otherwise specified in the contract documents. All restoration work shall be subject to acceptance by the City Engineer. All materials used for restoration work shall be new.

7003 REFERENCE STANDARD

Materials and construction methods shall comply with the applicable sections of these Technical Specifications and the City of Olathe *Design Criteria for Public Improvements*.

7004 PAVEMENT REPLACEMENT

Street restoration shall be in accordance with all applicable Standard Details. Materials and workmanship shall conform to Table 7004-1, or as approved by the City Engineer.

Table 7004-1 *- Street Restoration Material Specification References*

Surface Material	Applicable Technical Specification
Concrete	Section 2000
Asphalt	Section 1300
Trench Backfill	Section 4000 - Low-Strength Flowable Fill

All temporary surfacing placed to maintain traffic until the street restoration work can be completed shall be cold mix asphalt at a minimum. Required thickness of the temporary surfacing will be determined by the City Engineer. Maintenance of the temporary surface is the responsibility of the Contractor and is a subsidiary item unless noted otherwise in the contract documents.

7005 CONCRETE SIDEWALK

Concrete sidewalk removed in connection with, or damaged as a result of construction operations, shall be replaced with new concrete and associate materials. The work shall conform to the specifications contained in Sections 2000 and 2100 and all applicable Standard Details.

The surface finish of concrete sidewalk replaced, unless otherwise approved, shall match as closely as possible, the existing adjacent concrete sidewalk surfaces.

7006 CONCRETE CURB AND GUTTER

Concrete curb and gutter that has been removed or damaged shall be replaced with new concrete and associated materials conforming to the specifications contained in Sections 2000 and 2100 and all applicable Standard Details.

Dimensions, elevations and surface finish of curb and gutter that is replaced, unless otherwise approved by the City Engineer, shall conform to, and shall match as closely as possible, the existing adjacent concrete curb and gutter.

7007 GRAVEL SURFACING

Existing gravel drives, roadways, and parking areas that have had the gravel surfacing removed or damaged during the progress of the work shall be replaced with an aggregate surfacing at least as thick as that removed, but in no case shall it be less than four (4) inches.

New aggregate surfacing shall match the existing adjacent surfacing as nearly as possible in size, gradation, color, and compaction.

7008 MISCELLANEOUS REPAIR WORK

All existing items and construction, which are removed or damaged as a result of construction operations, shall be repaired or replaced unless otherwise approved by the City Engineer. The costs for replacing or repairing surfaces outside the construction limits shall be the responsibility of the Contractor.

Repair or replacement shall be in accordance with these specifications or as otherwise directed by the City Engineer.

When trenching in the roadway occurs a steel street plate shall be required prior to opening the roadway to traffic. Steel plates must be a minimum ¾" thick and large enough to span over 1' onto the undisturbed roadway in all directions. Steel plates shall be pinned and ramped with Hot mix asphalt (HMA) on all sides. Advanced warning signs of the street plate shall be installed. The costs for installing and maintaining the street plates shall be the responsibility of the Contractor.

SECTION 7200 - SEEDING AND SODDING

7201 SCOPE

This section covers the furnishing of all labor, equipment, tools, and materials necessary for installation of seeding and sodding operations as required by the project plans and specifications.

7202 GENERAL

The seeding work shall consist of furnishing and sowing seed by an experienced seeding contractor utilizing equipment manufactured expressly for the purpose, such as a seed drill, mulch chopper and blower for each phase of the seeding operation. Contractor may also use a hydroseeder as an alternative seeding method, if approved by the City Engineer.

For public improvement projects, sodding shall be required for all areas within the right-of-way disturbed by construction operations. Seeding and mulching shall be required at all locations shown on the plans and for all grass covered areas that are disturbed by construction operations, which are not designated to be replaced with sod.

Disturbed areas within established lawns shall be sodded by an experienced Contractor.

7203 MATERIAL

The sod shall be densely-rooted Turf Type Tall Fescue unless otherwise specified or approved by the City Engineer. The sod shall contain a growth of not more than ten (10) percent of other grasses and clovers, shall be free from all prohibited and noxious weeds and shall be three-fourths (3/4) inch to one and one-fourth (1-1/4) inch thick. Each strip shall contain at least one (1) square yard, with a minimum width of twelve (12) inches.

Commercial fertilizer for seeded or sodded areas shall be as shown on the Approved Materials List. It shall be uniform in composition, free flowing, and delivered to the site in standard size bags, showing weight, chemical composition and name of manufacturer. All fertilizer stored on site shall be kept dry until the time of application.

Seed mixes for cover crops shall be as specified herein unless otherwise specified or approved by the City Engineer. Seed mixes shall be free of prohibited weed seeds and shall not have more than one (1) percent noxious weed seeds. Seed mixes shall be delivered to the site in labeled containers bearing the name of the producer. A certificate showing the percentage of the purity and germination of each kind of seed specified shall be submitted to the City Engineer for approval.

The following formula shall be used to determine the amount of commercial seed required:

$$\text{Pounds of Commercial Seed Required Per Acre} = \frac{10{,}000 \times \text{Rate of Pure Live Seeds (lbs/acre)}}{\text{Purity \%} \times \text{Germination \%}}$$

Where seeding is required on shoulders, slopes and any other areas which will be regularly maintained, the pounds of live seed per acre are outlined in Table 7203-1.

Table 7203-1 *- Pounds of Live Seed Per Acre in Regularly Maintained Areas*

Type of Seed	Minimum Pure Live Seed (%)	Rate of Pure Live Seed Pounds/Acre
Turf Type Tall Fescue	80	325

1. Regenerate Turf Type tall Fescue (TTTF) 2. Maestro TTTF-33% 3. Reflection TTTF-33%

Where seeding is required in areas that are not regularly maintained, the seed mixture will be as defined in Table 7203-2.

Type of Seed	Minimum Pure Live Seed (%)	Rate of Pure Live Seed Pounds/Acre
Same as Above	80	225

Preferred mulch materials for application to seedbed areas are smooth brome grass hay, Sudan grass hay or prairie hay. Prairie hay shall consist chiefly of bluestem grasses, switchgrass, Indian grass and other desirable native perennial grasses. Mulch shall be free of prohibited and noxious weed seeds. Other mulching materials may be used with the approval of the City Engineer.

7204 TIME OF SEEDING OR SODDING

Seeding and fertilizing shall be performed between February 15 and April 30 for Spring planting and between August 15 and October 15 for Fall planting, unless otherwise approved by the City Engineer. Seeding and fertilizing shall not be done during periods of severe drought, high winds, or excessive moisture, as determined by the City Engineer.

Sod may be placed between March 1 and June 1 and between September 15 and November 15. Sod shall not be placed on frozen ground.

Any seeding or sodding during periods other than those previously designated will require a written request from the Contractor to extend the permissible period for performing such work. The Contractor shall explain the reason for the variance and shall include a guarantee of satisfactory results at the end of the fourth week of the subsequent growing season, as defined above. The Contractor shall perform any necessary re-seeding or re-sodding at that time.

7205 APPLICATION OF FERTILIZER

Commercial fertilizers shall be applied by drilling into the previously prepared soil with a fertilizer attachment on the seed drill. A commercial grade broadcast spreader may be used to spread the fertilizer in areas where it is not practical to use a seed drill. The fertilizer shall be spread uniformly after the soil has been prepared and prior to the seeding or sodding. The rate of application for the fertilizer shall be one (1) pound of actual nitrogen per one thousand (1,000) square feet of planting area.

7206 PREPARATION OF SOD BED

The sod bed shall have a uniform surface free from washes and depressions and shall conform to the finished profile or cross section shown on the plans. The soil, except where fresh top soil has just been applied and compacted, shall be thoroughly tilled to a depth of two (2) inches. Areas which have become dry and crusted over, shall be tilled as specified above, prior to placing the sod. The Contractor shall have the prepared sod bed inspected and approved by the City Engineer prior to placing any sod. Any sod placed prior to the inspection and approval of the sod bed is subject to removal, all deficiencies are required to be corrected and the sod replaced at the Contractor's expense.

Sod placed next to existing grassy areas, curbs, sidewalks or similar boundaries shall be placed to match existing grades.

7207 PLACEMENT OF SOD

Sod shall be delivered to the project within twenty-four (24) hours from the time it is harvested. All sod in stacks shall be kept moist and protected from exposure to the sun and from freezing.

The sod beds shall be in a lightly compacted condition with relatively fine texture at the time of sodding. Sod shall be moist when it is placed. The use of dry sod will not be permitted. Sod strips shall be placed parallel to the contour lines, commencing at the lowest point of the area and working uphill. The transverse joints of sod strips shall be staggered and the sod carefully placed to produce tight joints. The sod shall be rolled immediately after it is placed with a roller weighing not less than sixty (60) nor more than ninety (90) pounds per linear foot of roller. On steep slopes, the sod may be compacted with hand tools. The compacting process shall pack the sod roots firmly into the prepared soil. The Contractor shall discontinue rolling sod that contains excess moisture, and is required to wait until the moisture has been reduced before resuming rolling operations. Sod displaced by the rolling operation will not be accepted.

The Contractor shall water installed sod immediately after installation and shall water all sod twice daily for a minimum of twenty-one (21) days from initial placement, except those days where a minimum of 1/4 inch of rain falls within a twenty-four (24) hour period.

7208 PREPARATION OF THE SEED BED

The area to be seeded shall be thoroughly tilled to a depth of at least three (3) inches by discing, harrowing or other approved methods until the soil is well pulverized. After completion of the tilling operation, the surface shall be cleared of all stones, stumps, or other objects larger than 1-1/2 inches in diameter, and of roots, wire, grade stakes, and other objects that might hinder maintenance operations. Areas tilled shall then be brought to the desired line and grade and maintained until seeding and mulching is complete to ensure a smooth surface with no gullies or depressions.

Any objectionable undulations or irregularities in the surface resulting from tilling or other operations shall be removed before planting operations have begun. Seed bed preparation shall be performed only during periods when satisfactory results are likely to be obtained. When results are not satisfactory because of drought, excessive moisture or other causes, the work shall be discontinued until such conditions have improved to the satisfaction of the City Engineer.

7209 PLACEMENT OF SEED

Seeding may be accomplished by means of approved mechanical seed drills followed by packer wheels, by hydraulic type seeders, by broadcast-type seeders in small areas not accessible to machine methods or as approved by the City Engineer. Seed drills shall have depth bands set to maintain a planting depth of at least one-quarter (1/4) inch but not greater than one-half (1/2) inch. All seed sown by broadcast-type seeders shall be "raked in" or otherwise covered with soil to a depth of at least one-quarter (1/4) inch and rolled to obtain a firm seed bed. Water shall be applied when necessary.

Hydraulic seeding equipment shall include a pump capable of being operated at 100 gallons per minute and at a pressure of 100 pounds per square inch, unless otherwise directed. The equipment shall have an acceptable gauge and a nozzle adaptable to hydraulic seeding requirements. Storage tanks shall have an agitator and a means of estimating the volume used, or the volume remaining in the tank.

Seed shall not be drilled or sown during windy weather or when the ground is frozen or otherwise untillable. When a seed drill is used, the maximum spacing between rows shall not exceed four (4) inches.

7210 MULCHING

Hay mulch shall be applied uniformly to seeded areas at the rate of not less than two (2) tons per acre. Baled hay shall be broken up and loosened sufficiently before being fed into the blower hopper to avoid the placement of matted or unbroken clumps. The use of wet hay is prohibited.

Mulching shall be performed within twenty-four (24) hours after seeding, but not during windy or rainy weather or when such weather is imminent. Mulching shall be started at the

windward side of relatively flat areas or at the upper part of steep slopes, and shall continue uniformly until the entire area is covered.

The mulching material shall be disced or punched into the soil so that it is partially covered. Several passes may be required if a straight disc is used in order to mix the mulching material with the topsoil sufficiently to ensure protection from erosion by either wind or water. The mulch crimping operation shall be performed parallel to the ground contours.

7211 MAINTENANCE

All seeded areas shall be protected against damage by vehicle and pedestrian traffic by the use of barriers and appropriate warning signs. If at any time before completion and acceptance of the seeding work, any portion of the seeded area becomes eroded or otherwise damaged, such damaged areas shall be repaired by filling with soil to original grade, re-seeding and re-mulching. All costs of repair work shall be borne by the Contractor.

The Contractor shall be responsible for watering areas seeded for a period of five (5) weeks after the time of seeding, except when thoroughly wetted by rain. Sprinkling of the seeded areas shall be done in such manner as to avoid standing water, surface wash, scour or other erosion.

All sodded areas shall be thoroughly watered twice daily for a period of twenty-one (21) days after placement, except when thoroughly wetted by rain of one-quarter (1/4) inch or more in a twenty-four (24) hour period.

7212 GUARANTEE

The Contractor shall guarantee all sod for twenty-one (21) days from the date of installation. At the end of the twenty-one (21) day period, the City Engineer will inspect all sod. Any sod that is dead at the end of the twenty-one (21) day period shall be replaced by the Contractor at his expense and is subject to an additional twenty-one (21) day warranty period. All healthy sod at the end of the twenty-one (21) day period will be accepted by the City Engineer and turned over to the property owner for maintenance. The Contractor is not required to guarantee any healthy sod accepted by the City Engineer after the twenty-one (21) day period.

The Contractor shall guarantee all seeded areas for a minimum of five (5) weeks or until there is a minimum of seventy (70) percent coverage of healthy grass, whichever is greater.

7213 RECORD KEEPING

The Contractor shall maintain a log of his watering operations and rain events to demonstrate compliance with the watering requirements of Section 7211. The Contractor shall submit the records to the City Engineer at the end of the required maintenance period. The seeded and/or sodded areas shall not be accepted until the submittal has been approved by the City Engineer.

SECTION 7300 - EROSION AND SEDIMENTATION CONTROL

The City of Olathe erosion and sediment control technical specifications and design criteria shall conform to the Kansas City Metropolitan Chapter of the American Public Works Association (KC-APWA) *Section 2150 – Erosion and Sediment Control* and *Section 5100 – Erosion and Sediment Control*, latest edition, and Title 17 of the Olathe Municipal Code, unless otherwise directed by the City Engineer.

SECTION 7400-LANDSCAPE IRRIGATION SYSTEM

7401 GENERAL

The Contractor shall furnish all labor, materials, tools, equipment, supervision, and services necessary to install a complete irrigation system as shown on the approved plans, installation details, guarantee/warranty, and as specified herein.

The Contractor shall procure all applicable licenses, permits and fees associated with the irrigation system, including water meter, backflow prevention devices and water line tapping. The Contractor shall coordinate with the Fire Department-Building Codes Division to procure such permits and fees as required by the City of Olathe.

The Contractor shall field verify existing pressure and water line flows at the point of connection prior to construction. Contractor shall report any discrepancies to the City Engineer and have necessary design changes provided prior to installation of the system.

The Contractor shall be responsible for field verifying all existing underground or above ground utilities in the area of irrigation installation prior to installing the system. The Contractor will be responsible for damage to any utilities, structures, or adjacent site appurtenances and shall bear the expense of repairing such damage.

All planting islands and medians landscaping will be designed with a drip irrigation system. Only designated lawn areas and specific public buildings will be designed with spray head irrigation system layout. No median lawn area will be irrigated.

The Contractor shall be responsible for winterizing the system and spring start-up of the system for the first year of operation. The Contractor shall contact the City to allow the Park Operations maintenance staff to be present when these operations are performed.

7402 QUALITY ASSURANCE

The Contractor shall adhere to the current adopted version of the IPC (International Plumbing Code), the National Electric Code and all applicable laws and regulations of the governing authorities for all applicable codes and specifications regulating the irrigation system.

Products designated herein by brand, trade name, model and pattern are noted for the purpose of establishing quality standards for bidding.

It is not intended to allow substitution of equipment; however, any substituted equipment must be approved by the City Engineer a minimum of 21 calendar days prior to installation.

7403 SUBMITTALS

Shop Drawings and Material List

Contractor shall provide a material list of all pipe, fittings, mainline components, control system, etc. along with necessary shop drawings a minimum of twenty-one (21) calendar days

prior to the scheduled installation. All shop drawings shall be approved by the City Engineer prior to installation.

Contractor shall submit seven (7) copies of manufacturers' catalog cuts, specifications, warranty, and operating instructions for equipment to be provided for the installation of the irrigation system. All wiring diagrams shall show connections to the controller, automatic sensors, master valves and remote control valves.

The Contractor shall provide to the City Engineer a list of all changes of materials, layouts and equipment and obtain City Engineer approval a minimum of twenty-one (21) days prior to installation of the system.

The Contractor shall provide shop drawings, equipment submittals and a final as built set of drawings for project performance. Irrigation as built drawings should be sent to the Parks & Recreation Department at 100 E. Santa Fe, Attn: Parks Project Coordinator.

The as-built set of plans shall also be included in the construction documents for the project.

Project Record (As-Built) Drawings
Contractor shall submit to the City of Olathe Parks and Recreation Department at P.O. Box 768 Olathe Ks, 66051-0768, Attn: City Arborist a record as-built set of plans of the irrigation system. The plans shall record accurate dimensions, measured from at least two permanent reference points, for irrigation system main lines, section valves, valve boxes, drain valves, backflow devices, controllers, sleeves under pavement and future sleeves or stub out locations.

The as-built drawings must be submitted prior to a final site inspection. **No site inspection of the irrigation system will commence without as built drawing approval. Final site inspection of the irrigation system will not commence without as-built drawing approval.**

The as-built set of plans shall be signed and dated by the irrigation contractor and the plans shall be clearly labeled "As-Built".

Basic instruction for the operation of the system shall also be supplied to the City Engineer prior to acceptance of the system. The Contractor shall fully explain the settings on the controllers and the day to day operation of the system to Park Operations maintenance staff who will be responsible for the system.

The Contractor shall submit two controller charts for each controller supplied, showing the area covered by the automatic controller. The chart shall be a legible reproduction of the as-built irrigation system, sealed between two pieces of plastic, each piece being a minimum of ten (10) mils thick.

7404 JOB CONDITIONS

The Contractor shall examine the site prior to bidding on the work. The submission of a bid shall be considered evidence that the examination of the site was made.

All irrigation equipment and lines shown on the drawings are diagrammatic. The Contractor shall stake the locations of all pertinent equipment in the field and obtain approval from the City Engineer prior to installing the system.

No work shall occur prior to 7 am or later than 7 pm during the week days. No work shall occur on Saturday, Sunday or legal holidays observed by the City of Olathe without prior approval from the City of Olathe.

The Contractor shall coordinate all sleeving under pavements or shall make every effort to have piping and control wires in the ground before any pavement is laid, otherwise the Contractor shall bore under paved areas. No pavement patching will be allowed for new construction.

The Contractor shall protect all open excavation trenches and areas from an unsafe condition. No trenches shall be left open and unprotected over night or when Contractor is not working in the area.

All job materials shall be kept in an organized and protected manner. The contractor will be responsible for securing all materials and equipment needed for the work. All trash and debris shall be picked up at the end of each day to minimize the amount of litter to the area.

Damage of surrounding property and existing utilities shall be repaired and/or replaced by the Contractor at his expense.

7405 INSPECTIONS AND TESTING

Inspections shall include but not be limited to regular inspections by the Project Inspector. The Contractor shall notify the Project Inspector a minimum of forty-eight (48) hours in advance of any inspection needs regarding the irrigation system. No inspection of the irrigation system shall be done without the Project Inspector present.

The Contractor shall follow the procedures outlined by the Public Works Department and Fire Department-Building Codes Division of the City of Olathe for the inspection of all backflow prevention devices and water meters for the irrigation system.

All mainlines will be subjected to a hydrostatic pressure test for a period of two (2) hours without any pressure drop. This test will occur any time after partial completion of backfill. Leakage will be detected by visual inspection. Pipelines jointed with solvent-welded PVC joints shall be allowed to cure at least twenty-four (24) hours before testing. Replace defective pipe, fitting, joint, valve or appurtenance as necessary. Repeat the test until the pipe passes the test.

The Contractor shall provide all labor, fittings, and equipment necessary to conduct tests or retests required by the Project Inspector.

The Contractor shall provide a performance and coverage test of the system in the presence of the Project Inspector prior to acceptance of the system.

The Contractor shall correct any deficiencies found by the Project Inspector. The test shall be repeated until the Project Inspector is satisfied with the system and coverage.

7406 MAINTENANCE

Upon completion of final testing and inspections, the Contractor shall maintain the entire irrigation system for a period of thirty (30) calendar days. Periodic examinations and adjustments to the irrigation system components are required by the Contractor to achieve the most desirable application of water included, but not limited to, adjustment of sprinkler heights, drip patterns and ensuring all emitters are in good working order. All necessary repairs and replacement of defective parts or materials shall be completed by the Contractor at no additional cost to the City.

After the thirty (30) day maintenance period has ended the Contractor shall provide to the City a copy of all maintenance requirements and needs for the system.

The Contractor shall winterize the entire irrigation system during the first fall season of operation. The Contractor must perform this winterization in the presence of Park Operations maintenance staff.

The Contractor shall conduct start-up operations in the presence of Park Operations maintenance staff in the spring of the first year including: reinstall backflow prevention device(s), close manual drain valves, pressurize system, replace 9 volt batteries in controllers, reprogram if required, and inspect and repair any leaks or damage which may have occurred at no additional expense to the City.

7407 SYSTEM GUARANTEE

All materials and workmanship shall be guaranteed for a period of two (2) years after the date of project acceptance by the City Council.

7408 MATERIALS

Quality

All materials used for the irrigation system shall be new and without flaws or defects of any kind or type. The materials shall be the best of their class and kind.

Substitutions

Pipe sizes referenced in the construction documents are minimum sizes, and may be increased at the option of the Contractor.

The Contractor shall notify, in writing, any material substitutions to the City Engineer. The Contractor shall explain in writing why these substitutions are being recommended. Approval of all substitutions must be given to the Contractor prior to installation of any and all substitutions.

Pipe and Fittings

All piping shall be furnished and installed complete with all fittings, jointing materials, supports, anchors, and other necessary appurtenances.

Plastic pipe shall be rigid PVC extruded from virgin parent material of size specified on the drawings. The pipe shall be homogeneous throughout and free from visible wrinkles, dents, gouges and damaged ends.

Main and lateral line pipe shall be PVC Class 200 conforming to ASTM D2241 "Specifications for PVC Plastic Pipe".

All plastic pipe fittings to be installed shall be schedule 40 manufactured of the same material as the pipe and shall be suitable for solvent weld joint connections.

All pipe shall be continuously and permanently marked with the manufacturer's name, size, schedule and type of pipe, working pressure at 73°F., and National Sanitation Foundation (NSF) approval.

Copper Pipe (if required): Copper pipe shall be Type "K" rigid conforming to ASTM Standard B88. Fittings shall be brass or cast bronze, soldered or threaded per the installation details. Solder shall be 95% tin and 5% antimony.

Sleeving Pipe for Irrigation Supply Line:

- All irrigation line sleeves shall be twice the size of the pipe to be sleeved and shall be Schedule 40 pipe.
- A separate PVC sleeve shall be provided for all electric wiring of the system. The diameter shall vary depending on the size and quantity of wire to be used on system.
- Polyurethane foam shall be used to plug the end of sleeves after circuit piping and circuit wiring have been routed to prevent soil infiltration into the sleeve.

All connections of PVC pipe shall be made with ASTM F656 Primer and ASTM A2564 solvent cement.

All irrigation supply lines shall have a tracer wire installed anywhere a 2-wire system is not present.

Valves

Valves of industrial strength glass-filled nylon globe valves for commercial applications shall be provided by the Contractor. The valve shall be of durable plastic bodies, unless otherwise indicated, to withstand constant 150 psi pressure and 2 to 150 gpm flows. Valve shall be normally closed, forward flow design, slow closing to prevent water hammer and subsequent system damage. Valves shall be one-piece solenoid with captured plunger and spring for easy servicing. Valves shall be manufactured in accordance with the Approved Materials List.

Master Control Valves: Globe or angle valves operated by low power (24 volt) solenoid, normally closed, manual flow adjustment.

Automatic Circuit Valves: Globe valves operated by low-power solenoid, normally closed, manual flow adjustment, with pressure regulating module.

Manual Drain Valves: Brass stem valve, fitted for key operation. Install six (6) inch sleeve to all drain valves for access to valve this valve shall be installed a minimum of three (3) feet outside of the meter pit.

Manual Gate Valves (Isolation Valves): Brass stem valve, fitted for key operation.

Drain Back Valves: Brass stop and drain valve (line size), 2-1/2" curb access box, and metal rod w/key. Locate between irrigation meter and backflow prevention device.

Valve Box Cover and Frame: The valve box shall be in accordance with the Approved Materials List and shall be appropriate for the valve size and necessary ability to work on the items in the box.

Drainage Pit Backfill: Clean gravel or crushed stone, graded from 2" maximum to ¾" minimum.

Two-wire field decoders: Two-wire field decoders shall be installed in the valve box and shall be in accordance with the Approved Materials List.

Backflow Prevention Device

All backflow prevention devices must meet or exceed City requirements for lawn sprinkler irrigation systems. All backflow prevention devices and associated materials shall be purchased and installed by the Contractor.

The Contractor shall coordinate with the Building Division at Fire Administration, 1225 South Hamilton Circle, Olathe, Kansas (913-971-9875) or Water One 913-895-1815 for all permitting and installation requirements of the water meter and necessary tapping of the water service line. If the project is located within the Johnson County Water One service area, the irrigation contractor shall coordinate with Johnson County Water One, 10747 Renner Blvd., Lenexa, Kansas, or by calling 913- 895-1822 or email DWQ@waterone.org.

If the project is located within the City of Olathe Water service area, copper pipe shall be installed between the meter and backflow prevention device. Copper pipe shall be extended past the backflow device no less than four (4) feet.

The backflow prevention device shall be a reduced pressure backflow preventer. The size shall be as specified on the plans or equal to the size of the main service line, so it is suitable for the operation of the irrigation system.

The backflow preventer shall be installed with copper unions on the incoming and outgoing copper pipe within the prevention cover box, as shown on the details. PVC sleeves shall be installed through the concrete base for ease of removal and repair of the device.

A fiberglass backflow prevention cover is required for outside installations. No cover is necessary if the backflow preventer is located within a structure. The backflow preventer shall be in accordance with the Approved Materials List.

The backflow preventer box shall be constructed using injection-molded fiberglass-reinforced resin that is pigmented the same color as the get coat to provide a solid color throughout the laminate.

A foam liner shall be one (1) inch rigid polyurethane foam liner compression molded to provide a uniform thickness and a consistent cell structure with a secondary bond to the fiberglass cover. The inside shall have a smooth but rigid surface that will help provide protection from freezing. The thermal resistance shall be: R=6.72 per 1 inch of foam.

The cover shall have a 1/8” laminate and the base shall have a 3/16” laminate to provide a durable enclosure that meets the ASSE structural test.

The box shall have the highest grade of marine gel coat for outstanding UV protection and weatherablility.

The lid shall include two (2) flexible draw latches made from EODM (ethylene propylene diene monomer) polymer. It should have exceptionally good weather, aging and ozone resistance. Hardware shall be riveted to cover and base using aluminum rivets to protect from rusting.

The box color shall be approved by the City Engineer prior to installation.

The box base shall be installed on a concrete base which extends four (4) inches beyond the base of the box.

The box shall be sized to meet the needs of the backflow device to be housed in the box.

If Johnson County Water One is the source of water, refer to their requirements for tapping and backflow prevention requirements. Johnson County Water One, 10747 Renner Blvd., Lenexa, Kansas. Phone number 913- 895-1822 or e-mail: DWQ@waterone.org.

Sprinkler Heads

Manufacturer's standard unit shall be designed to provide uniform head to head coverage over entire area of spray shown on drawings at available water pressure. Pop-up heads shall be a minimum of four (4) inches with height determined by mature height of plant material located in the zone of irrigation. All sprinkler heads shall be in accordance with the Approved Materials List and meet the following standards:

- Pop-up (min. 4" pop-up): Plastic body, molded plastic nozzle, with multi-function wiper seal and a double orifice nozzle for improved distribution.
- Pop-up Rotary Impact: Full circle and part circle as indicated on the Approved Plans. Body and cover high impact plastic with stainless steel tapered shaft.

Electric Wire shall be no less than 14 gauge, UL listed wire.

All sprinkler heads shall be installed on swing joints as indicated on the details.

Quick Coupling Valve Assembly

Quick coupling valves shall be provided as shown on the irrigation drawings. All quick couplings valves shall be on double swing joints as shown in the details.

The Quick coupler shall be a one piece body design with a rubber cover and have an operating pressure of 5 to 125 psi and a flow of 10 to 125 gpm. The coupler shall be in accordance with the Approved Materials List. Provide one key for every two quick couplers installed.

All quick couplers shall be installed in a valve box as shown in the details.

A quick coupler shall be installed inside the backflow prevention box, between the backflow preventer exit side and where the pipe re-enters the soil–inside the void of the box

WINTERIZATION OF THE IRRIGATION SYSTEM:

- FOR PLANTING BEDS IN MEDIANS: Install a quick couple valve at each end of a planting bed island located in the median.
- FOR SITE IRRIGATION SYSTEMS: Install a quick couple valve on the main line just down-stream of the backflow prevention device but within the backflow prevention cover.

Drip Irrigation

Landscape drip lines shall be in accordance with the Approved Materials List. The tubing shall be 0.92 GPH with 1 hole per foot in a 500 foot spool.

The control zone kit shall include, in this order, a PVC ball valve and a two-wire control valve placed in appropriate size valve box.

Automatic Control System

The automatic controller(s) for lawn and drip irrigation shall be:

- A solid state two-wire decoder controller manufactured expressly for control of automatic circuit valves of landscape irrigation systems. The controller shall have three automatic schedules with multi-manual program, 32 character alpha-numeric LCD control pane. Each controller shall have factory installed lightning and surge arresters, UL listed. The controller shall be in accordance with the Approved Materials List. The exterior control enclosure shall have a weatherproof locking cabinet, turf pedestal or wall mounted system, complying with NFPA 70.
- Circuit Control: Each circuit variable shall be from 1-120 minutes, with four (4) independent programs and eight (8) start times per program. Program Day cycles shall be programmed to include custom days of the week, and odd, even and cyclical dates. Switches for manual or automatic operation of each circuit shall be provided by the Contractor.
- Time Device: A time device shall be installed at locations shown on the plans and coordinated with the City.

In an isolated situation or where there are less than four (4) valves to a system the following controller information may be used:

- A battery-operated line of buriable controller which allows the use of DC power. It shall be vandal resistant; 9-volt potted latching solenoid, reliable and must meet all irrigation needs with only a 9V alkaline battery. The system shall be in accordance with the Approved Materials List. One controller shall be provided for every four (4) valves installed on the system.
- The control module shall be installed on the wall of the valve box and located so that the battery can be easily accessed.

Spare Parts and Equipment

The Contractor shall provide the following spare parts, tools and equipment:

- Two (2) wrenches for disassembly and adjustment of each type of sprinkler head used in the system
- Two (2) screwdrivers for adjustment of each type of sprinkler head used in the system.
- Two quick coupler keys with 3/4–inch bronze hose bib, bent nose type with hand wheel and two coupler lid keys.
- One valve box cover key or wrench.
- Two extra sprinkler heads of each size and type used in the project.
- Two field transmitters (drip irrigation controllers) in accordance with the Approved Materials List.

PVC Sleeves

All PVC sleeves should be used for all irrigation supply lines installed under all concrete, asphalt or hardscape items.

All PVC sleeves shall be schedule 40 PVC with the size as specified on the drawings.

Polyurethane foam shall be used to plug end of sleeves after circuit piping and circuit wiring have been routed to prevent soil infiltration into sleeves.

7409 WATER SUPPLY

The existing water main is shown on the drawings and should be utilized for the system. For the requirement of tapping the water main and installing the water meter, contact the City of Olathe Public Works Department at 913-971-9311, if the water service is provided by the City. Contact Johnson County WaterOne 10747 Renner Blvd., Lenexa, Kansas Phone number 913-895-1822 or e-mail DWQ@waterone.org if WaterOne is the provider. Provide a connection to the backflow prevention unit per the irrigation drawings and details and as outlined in Section 7408 of these specifications.

7410 LAYOUT AND INSTALLATION

Layout

Irrigation heads shall be installed as shown on the plans. Routing of irrigation lines as indicated on drawings is diagrammatic. Install lines (and various assemblies) shall be installed to conform to the details on plans. Whenever possible, all irrigation equipment shall be placed in the planting areas. Irrigation elements in hardscape areas on the plans are for graphic clarity only and are meant to be placed in planting areas. Any minor adjustments required due to differences between site and the drawings shall be allowed by the Contractor. Any such deviation in layout shall be within the original design intent and approved by the City Engineer.

All irrigation equipment shall be installed using an approved staking method, and staking shall be maintained based on the approved layout.

All median islands shall be designed using drip irrigation as indicated on the drawings and specified herein.

All lawn areas in medians **WILL NOT** be irrigated unless otherwise specified.

All layouts shall be approved by the City Engineer prior to installation.

Excavation, Trenching and Backfilling

PVC pipe shall be pulled into the soil utilizing a vibratory plow device specifically manufactured for pipe pulling. Minimum burial depths equal minimum cover listed above. A twenty-four (24) hour minimum curing time shall be required for glued joints prior to pulling pipe.

The Contractor shall backfill the mainline only after lines have been reviewed and tested.

Excavated material is generally satisfactory for backfill. Backfill shall be free from rubbish, vegetable matter, frozen materials, and stones larger than two (2) inches in maximum dimension. Unsuitable backfill material shall be removed from the job site. Backfill placed next to pipe shall be free of sharp objects which may damage the pipe.

All trenches shall be backfilled so the soil is level with the surrounding ground. Soil shall not be allowed to settle and create depressions in the trenches. All backfilled trenches should be tamped to prevent low areas from occurring.

Excess backfill shall be incorporated into surrounding site grades.

Where utilities interfere with irrigation trenches and pipe work, the Contractor shall contact the Design Engineer or City Engineer for trench depth adjustments. The Contractor shall show all modifications on the as-built drawings.

Pipe Installation

Before starting work on irrigation system, the Contractor shall determine that work may proceed without disruption of activities of other trades.

The Contractor shall carefully check grades to ensure that the area is safe to begin work.

The Contractor is responsible for taking all reasonable investigative actions and precautions when working around any utility system. The Contractor shall be responsible to repair any utility he has damaged due to the installation of the irrigation system.

The Contractor shall install concrete thrust blocking (approximately 1 cubic foot per block) at all changes of direction 45 degrees or greater on all mainline, 2 inch or larger. The Contractor shall install 3,000 minimum psi concrete thrust blocks per the details. Pipe restraint system shall be used in lieu of thrust blocks on bell and gasket pipe where specified.

Piping: Lay pipe in properly excavated trenches in accordance with the following criteria:

1. All lines shall have a minimum clearance of four (4) inches from each other and twenty-four (24) inches from other utility lines.
2. Pipe depths shall be as follows:
    a. Main line eighteen (18) inches below finish grade.
    b. Lateral lines twelve (12) inches below finish grade.
    c. A minimum cover of twenty-four (24) inches shall be provided between the top of the pipe sleeve and bottom of aggregate base for non-pressure (lateral line) piping installed under asphaltic concrete paving.
    d. A minimum of thirty-six (36) inches shall be provided between the top of the pipe sleeve and the bottom of aggregate base for pressure mainline piping installed under asphaltic concrete paving.

e. Sleeves shall be two (2) times the diameter of lateral line, mainline, and wire bundle size, and a minimum of two (2) inches in size. Separate sleeves shall be installed for each use. For circuit piping, drain valves shall be sloped at least ½ inch in ten (10) feet of run.

3. PVC pipe shall be installed in dry weather when temperature is above forty (40) degrees Fahrenheit in strict accordance with manufacturer's instructions. Joints shall be allowed to cure at least twenty-four (24) hours at temperatures above 40 degrees Fahrenheit before testing, unless otherwise recommended by the manufacturer.
4. All PVC piping shall be flushed after installation and prior to head installation to remove debris from lines.
5. Drip irrigation lines shall be installed in a serpentine pattern weaving in and out of plants within six (6) inches of base of plants.
6. In areas with trees, the drip tubing shall circle the entire base of the tree.

Manual Drain Valves

Manual drain valves shall be installed at each end of the main irrigation supply line. Manual drain valves shall consist of a PVC valve that dumps into a drainage pit. All manual drain valves shall be placed in an appropriately sized valve box.

Drainage Pits

One (1) cubic foot of clean gravel, 1 ½" – 2" size, shall be located at all manual and automatic drain valves. The drainage pit shall be covered with a soil separator and backfill to finish grade with excavated soil material.

Sprinkler Heads

Circuit lines shall be flushed with a full head of water and heads shall be installed after the hydrostatic test is completed.

All sprinkler heads shall be set plumb at the elevation to be flush with finish grade. Where settlement may occur, the Contractor shall correct the grad so the finish grade is flush with surrounding land forms.

Part-circle heads shall be located to maintain a minimum distance of six (6) inches from walls and fences, and two (2) inches from other boundaries, unless otherwise indicated.

Wiring

The control wire shall be 14 gauge, specifically designed for direct burial use and two-wire control system. A minimum of seven (7) extra wires shall be pulled from each controller to the last valve operated by that controller. A minimum loop of twenty-four (24) inches shall be left at each valve, at each splice, at each change in direction, at every five (5) feet of straight run, and at each controller for expansion and/or servicing.

Wire shall be placed consistently along one side of the pipe in the trench. Splices and connections shall be water tight and leak proof. Multiple wires in the trenches shall be banded together at twenty (20) foot intervals for protection.

All wiring under concrete shall be placed in sleeves.

Controller
Automatic controllers shall be in locking cabinets. Locations shall be approved by the City of Olathe.

The irrigation Contractor shall ensure that controllers are properly programmed by the manufacturer for the project prior to their installation.

One controller shall be provided on median or roundabout systems with 4 or less valves.

7411 CLEANUP

The Contractor shall keep the premises free at all times from wasted materials. Debris shall be cleaned up on a daily basis and the site shall be maintained in a neat condition.

The Contractor shall perform final cleanup prior to acceptance of the work by the City. Final cleanup shall include:

- Removal of dirt and unsightly substances from all visible surfaces and areas.
- Grading, raking, smoothing, replacing vegetation and other operations necessary to restore to original or better condition all areas affected by the Contractor's operations.

SECTION 7500 – TREES, SHRUBS AND GROUNDCOVERS

7501 SCOPE

This section covers the furnishing of all labor, equipment, tools, and materials necessary for the installation of all trees, shrubs and groundcovers as required by the project plans and specifications. Groundcover planting shall mean all woody ground cover plants as well as annual and perennial plant materials.

7502 GENERAL

The planting of trees, shrubs and ground covers shall consist of furnishing and installing all plant materials by an experienced Contractor familiar with planting in the Midwest. All plant material delivered to the site for approval and installation shall be identified and tagged, so as to ensure the plants are as specified and indicated on the contract documents.

Prior to planting, the Contractor shall locate all existing underground utilities and irrigation systems. The Contractor shall request direction from the City Engineer when there are conflicts between existing or proposed underground utilities and the location of the planting material.

The Contractor shall maintain all plant material until final acceptance of the project. Plant material guarantees shall be as stipulated in the warranty section of this document.

7503 MATERIALS

All plant material shall be nursery-grown stock, unless specified otherwise, and shall be equal to or larger than the sizes specified. It shall be certified by all federal and state regulations, conform to the American Standards for Nursery Stock Document (ANSI Z60.1) latest edition and shall be free of disease and hazardous insects.

Plants shall comply with USDA Plant Hardiness Zone 6a, or farther north. Plants shall be typical of their species or variety, and shall have a normal habit of growth. They shall be sound, healthy, vigorous, well-proportioned and well-branched. Evergreens shall have full foliage; other plants shall be densely foliated when in leaf. All plant material shall have healthy, well-developed root systems. Plants shall be free from mechanical injury, cultural injury, injury by animals and free of noticeable injury due to insect attack or blight.

The Contractor shall apply a commercial root stimulator approved by the City Engineer at rates recommended by the manufacturer following the initial plant watering.

Composted soil material shall be a well-rotted mix of organic materials free of any deleterious materials including stones over one (1) inch diameter, twigs, trash, etc.

Wood mulch material shall be shredded wood material free of dirt, rocks, weeds or other deleterious materials.

Transplant additive shall be . a mycorrizal fungal transplant inoculant containing the minimum mixture of appropriate species of mycorrhizal fungi and bacteria fungi stimulant, water retaining agents, mineral and organic nutrients and inert ingredients shown in Table 7503-1.

Table 7503-1 *- Transplant Additive Mixture Rates*

Additive	Rate	
Ectomycorrhizal Fungi		**95 million spores/lb**
Pisolithus. Tintorius	95 million spores/lb	
VA Mycorrhizal Fungi		
Entrophospora columbiana	1,325 spores/lb	
Glomus clarum	1,325 spores/lb	
Glomus etunicatum	1,325 spores/lb	
Glomus intraradices	1,325 spores/lb	
Rhisosphere Bacillus spp.		
Bacillus licheniformis	54 million cfu/lb	
Bacillius megaterium	54 million cfu/lb	
Bacillius polymyxa	54 million cfu/lb	
Bacillus subtillis	54 million cfu/lb	
Bacillius thuringliensis	54 million cfu/lb	
Paenibacillus azotofizans	54 million cfu/lb	
Terra-Sorb Hyrdogel (potassium polycarcrylamide)		**33.3%**
Formononetin		**0.007%**
Microbian Nutrients		**39.4%**
Kelp Mean	23.60%	
Humic Acids	10.50%	
Maltodextrin	3.70%	
Soluble Yucca Extract	1.60%	
Inert Ingredients		**27.293%**
Greensand	17.60%	
Leonardite (other than hulmic acids)	5.80%	
Clay	1%	
Talc	0.023%	
USPS Mineral Oil	2.87%	

The Contractor shall demonstrate installation of all transplant additives, and shall provide the actual quantity of transplant additive product applied to the City Engineer.

The number of transplant additive packets per tree/shrub shall be applied according to the manufacturer's recommended rates and instructions. The packet mix shall be evenly distributed into the upper eight (8) inches of backfill soil next to the rootball. Additive mixture shall not be placed in the bottom of the planting pit.

Tree stakes shall be studded steel fence posts. No wood stakes shall be used when staking trees.

7504 TIME OF PLANTING

Trees and shrubs shall be installed within the following time periods, unless otherwise approved by the City Engineer:

Spring	Fall
March 15 – May 15	September 15 – November 15

Perennial/Annual plants shall be installed within the following time periods, unless otherwise approved by the City Engineer:

Spring	Fall
April 15 – May 30	September 15 – November 15

7505 EXECUTION

Prior to planting operations, the Contractor shall schedule an onsite meeting with the City Arborist or representative to verify that subsoil and topsoil are properly prepared and ready to receive the planting material. The Contractor shall verify location of all underground and above ground utilities that may interfere with the installation of plantmaterials.

A. Excavation of planting pit for trees and shrubs:
The Contractor shall excavate a hole a minimum of four (4) feet in diameter or at least two times wider than the root ball diameter of the tree. There shall be a minimum of one (1) foot clearance on each side of the root ball. The depth of the pit shall be such that the top of the root ball where root flare begins is two (2) inches above finish grade with the root ball resting at the bottom of the pit.

B. Excavation of shrub planting bed(s):
All balled and burlapped or container-grown shrubs shall have a planting pit diameter sufficient in size to provide a minimum of six (6) inches clearance on each side of the container or ball of the shrub. The base of the plant shall be flush with the adjacent grade.

C. Excavation of groundcover planting bed(s):
The area designated for groundcover plantings shall be tilled to a minimum depth of twelve (12) inches in order to provide a plantable area for groundcovers.

D. Planting of trees and shrubs:
The top of the root ball where root flare begins shall be two (2) inches above the finish grade on all trees. All trees and shrubs shall be plumbed before backfilling and the Contractor shall maintain plumb while working backfill around roots. Remove all wire, twine and burlap from the top two-thirds of the root ball. Soil used in the tree pit shall consist of 3 parts excavated soil to 1 part compost, thoroughly mixed before planting. Firm the soil so the tree is plumb and adequately supported, but do not pack soil.

Saturate the entire backfilled soil with water, and add additional soil as needed to compensate for settling. Create a two (2) inch depression in the soil to hold water around the perimeter of the pit. Mulch a 5-foot diameter tree ring at the base of the tree with two (2) inches of mulch over root ball and three (3) inches of mulch over the remainder of the tree ring. Do not allow mulch to cover the tree trunk by more than ½ inch. Pruning of broken or dead branches shall only be conducted by, or under the direct supervision of, a Certified Arborist.

Stake all trees with two steel studded fence posts driven a minimum of eighteen inches (18") into soil outside of the planting pit. The post height above the finish grade shall be a minimum of five (5) feet. The tree tie system shall be approved by the City Engineer prior to installation. Ties shall be 17 ga. Galvanized fence wire, run through a piece of 12' garden hose, around the stem. Where possible, stakes shall be installed on a northeast to southwest orientation.

For non-irrigated trees, install watering bag with the tree planting. Install two (2) 20-gallon slow-release watering bags for each shade or ornamental tree per the manufacture's recommendations. For Evergreen trees, not irrigated, install similar bag which does not interfere with the lower branches of the unlimbed evergreen trees with similar dispersion rates.

For container plant material, the Contractor shall remove the container and spread out roots horizontally in the planting pit. Plant the roots as shallow as possible in a flared-out, horizontal position. Slice or shave the roots vertically down the sides of the root ball to release container-bound root material. Follow the same soil backfill installation as above for trees.

All shrub beds shall have a shoveled edge unless otherwise noted. Edge shall be six (6) inches in depth with consistently straight lines and smooth curves.

E. Planting of groundcovers:

The soil in areas designated for groundcovers shall be loosened by roto-tilling or other approved method to a minimum depth of twelve (12) inches prior to the planting operation. The backfill material shall be thoroughly mixed topsoil and composted peat moss. No more than 10% of the soil mix shall consist of clods one (1) inch or larger.

Plants shall be evenly spaced at the specified distance in a triangular pattern, unless otherwise noted on the plans. Spacing shall dictate the final quantity of plants per bed. Spacing from pavement, curb, similar hard surfaces and edges of plant bed shall be ½ the specified plant spacing. Spacing between different species shall be the sum of ½ the space for each species.

All groundcover beds shall have a shoveled edge unless otherwise noted. Edge shall be six (6) inches in depth with consistently straight lines and smooth curves.

All mulch shall be applied to a depth of two (2) inches in all ground cover planting bed areas and to a depth of three (3) inches in all annual, perennial, and shrub planting bed areas.

All ground cover beds shall be thoroughly watered immediately after planting is completed. For beds in areas of existing vegetation, the Contractor shall verify the location and remove all vegetation. An herbicide treatment may be necessary to eradicate existing vegetation. Round-up or similar herbicide shall be applied a minimum of two (2) weeks prior to planting, and plant material shall not be installed in planting beds within two (2) weeks of the herbicide treatment. All shrub and ground cover beds shall be roto-tilled as described above.

e.

7506 MAINTENANCE

Contractor shall maintain all planted areas until the final acceptance of the project.

For shrubs and groundcovers, without watering bags, each watering shall provide a deep soaking of the entire plant bed including the plant root zones and soil areas between the plants.

For plants with watering bags, each watering shall fill the watering bag to full capacity as recommended by the manufacturer.

Contractor shall guarantee that all plant material is alive and in an acceptable form at the time of final acceptance.

7507 RECORD KEEPING

Contractor shall maintain a log of his watering operations and rain events to show compliance with the watering requirements, and shall submit the records to the City Engineer at the end of the required maintenance period. The plantings shall not be accepted until the watering loghas been approved by the City Engineer.

7508 WARRANTY

Contractor shall guarantee all plant material on the project for a minimum of one (1) year from final acceptance of the project. Any dead or dying plant material found during the guarantee period shall be removed from the project site by the Contractor and replaced. If the Contractor does not remove the plant material within a reasonable time, the City will remove the plant and add it to the list of replacement materials. The Contractor shall report to the City and log those removals and the specific locations of replacements. Replacement of any dead or removed material shall occur within the planting periods as described in Section 7504.

SECTION 8000 - MATERIALS TESTING

8001 SCOPE

This section shall apply to all required testing services for soils, asphalt, concrete and other materials, as required by the City Engineer.

8002 GENERAL

All materials testing shall be conducted by a testing laboratory qualified and approved by the City Engineer to perform the required sampling, analysis, testing and report writing services. Reports shall be prepared by or under the supervision of and bear the seal and signature of a professional engineer licensed in the State of Kansas. Improperly completed or certified reports will not be accepted.

8003 RESPONSIBILITIES OF THE CONTRACTOR

The Contractor shall be responsible for all costs associated with the required sampling and testing unless otherwise specified. The Contractor shall allow the testing agency access to the job site and shall furnish any labor required to obtain and handle samples at the source of the material and at the project site. Adequate facilities shall be provided at the project site for the safe storage and proper curing of specimens. The use of a testing agency's service does not relieve the Contractor of the responsibility to furnish the required materials and to perform the required construction in full compliance with the City of Olathe *Technical Specifications for Public Improvement Projects*. The successful passing of a test does not constitute acceptance of the work or materials represented by the test or any portion of the work or materials. Final acceptance of the project shall be granted only through the acceptance of the Project Completion Certificate by the City Council and the expiration of the two (2) year maintenance period as established in these specifications.

8004 RESPONSIBILITIES OF THE TESTING AGENCY

All testing agencies shall meet the requirements of ASTM E329. A representative shall inspect, sample and test the materials and work as required by the City Engineer. Any material furnished or work performed by the Contractor failing to conform to the specification requirements shall be immediately brought to the attention of the City Engineer and the Contractor. Preliminary written field reports of all tests and inspection results shall be given to the Contractor and City Engineer immediately after they are performed. Results of all tests taken, including failing tests, shall be reported. The testing agency and its representative are not authorized to modify any requirement of the specifications, nor to approve or accept any portion of the work.

8005 ASPHALT TESTING

Sampling and testing of the asphalt mix shall be required on all asphalt paving projects constructed in the City of Olathe.

Sampling and testing of asphalt mixes for modified Superpave surface and base shall be performed as required in Section 1300 of these specifications.

Sampling and testing of asphalt mixes utilized for the construction of local and collector streets, bicycle paths, trails, parking areas, and other areas where modified Superpave is not specified shall be performed as follows:

Samples of the actual asphalt mix being used shall be acquired by a qualified testing laboratory technician at either the construction site or the batching plant per ASTM Standards D979 and D3665. These samples shall be used to perform the following tests:

- Aggregate Gradation in accordance with ASTM C136
- Asphalt Content on total mix basis with dust to binder ratio reported in accordance with ASTM D6307, Ignition or ASTM D2172, Extraction.
- Stability and Flow per ASTM D5581.
- Bulk Specific Gravity in accordance with ASTM D2726

A minimum of one complete group of tests shall be conducted on both the base material and the surface material for each paving project. Additional sampling and testing shall be as required by the City Engineer.

The Contractor shall be required to secure, at his expense, the services of an approved independent testing laboratory to verify the test results submitted by the Contractor's laboratory. The Contractor's laboratory will coordinate with the laboratory performing verification testing to ensure the samples are taken at the same location and time. A minimum of one verification test shall be conducted on both the base material and the surface material for each paving project. Additional verification testing shall be as required by the City Engineer. The Contractor's laboratory shall furnish the verification laboratory other items such as the Job Mix Formula (JMF) mix gradation, plant setting, bulk specific gravity of the aggregate and specific gravity of the asphalt. Laboratories shall compare final test results when the mix is out of specification. The test results shall indicate whether adjustments are required to bring the mix design into conformance with specification tolerances.

In-place density tests shall be conducted with a nuclear density gauge during the course of the work. Density tests may be performed by City Engineer to verify compliance with compaction requirements. The asphalt shall be compacted to a density equal to or greater than 95% of maximum density as determined by the fifty (50) blow Marshall procedure. The number and locations of tests to be taken shall be determined by the City Engineer. Tests performed with a nuclear density gauge shall be conducted in accordance with ASTM D2950.

8006 CONCRETE TESTING

Sampling and testing shall be required on all concrete work. See Table 8006-1 for frequencies and required tests.

Table 8006-1 *- Portland Cement Concrete Testing Requirements, Methods and Frequencies*

Type of Construction	Required Test	Method	Frequency
Portland Cement Concrete structures and miscellaneous construction	Temperature Slump Air Content Unit Weight Cylinders (4 per set)	KT-17 KT-21 KT-18 or KT-19 KT-20 KT-22	Minimum of 1 set per 50 cubic yard placed or fraction thereof as directed by the City Engineer
Portland Cement Concrete pavement	Temperature Slump Air Content Unit Weight Cylinders (4 per set) Profilograph	KT-17 KT-21 KT-18 or KT-19 KT-20 KT-23 KT-46	Minimum of 1 set per 100 cubic yard placed or fraction thereof as directed by the City Engineer. Profilograph as required by the City Engineer

If samples of fresh concrete have not been obtained and tested, a minimum of three (3) cores shall be taken per ASTM C42 and broken as directed by the City Engineer. Air content in accordance with ASTM C457 and cement content per ASTM C1084 shall also be determined. The test results will be considered adequate if the average strength of the cores is equal to a minimum of 95% of the specified strength (f'c) and if the strength of any single core is not less than 80% of f'c. All core holes shall be completely filled with a low-slump, high strength concrete at the Contractor's expense.

All reports by testing laboratories shall include the type of structure or pavement and information on obtaining, transporting, storing, curing, time between obtaining and casting cylinders (when applicable), supplier, finisher and batch as well as the specific test data.

8007 SOIL TESTING

Sampling and testing shall be required on all subgrade preparation for street construction and all trench backfilling operations within the City of Olathe.

Prior to beginning any work on street subgrade the Contractor shall secure the services of a qualified testing agency to acquire samples of the material to be used for subgrade construction. These samples shall be analyzed to determine Proctor values, liquid limits and plasticity index. The technician will take the samples at locations determined by the City Engineer. Copies of the analysis shall be provided to the City Engineer for review prior to commencing any subgrade preparation.

Tests for subgrade material requiring fly-ash modification shall be in accordance with the requirements of Section 1200.

The City Engineer shall designate the locations and depths at which a qualified technician shall perform moisture-density testing of the subgrade material in accordance ASTM D698 for cohesive soils and ASTM D4253 and D4254 for non-cohesive soils. The number of tests taken shall be as directed by the City Engineer. Reports for moisture-density tests shall include the following:

- Project name and number
- Date
- Location of test
- Depth or elevation of test
- Soil/Proctor description
- Proctor density
- Density-% of Proctor
- Wet density
- Dry density
- Optimum moisture %
- Actual moisture %
- Weight of water

Results of these tests shall indicate whether or not the performance specifications stated in Section 1200 of these Specifications have been achieved. If the tests indicate the compaction is not sufficient, the Contractor shall rework the area to achieve satisfactory compaction. Tests performed with a nuclear density gauge shall be conducted per the requirements of ASTM D6938.

During trench backfilling, in-place density tests may be required by the City Engineer. The number and locations of tests to be taken shall be determined by the City Engineer. Results of these tests shall indicate whether or not the performance specifications stated in Section 4000 have been achieved. If the tests indicate the compaction is not sufficient, the Contractor shall rework the material to achieve satisfactory compaction.

SECTION 9000-STREET LIGHTING

9001 SCOPE

This section applies to all street light construction and shall consist of furnishing all labor, materials and equipment for the complete installation of street lighting systems. A complete list of approved products for street lighting is available on the City of Olathe public website at www.olatheks.org.

9002 GENERAL

The standard street light details that accompany these specifications shall be considered a part thereof. These standard details are available on the City of Olathe public website at www.olatheks.org.

When a conflict arises with the plans or specifications and the proposed work, the Contractor shall immediately notify the City Engineer. The City Engineer will review the plans and provide direction to the Contractor.

All incidental parts which are not shown on the plans or specified herein, and which are necessary to complete the street lighting system shall be furnished and installed as though such parts were shown on the plans or specified herein. All systems shall be complete and in operation to the satisfaction of the City Engineer at the time of acceptance of the work.

All appurtenances shall be located as shown on the plans. Any deviations must be approved by the City Engineer.

The Contractor shall always have a signed copy of the plans and specifications at the job location.

Prior to the acceptance of the work, the Contractor shall submit an “as-built” or corrected plan showing all construction changes in detail, including location and depth of conduit. As-builts shall be provided in Adobe pdf format.

9003 GRADES

All work shall conform to line, elevation and grades as shown on the plans.

9004 REGULATIONS AND CODE

All electrical equipment shall conform to the standards of the National Electrical Manufacturers Association (NEMA). In addition to the requirement of these specifications, the plans and the lighting specifications, all material and work shall conform to the requirements of the National Electric Code (NEC), the Standards of the American Society for Testing Materials (ASTM), the American Standards Association (ASA), the Illuminating Engineering Society (IES) and all local ordinances.

The approved plans and applicable codes adopted at the time of advertisement for bids shall govern the work unless otherwise required by the City Engineer.

9005 PRELIMINARY SCHEDULE OF EQUIPMENT AND MATERIAL

Within twenty (20) days following the date of the approval of a final plan, the Contractor shall submit a complete schedule of materials and equipment proposed for installation. This schedule shall include catalog cuts, diagrams, drawings, and other data as may be required. In the event any material or equipment contained in the schedule fail to comply with specification requirements, such items may be rejected.

In lieu of submitting catalog cuts, the Contractor may utilize pre-approved materials as shown on the City of Olathe Approved Materials List. The Contractor shall then list the materials from the pre-approved list that are proposed for use and submit to the City for approval.

9006 REJECTED MATERIALS

Rejected materials shall be immediately and permanently removed from the project site by the Contractor. Work shall be commenced and continued at such points as may be approved by the City Engineer and shall be carried on diligently and without unnecessary or unreasonable delay.

9007 EXISTING UTILITIES

The Contractor shall locate all utilities, whether above, on, or below the ground, and shall be responsible for all damages arising from his negligence to protect existing utilities.

No new fixture shall be constructed which conflicts with any existing utility facilities or the approved plans, unless otherwise approved by City Engineer.

9008 PERMITS

The Contractor shall have a set of plans signed by the City Engineer before the commencement of any work, which will authorize the Contractor to work within the right-of-way.

9009 NOTIFICATION

The Contractor shall notify the City Engineer and Traffic Operations at 913-971-5180 five (5) days before beginning work on the project. The Contractor shall provide the City Engineer weekly, or more frequent as requested, written progress reports with estimated completion dates. The City Engineer may require any work completed without inspection to be dismantled for inspection and reassembled as required.

9010 PROTECTION OF WORK AND CLEANUP

The Contractor shall be responsible for all work until final completion and acceptance by the City. All damage done to existing infrastructure shall be repaired by the Contractor. The

Contractor shall remove all surplus material and rubbish from the work site as it accumulates and before the Contractor makes application for the acceptance of the work.

9011 TRAFFIC CONTROL

All traffic control shall be in conformance with the General Provisions of the City of Olathe *Technical Specifications and Design Criteria for Public Improvement Projects*.

9012 TURN ON AND TESTING

The Contractor shall contact the City of Olathe, Traffic Operations at 913-971-5180, for an electrical inspection as soon as the control center(s) is/are installed. Prior to the inspection, the Contractor shall coordinate with the electrical service provider to ensure electric service is available to energize the system.

All street lighting system elements shall function properly as a complete system for a minimum period of fifteen (15) consecutive days before acceptance by the City. Any malfunction observed or recorded shall stop the test period as of the time of the malfunction, and the test period shall not resume until all components are satisfactorily operating.

9013 BONDING

The Contractor shall submit a performance and maintenance bond on all projects before beginning construction. The amount of the bond shall be for the full amount of the project and shall remain in effect for a period of two (2) years after the date of completion and acceptance by the City Council.

9014 MAINTENANCE

During a period of two (2) years from the date of project acceptance by the City, the Contractor shall make all needed repairs resulting from defective workmanship or materials. If within ten (10) days after providing written notification the Contractor neglects to make or to undertake with due diligence the required repairs, the City shall make such repairs at Contractor's expense. In case of an emergency where, in the judgment of the City Engineer, delaying the repair would cause serious loss, hazard, or damage, repairs may be made without notifying the Contractor, at Contractor's expense.

9015 GENERAL MATERIAL SPECIFICATIONS

All materials used in the fabrication or assembly of the items listed below shall comply with approved plans and Standard Details.

All lighting equipment shall be new and shall be approved by the City Engineer.

9016 ALUMINUM STANDARDS

The type of pole and length of luminaire arm (if any) shall be as specified on the approved plans. The contractor shall contact the City Engineer or Project manager to determine the color of the

pole. This pole specification is in addition to the Standard Details, which describes the material specifications and pertinent design details.

20', 30' and 40' Poles

1. Shaft. The aluminum lighting shaft assembly shall be constructed from one piece of seamless tubing with a mechanical strength of not less than T6 temper. The cross section of the pole shall be round, and the shaft shall be fabricated in a continuous true taper from at least six (6) inches above the handhole to the top of the shaft. The shaft shall have no longitudinal or circumferential welds, except to join the shaft to the base. The assembly shall be tire wrapped with a non-staining paper during shipping.

   Pole dimensions shall be as specified on the Standard Details. It is the responsibility of the fabricator to verify and attest that the poles are structurally adequate and in full compliance with this specification and the Standard Details.

2. Handhole. Each shaft shall be equipped with a minimum 4" x 6" (clear opening) handhole with frame and cover, and a grounding lug located opposite the handhole. The handhole opening shall be clear of any interference from the handhole reinforcing frame. When the pole is installed, it shall be positioned so that the handhole is facing away from traffic.

3. Shoe Base. The shoe base shall be a permanent mold casting. The base shall be free of cracks, pits, and blow holes and of sufficient size and strength to withstand full design loads. The base shall telescope the shaft, and one weld shall be on the inside of the base at the end of the shaft, while another weld shall be on the outside at the top of the base. The shoe base and the two (2) welds shall develop the full strength of the pole assembly.

   The base shall be cast with four (4) slotted holes to receive the anchor bolts-threaded studs and tapped holes for attaching the four (4) cast aluminum alloy removable bolt covers provided for each pole. The bolt covers shall attach to the upright portion of the body of the base. The bolt circle is provided in the Standard Details.

4. Luminaire Arm. The single member arm shall be tapered by cold working from round tubing. After tapering, the member shall be flattened to produce an elliptical cross-section with the major diameter in the vertical plane, perpendicular to the wind. The outboard end of the arm shall remain round with a 2-inch slipfitter for mounting the luminaire. The single member arm shall be designed to meet all design factors and mounting dimensions.

   The truss type member arm assembly shall be a one piece welded assembly consisting of an upper arm and lower arm (brace) securely joined by a vertical strut and a connector or weld at the outboard end of the arm assembly. The upper arm shall be tapered by cold working from round tubing. After tapering, the upper arm shall then be flattened to

produce an elliptical cross-section with the major diameter in the horizontal plane, parallel to the wind. The outboard end of the upper arm shall remain round with a 2-inch slipfitter for mounting the luminaire. The outboard end of the lower arm (brace) shall be covered by an end cap.

Luminaire Arm for all 20' poles shall be specified within the most recent approved materials list for streetlights.

5. Breakaway Support. All 30-foot and 40-foot poles shall be equipped with breakaway supports. The support shall be a frangible base approximately nine (9) inches tall with a door on one side for both single and double arm poles. When the breakaway support is installed, it shall be positioned so that the door faces away from traffic.

9017 ILLUMINATION EQUIPMENT

LED Roadway Luminaire

LED luminaires with Ubicquia Ubicells shall be installed on all roadways in accordance with the Approved Products List.

9018 ELECTRICAL MATERIAL

Secondary Cable and Power Lead-in Cable

Power lead-in cable shall be 2/0 A.W.G. and secondary cable shall be #4 A.W.G. stranded annealed copper, ground wire clearly marked the entire length for operation at 600 volts maximum. All secondary service cable shall be installed in 3-inch inside diameter (I.D.) conduit conforming to the Standard Details and these specifications. All branch circuit cable shall be installed in a 2-inch inside diameter (I.D.) conduit conforming to the Standard Details and these Specifications. Material shall meet the applicable requirements of I.P.C.E.A. Standard S-19-81, with thermoplastic insulation of GRS- Rubber base meeting Appendix K (A) of Insulated Cable Engineers Association (I.C.E.A.) and listed by U.L. as Type U.S.E. for direct burial; or material shall meet the applicable requirements of I.C.E.A. Standard S-66-524, interim standard #2, with thermo setting insulation of cross link polyethylene meeting requirements of Column "A" of I.C.E.A. and listed by U.L. as Type U.S.E. RHW-75°C.

Ground Cable

All poles shall be bonded to form a continuous system. At each multiple service point, two (2) grounding electrodes shall be installed at least six (6) feet apart. The electrodes shall be a copper rod not less than one-half (1/2) inch in diameter and ten (10) feet in length, unless otherwise noted on the plans, driven to a depth so the top is six (6) inches below the surface of the ground. The service equipment shall be bonded to the driven ground rods by a No. 4 A.W.G. copper wire enclosed in a one (1) inch diameter conduit.

Pole and Bracket Cable

Pole and bracket cable above the handhole in pole to luminaire(s) shall be No. 14 A.W.G. 4 Conductor electrical wire. The conductor shall be stranded annealed copper.

Control Center and Service Disconnect Pedestal

Control centers and service disconnect pedestals shall be in accordance with the Approved Materials List.

1. Control Center. The control center (street light cabinet) shall be an underground service type, rated for 200 A (as specified on the plans) and 240 volts. The pedestal shall be heavy-gauge aluminum raintight construction with an individual meter, panel, conductor, and rear service pull compartments. The panel compartments shall have piano-hinged doors and include a Corbin Lock accessible with a #2 Traffic Signal key. The meter base shall be of the type used by the local utility. The panelboard shall have a copper bus and shall accept twelve 1-inch plug-in breakers in accordance with the Standard Details. The panelboard compartment shall contain a photocell and test switch. All factory installed wire shall be copper. The control center shall be U.L. listed. The pedestal finish shall be natural aluminum.

2. Service Disconnect Pedestal. The service disconnect pedestal (meter pedestal) shall be an underground service type, rated for 200 amps and 240 volts, in accordance with the Standard Details.

Conduit

Rigid nonmetallic conduit shall be High Density Polyethylene (HDPE) Schedule 40 or Schedule 40 polyvinyl chloride (PVC) conduit. PVC will only be used for sweeping 90-degree bends at pole bases, control centers and boxes. All nonmetallic conduits shall be gray in color. The conduit shall bear an Underwriters' Laboratories label and shall conform to Federal Specification W-C-1094A (latest version).

9019 EXCAVATION

The Contractor shall perform all excavations for installing underground conduits, cable, boxes and pole bases to the depths indicated on the drawings unless otherwise approved by the City Engineer. During excavation, material suitable for backfilling shall be stockpiled in accordance with Section 4000. All excavated materials not required or unsuitable for backfill shall be removed from the site by Contractor.

9020 BACKFILLING

All areas excavated shall be backfilled and compacted in accordance with the City of Olathe *Technical Specifications and Design Criteria for Public Improvement Projects*, Section 4000.

9021 SODDING

All areas will be sodded in accordance with the City of Olathe *Technical Specifications and Design Criteria for Public Improvement Projects*, Section 7200.

9022 REPLACING DAMAGED IMPROVEMENTS

Improvements such as sidewalks, curbs, gutters, Portland cement concrete and asphaltic concrete pavement, bituminous surfacing base material and any other improvements removed, broken or damaged by Contractor shall be replaced or reconstructed with the same kind of materials as found on site or with materials of equal quality. The replaced improvements shall be left in a serviceable condition satisfactory to City Engineer. Whenever a part of a square or slab of existing concrete sidewalk, driveway or pavement is damaged, the entire square or slab shall be removed and replaced at the Contractor's expense.

9023 FOUNDATION ANCHORS

Screw-in foundation anchors shall be in accordance with the Standard Details. All anchors shall include an integral theft device. The anchors shall be screwed into the ground; pre- drilling holes for the anchor shall not be permitted. In instances where voids are created below the level of the conduit entry points, flowable fill shall be used to fill the void up to the bottom of the conduit entry point. During installation, the foundation shall be plumbed with a level and the base plate shall be level.

Minor leveling adjustments on poles shall be made with the use of leveling shims or washers. Shims and washers shall be galvanized or cadmium-plated steel no more than 1/4-inch thick. Only one (1) shim or washer shall be allowed at any one anchor bolt, with a maximum of two (2) on any pole.

If installation of a screw-in foundation anchor is not feasible for any reason, concrete foundations shall be installed at Contractor's expense.

9024 CONCRETE FOUNDATIONS

The bottom of the concrete foundations shall rest on firm ground, and foundations shall be poured monolithically. The exposed portions shall be formed and finished to present a neat appearance and shall be true to line and grade. The top of footing elevation shall be established using the finished curb or sidewalk unless otherwise directed by City Engineer. Forms shall be rigid and securely braced in place. Conduit ends and anchor bolts shall be placed in proper position to proper heights and held in place by means of a template until the concrete sets. Anchor bolts shall be provided with a hex head nut, flat washer and lock washer. The forms and ground which will contact the concrete shall be thoroughly moistened before placing concrete.

Concrete for pole base and control center foundations shall be KDOT Grade 4.0 AE.

Concrete shall not be placed until forms and reinforcing steel have been approved by the City Engineer. Placement of concrete shall be inspected by the City Engineer during construction.

Concrete pole bases shall be consolidated by an internal-type vibrator. The vibrator shall operate at frequencies of vibration not less than 4,500 cycles per minute under load. The amplitude of vibration shall be adequate to property consolidate concrete. The concrete shall be cured with an approved moisture barrier such as wet burlap, polyethylene, etc., for a period of seventy-two (72) hours. Cold weather curing shall be such that the concrete temperature shall be maintained above freezing for the entire curing period. Forms shall not be removed until the concrete is thoroughly set.

Control center foundation shall have four (4) conduits for exiting cable that end in a Type 3 Junction Box. The direction of the exiting conduit shall be determined by the City Engineer. The control center foundation shall be oriented so that the porch of the foundation allows the technician to view traffic while accessing the cabinet.

9025 CONDUIT

Conduit shall be of a rigid type conforming to the provisions and diameters specified in the approved plans. Installation shall conform to the appropriate articles of the National Electric Code. All street lighting cable shall be installed in two (2) inch Schedule 40 HDPE except two (2) inch Schedule 40 PVC may be used for sweeping 90-degree bends at pole bases, control centers and boxes. Where conduits connect from more than one direction, they should terminate in a Type II junction box in accordance with the Standard Details.

It shall be the option of the Contractor, at his own expense, to use larger size conduit if desired; and where larger size conduit is used, it shall be for the entire length of the run. No reducing couplings will be permitted.

The ends of all conduits shall be well reamed to remove burrs and rough edges. Field cuts shall be made square and true so that the ends will butt together throughout the entire circumference of the joint. Slip joints will not be permitted for coupling conduit. All couplings shall be fitted and tightened until the ends of the conduits are firmly joined.

The location of street crossings of all conduits installed or used on the project shall be marked by a saw cut arrow placed in the face of curb, gutter, or wall, directly above the conduit in accordance with the Standard Details.

All joints in PVC conduit shall be glued. HDPE to PVC adapters shall be permitted to connect HDPE and PVC conduits.

Conduit bends, except factory bends, shall have a radius of not less than six (6) times the inside diameter of the conduit. Where factory bends are not used, conduit bends shall be made without crimping or flattening, using the longest radius practicable.

Conduit shall be jacked under pavement sections at a depth of thirty-six (36) inches below bottom of pavement. Conduit installed in trenches in unpaved areas, shall be laid to a depth of thirty-six (36) inches below natural ground level.

Conduit shall be placed under existing pavement by approved jacking or drilling methods. Pavement shall not be disturbed without the written permission of City Engineer. Jacking or drilling pits shall maintain two (2) feet clear distance from the edge of any type of pavement. Excessive use of water shall not be permitted.

Conduit set in standard bases shall extend vertically approximately three (3) inches above the foundation. Conduit entering through the bottom of a junction box shall be located near the ends to leave the major portion of the box clear. Conduit entering service boxes shall terminate two (2) inches inside the box wall and shall be sloped to facilitate pulling of cable. At all outlets, conduit shall enter from the direction of the run.

Conduit entering junction boxes shall be continuous into the box, and conduit elbows shall be provided to bring the conduit up into the box.

Wherever the end of a conduit is installed within five (5) feet of another conduit or junction or service box, the conduit shall be made continuous between the conduits or into the box.

Existing underground conduit to be incorporated into a new system shall be cleaned with a mandrel and blown out with compressed air.

The location of conduit runs shown on the plans are for bidding purposes only and may be changed with permission of City Engineer to avoid underground obstructions.

9026 SERVICE AND JUNCTION BOXES

Service boxes and junction boxes shall be installed at the locations shown on the plans in accordance with the Standard Details. The Contractor may install, at his own expense, additional boxes with written approval from the City Engineer. Type 3 junction boxes shall be used where the four (4) conduits for exiting cable from the control center end. Type 2 junction boxes shall be used for all other applications.

Service boxes and junction boxes shall be installed on eighteen (18) inches and eight (8) inches of KDOT PB-2 aggregate, respectively, as shown on the plans or as directed by the City Engineer. Boxes shall be installed so that the covers are level with the curb or sidewalk grade, or level with the surrounding ground when no grade is established.

9027 WIRING

Roadway lighting conductor cables shall be installed inside conduit, suitable for a 240-volt system in accordance with the approved plans. Wiring shall conform to the appropriate articles of the National Electric Code. Cable shall be laid to a minimum depth of thirty-six (36) inches below the bottom of the pavement or the natural ground level, whichever is applicable, and be installed in continuous lengths. No splices of cable will be permitted in conduit or outside of service boxes, junction boxes or pole bases.

Powdered soapstone, talc or other approved lubricant shall be used when inserting conductors in conduit. All cable to be installed in one conduit shall be pulled by the contractor in one operation, and all ends shall be taped until the splices are made or terminal appliances attached. Ends of spare conductors shall be taped.

All splices in junction boxes and service boxes shall be made with appropriate watertight splice connectors in accordance with the Standard Details.

One foot of slack shall be left at all control centers, junction boxes and service boxes for splicing and connecting wires. Wiring within boxes shall be neatly arranged and laced. Wires shall be color-coded (Black and Red = hot, green = ground) and circuits permanently identified in accordance with the approved plans.

All splices in light pole bases shall be made with multiple-tap, molded connectors. The Contractor shall install in-line fused disconnects with the female end of the connector on the line side. Fuse holders in all poles shall be crimped. Fuses shall be KTK or approved equal, eight (8) amp, high interrupting fuses. The multiple-tap connectors and fuse holders shall be installed convenient to the handhole at the base of the pole. One (1) foot of surplus cable shall be coiled at the line side of the multiple-tap connector, between the multiple-tap connector and the fused disconnect, and on the load side of the fused disconnect. The unfused connectors for the ground shall be installed with the female end of the connector on the line side.

9028 GROUNDING

All poles shall be bonded to form a continuous system. At each multiple service point, two (2) grounding electrodes shall be installed at least six (6) feet apart. The electrodes shall be a copper rod not less than one-half (1/2) inch in diameter and ten (10) feet in length, unless otherwise noted on the plans, driven to a depth so the top is six (6) inches below the surface of the ground. The service equipment shall be bonded to the driven ground rods by a No. 4 A.W.G. copper wire enclosed in a one (1) inch diameter conduit.

9029 LOCATION

Unless otherwise noted on the plans, or otherwise approved by the City Engineer, equipment shall be located as follows:

- Cable shall be kept a minimum of two (2) feet and a maximum of four (4) feet behind the back-of-curb.

- Street light poles shall be installed on property lines at a distance of three (3) feet, plus or minus one (1) foot, behind the back-of-curb. When the pole is installed, it shall be positioned so that the handhole is facing away from traffic.

- Junction boxes shall be installed a minimum of two (2) feet and a maximum of four (4) feet behind the back-of-curb and no closer than two (2) feet to any street light pole.

- Control centers shall be located adjacent to the sidewalk or a minimum of five (5) feet and a maximum of six (6) feet behind the back of curb if no sidewalk exists. The control center foundation shall be oriented so that the porch of the foundation allows the technician to view traffic while accessing the cabinet

9030 STREET LIGHTING COMPLETION TIME

The streetlights shall be installed and accepted prior to issuance of any occupancy permits.

SECTION 9100 - PAVEMENT MARKINGS

9101 SCOPE

This section discusses the requirements for pavement markings.

9102 DEFINITIONS

Longitudinal markings shall include pavement markings parallel to the path of travel and include such items as centerlines, lane lines, edge lines, and barrier lines. Lines may be either continuous (solid) or broken.

Transverse markings shall include pavement markings perpendicular to the path of travel and include such items as channelizing lines, stop bars, crosswalk lines, railroad crossing approaches, parking limit lines, turn arrows, and word or symbol messages.

9103 GENERAL

All pavement markings shall be in accordance with the latest edition of the Manual on Uniform Traffic Control Devices (MUTCD). All words and symbols shall conform to the latest edition of *Standard Highway Signs* printed by the US Department of Transportation, Federal Highway Administration. All pavement marking material shall be included on the City of Olathe *Approved Materials List*, latest edition.

Contractor shall be required to layout the location of all longitudinal pavement markings before the surface lift of asphalt is paved. Layout shall include reference lines that result in the proper lane widths and ensure the pavement markings will be located the proper distance from pavement joints. The layout will need to be approved by the City Engineer prior to pavement marking installation.

All turn arrows and legends shall be centered in their respective traffic lanes. Pavement markings, either temporary or permanent, are required at all times if the roadway is open to traffic. All existing markings that conflict with the proposed markings shall be completely removed. The edge of pavement markings paralleling the longitudinal pavement joints shall be located four (4) inches to eight (8) inches from the pavement joint unless otherwise approved by the City Engineer.

All longitudinal markings shall be HPS-8 Integrated Multi-Polymer Pavement Markings (HPS-8) or cold tape (hot-inlaid) per the manufacturer's recommendations and the following requirements:

- Application of HPS-8 shall only occur from April 1 to Nov 1 and shall comply with all manufacturer's recommendations, unless otherwise approved by the City Engineer. Pavement markings installed outside these dates, or when HPS-8 cannot be installed due to manufacturer's recommendations, shall be cold plastic. Cold plastic pavement markings shall be hot-inlaid in conjunction with the paving operation. Application shall

be done per manufacturer's recommendations, unless otherwise approved by the City Engineer.

- HPS-8 pavement markings shall not be applied within 24-hours of final paving to allow for proper curing of the pavement. HPS-8 pavement markings shall be installed within fifteen (15) calendar days of final paving, unless otherwise approved by the City Engineer.
- The material shall be 100% solids and shall be applied by standard thermoplastic application equipment at a thickness of 90 mil.
- The material shall be applied by truck mounted equipment unless otherwise approved by the City Engineer.
- A verifiable material certification report showing detailed analysis and compliance shall be provided by the material manufacturer and submitted to the City Engineer for approval prior to the Contractor performing the installation work.

Symbols and transverse markings shall be pre-formed thermoplastic. Application shall be done per manufacturer's recommendations, unless otherwise specified or approved by the City Engineer.

A manufacturer approved primer shall be used on existing asphalt pavement older than 12 months, or on concrete pavement, unless otherwise approved by the City Engineer.

Temporary markings shall be removable tape or paint, and shall be maintained throughout the duration of construction. Temporary markings shall be subsidiary to HPS-8 Pavement Markings unless stated otherwise in the approved plans.

The Contractor shall coordinate any pavement marking operations with the Project Inspector and the Traffic Control Supervisor (913-971-5170) a minimum of twenty-four (24) hours in advance of installing any pavement markings.

SECTION 9200 - TRAFFIC SIGNAL

9201 DESCRIPTION

These specifications are intended to describe the equipment, material, and construction requirements for the lump sum bid item Traffic Signal Installation. The installation shall include all poles, foundations, conduit, pull boxes, wiring, signal heads, detectors, control equipment and such other miscellaneous parts and materials as shown in the approved plans or as otherwise required by the City Engineer.

9202 GENERAL CONSTRUCTION

The traffic signal installation shall be constructed per the following specifications, as directed by the City Engineer, and the latest edition of the City of Olathe's *Technical Specifications and Design Criteria for Public Improvement Projects* (hereinafter referred to as "General Provisions" or "Technical Specifications"), the latest edition of the Kansas Department of Transportation *Standard Specifications for State Road and Bridge Construction* (hereinafter referred to as "Standard Specifications"), and the latest edition of the Kansas Department of Transportation Traffic Signal Specifications included in the standard details TE120A, TE120B, TE120C, and TE120D (hereinafter referred to as "KDOT Signal Specifications") that are either directly or by reference included herewith. All incidental parts which are not shown in the approved plans or in the Specifications and which are necessary to complete the traffic signal installation shall be furnished and installed as though such parts are shown in the approved plans. The traffic signal system shall be complete and in operation to the satisfaction of the City Engineer at the time of acceptance of the work. All signs, signals, and markings shall conform to the latest edition of the Manual on Uniform Traffic Control Devices (MUTCD).

9203 COORDINATION OF TECHNICAL SPECIFICATIONS, PLANS, SPECIAL PROVISIONS, AND PROJECT SPECIAL PROVISIONS

Coordination of discrepancies between the Technical Specifications, Plans, and Special Provisions, shall be in accordance with the City of Olathe *Technical Specifications and Design Criteria for Public Improvement Projects*. In the case of a discrepancy within the Plans, the plan notes shall govern over the standard installation details, and the installation details shall govern over these specifications.

9204 CERTIFICATION OF CONTRACTOR PERSONNEL

All traffic signal installation work shall be done by, or in the presence of and under the responsible charge of a Contractor with proof of International Municipal Signal Association (IMSA) Level II Traffic Signal Construction Certification.

Before starting work, the Contractor shall provide the City Engineer with the names and certification credentials of the Level II Traffic Signal Electricians and/or Level II Traffic Signal Technicians assigned to perform traffic signal related work. If the Level II Traffic Signal Electricians or Level II Traffic Signal Technicians are dismissed from the project, all traffic signal installation work shall cease until the names and photocopies of certification cards for replacement personnel are provided to the City Engineer.

9205 TRAFFIC SIGNAL PRODUCTS & MATERIAL LIST

Prior to commencing traffic signal installation, the Contractor shall submit a complete list of traffic signal products and materials proposed for the installation. All equipment supplied for the traffic signal installation shall be listed on the most recent edition of the City of Olathe's Approved Products List (APL). Products not included on the APL shall be tested and approved in accordance with Section 9227 prior to construction.

9206 LOCATION OF UNDERGROUND UTILITIES

The location of underground utilities on the approved plans is not guaranteed. Additional existing utilities may also be encountered. The Contractor shall have all underground utilities marked and located, potholing where necessary, before beginning any construction excavation, and shall work around any existing utilities located within the right-of-way which do not conflict with the proposed construction. The Contractor shall be responsible for all damages to underground utilities due to his failure to preserve the utility markings.

9207 NOTIFICATION OF LOCAL POWER COMPANY

The Contractor shall notify the local power company prior to beginning work to determine the proper type and method of hook-up. The Contractor shall be responsible for payment of any fees assessed by the power company for the power hook-up, regardless of whether these costs have been listed in the approved plans. The fees may include, but are not limited to, service connection fees, conduit, lead-in wire, service pole, meter landing, and power used during installation and testing until the traffic signals are accepted.

9208 STAKING OF POLES, PEDESTALS, PULL BOXES, CONTROLLER, AND LOOP LOCATIONS

The locations for signal poles, pedestals, service boxes, junction boxes, controller and detector loops shall be staked by the Contractor. Staked locations shall be approved by the City Engineer prior to construction.

9209 TRAFFIC SIGNAL IMPROVEMENT POLICIES

The work included in this project may involve replacement and/or modification of existing traffic signal equipment at a location which is presently controlled by operating traffic signals. The following policies are to be observed during the proposed modifications and improvements:

Existing Operation

Unless otherwise noted in the approved plans, the Contractor shall provide continuous operation of the existing traffic signals during the signal modifications and improvements except for shutdowns as required for installation of the proposed improvements.

Periods of Disruption

The Contractor shall coordinate any planned disruption of signal operations with the City Engineer and Traffic Operations staff (913-971-5180) at least forty-eight (48) hours in advance of such disruption of operations.

Disruption Times

Planned disruption of signal operations shall be limited to the hours between 9:00 a.m. and 3:00 p.m., unless otherwise noted in the approved plans. Traffic control during signal disruptions shall be provided as directed by the City Engineer. The signal controls shall be operable during all other periods.

Existing Wiring

All existing wiring within existing controller cabinets shall be identified by the Contractor and each conductor properly labeled in accordance with the Standard Details and Section 9217, prior to de-energizing the existing controller.

9210 SALVAGED EQUIPMENT

Reinstalled

When salvaged equipment is to be reinstalled, the Contractor shall furnish and install all necessary new materials and equipment including anchor bolts, nuts, washers, concrete, etc. required to install the salvaged equipment in the existing or new location.

Non-Reinstalled

When salvaged equipment is not to be reinstalled, it shall be returned to the City of Olathe Traffic Operations Center (TOC) located at 309 N. Rogers Rd. The Contractor shall notify the TOC Supervisor within forty-eight (48) hours prior to delivery of the equipment. The stored equipment shall be the responsibility of the Contractor until it is delivered to the TOC.

9211 REMOVAL OF EXISTING FOUNDATIONS

Existing foundations for traffic signal poles, pedestals and controllers shall be removed a minimum of twenty-four (24) inches below finished grade, and the area backfilled in accordance with Section 7000 of the Technical Specifications.

9212 CONDUIT INSTALLATION

Conduit shall be installed in accordance with Section 9000 of the City of Olathe Technical Specifications and the Standard Details. The conduit shall be of the type indicated in the approved plans and shall be of one type from outlet to outlet.

Conduit under existing pavement, sidewalk, or driveways shall be installed using an approved jacking or boring method.

All conduit installed above ground shall be metallic. Conduit attached to bridges shall have expansion fittings installed at the end of the bridge and at each expansion joint on the bridge. Any attachments to bridges on the state highway system must be approved by the applicable regulatory agency.

All metallic conduits shall be electrically bonded by a grounding bushing and ground wire as detailed in the approved plans.

High Density Polyethylene (HDPE) SDR9 conduit joints shall be made with either a Shur-Lock II coupler or fusion welder.

HDPE conduit shall be continuous from outlet to outlet, with no splices allowed. Bend radii shall not be less than the manufacturer's recommendations.

9213 PULL BOXES

Service box and junction box installations shall be per the Standard Details, and as noted below. The location of boxes may be adjusted during installation to clear obstructions and facilitate wiring as approved by the City Engineer but shall be installed no closer than twenty-four (24) inches from the back of curb. The quantity of boxes as shown in the approved plans may not be reduced. Additional boxes may be provided at the Contractor's expense. Boxes shall not be located in sidewalk ramps. All boxes shall be free of trash, wire scraps, etc.

Bedding

An eighteen (18) inch thick layer of aggregate shall be provided under all pull boxes. The aggregate shall meet the requirements of PB-2 described in Subsection 1107 of the Standard Specifications and shall be visually accepted by the City Engineer.

Conduit Entrances

The area around the conduit entrance in in-ground boxes shall not be larger than one (1) inch and shall be sealed with a mortar grout or a silicone sealant (spray foam is not allowed).

Cable Hooks

Cable hooks shall be installed in service boxes as detailed in the approved plans.

Bridge Mounted

Junction boxes mounted to bridges shall be mounted with wedge anchor bolts of sufficient size and strength to safely secure the box to the structure. The surface of the junction box which comes in contact with concrete shall be covered with aluminum colored butyl rubber sealant (caulking compound). Any attachments to bridges on the state highway system must be approved by the applicable regulatory agency.

9214 FOUNDATIONS

Concrete foundations for poles, pedestals and cabinets shall be constructed per the Standard Specifications, as modified below, and as detailed in the approved plans.

Reinforcing steel shall meet the requirements of Section 1600 of the Standard Specifications, and shall be free of rust and dirt, and shall be of the size, quantity and dimensions shown in the approved plans.

Before placing the concrete for the foundation, the Contractor shall ensure that the appropriate anchor bolts are placed in proper orientation, elevation and verticality. This may be accomplished by using positioning plates and/or tying or welding the anchor bolt assembly

to the reinforcing steel cage. "Stabbing" of anchor bolts will not be permitted.

The anchor bolt threads shall be protected from concrete fouling when the concrete is poured.

All piers for foundations shall be drilled and constructed in one pour. The top six (6) inches of pole and pedestal foundations shall be formed in a square and shall be level with the adjacent sidewalk, or approximately two (2) inches above finished grade if no sidewalk is present. The work apron on the controller pad shall be level with the adjacent sidewalk or approximately one (1) inch above finished grade if no sidewalk is present.

9215 TRAFFIC SIGNAL POLES AND PEDESTALS.

Traffic Signal Poles

The traffic signal poles shall be plumbed after the mast arm and other loads have been applied. Adjustment shall be made using the leveling nuts on the anchor bolts. The final distance between the top of the concrete foundation and the bottom of the leveling nuts shall not exceed one (1) inch. The nuts shall be thoroughly tightened to the manufacturer's recommendations and covered with the nut covers provided with the poles.

The mast arm and luminaire arm(s) (on combination poles) shall be attached to the pole by a suitable mast arm connection. Clamp on connections will not be accepted. Connections shall be installed to the manufacturer’s recommendations.

All other attachments to the poles and mast arms shall be located in the field, and all wire entrances into the pole or mast arm shall be drilled or punched in the field. All drilled or punched surfaces shall be carefully reamed to remove any sharp edges or burs before application of a field coat of organic zinc rich paint as described in Section 1801 of the Standard Specifications. The one (1) inch rubber grommets supplied with the poles shall be installed at all outlets for signal wiring before the wires are installed.

Poles shall not be installed until the utility company has installed power for the traffic signal. Contractor shall provide a screen to keep rodents from entering the pole through the gap at the base. The screen material shall be a stiff, welded steel wire mesh with ¼" square openings, and shall be wrapped around the pole anchor bolts, securing ends together with wire ties or other suitable banding material as approved by the City. The screen shall be wedged between the base of the pole and the surface of the foundation after the pole is plumb. Prior to acceptance, grouting along with 1/4” weep holes, will be required to fill the void between the base of the pole and foundation.

The end caps provided with the poles shall be securely installed on the end of the arms and the top of the pole prior to acceptance of the signals.

Pedestals

The cast aluminum pedestal bases shall be bolted to the concrete foundation using ¾" by 2"

galvanized square washers and tightened to the manufacturer's recommendations.

All attachments to the pedestal shall be located in the field and all wire entrances into the pedestal shaft shall be drilled or punched in the field. All drilled or punched surfaces shall be carefully reamed to remove any sharp edges or burs. Plastic or rubber bushings shall be installed at each opening before the wires are installed.

The post cap and hand hole cover provided with the pedestal shall be securely installed prior to acceptance of the signals.

The pole shall be screwed into the pedestal base and have a pole and base collar assembly affixed, to prevent the pole from loosening.

9216 TRAFFIC SIGNAL HEAD INSTALLATION

The faces of all signal heads shall be completely covered with orange mesh lens covers until signal turn-on. Signal heads shall not be installed more than ten (10) days prior to the signal turn-on, or before meter is installed at service, unless otherwise approved by the City Engineer. All heads shall be plumbed as viewed from the direction in which they face and in the vertical plane. The City Engineer shall direct the final positioning of the signal heads for optimum visibility.

Mast Arm Mounting

Mast arm signal head assemblies shall be rigidly mounted in accordance with the approved plans. The brackets shall be securely attached to the mast arm according to the manufacturer's recommendations. All conductors shall be concealed within the assembly.

All mast arm signal heads shall be attached to the mast arm at the time of mast arm installation to minimize the effects of vibration. Special care must be taken before drilling the arm for attaching the signal heads in order to assure that the signal heads will be in proper orientation over the intended traffic lanes.

Mast arm mounted signal heads shall be installed at a height of 17 to 19 feet from the pavement to the bottom of the signal head, with 17 feet being the desirable minimum height.

Side-Of-Pole Mounting

Side-of-pole signal heads shall be supported in accordance with the Standard Details. All members shall be either plumb or level, symmetrically arranged, and securely assembled. Mounting brackets shall be attached to the pole with heavy duty, black coated, stainless-steel banding and buckles. All conductors shall be concealed within the assembly.

Side-of-pole signal heads shall be oriented 180 degrees from the mast arm unless otherwise specified by the City Engineer. Signal head shall be oriented so that indication doors open away from pole, and if inverted, shall have weep holes plugged to prevent moisture from entering the head.

Side-of-pole traffic signal heads shall be installed at a minimum height of ten (10) feet from the base of pole to the bottom of the signal head.

Pedestrian signal heads shall be mounted at a minimum height of seven (7) feet from the base of pole to the bottom of the signal head.

9217 WIRE AND CABLE INSTALLATION

Wire and cable shall be installed per the Standard Specifications, as modified herein, and in accordance with the wiring diagram in the approved plans. Cable runs for overhead mounted equipment including, but not limited to, L.E.D. street name signs, video observation equipment, Opticom, and Wavetronix units shall be a complete, continuous run back to the signal cabinet, without any splices. No splicing of signal wire/cable shall be allowed except for the following:

Loops

The ends of the wire forming each loop shall be spliced in the nearest pull box to a detector lead-in cable. Splices between loops and lead-in cables shall be twisted and secured with a wire nut, and the splice shall be waterproofed, including the end of the loop wire tubing, using an approved loop splice kit. Taped splices will not be permitted. The splice shall be located in the upper seventy-five (75) percent of the box.

Multi-conductor Cable in Pedestal Bases

Multi-conductor cable runs to pedestal bases shall be spliced in the pedestal base to the multi-conductor cables running up the pedestal shaft to the signal heads and/or pushbuttons. Each conductor shall be clearly labeled, as to its function, in accordance with the City of Olathe Color Code, and the splices shall be waterproofed. The wires shall be arranged in the base to prevent the splices from coming into contact with the sides of the base or top of the foundation. Any unused conductors shall be taped.

Pulling Wires and Cables through Conduit

Separate three (3) inch conduits shall be provided for both low and high voltage wire bundles. When pulling wires into the conduit, a pulling sock or other similar device shall be used to equalize pulling strain on the conductors.

Excess Cable

A minimum of 6 feet of slack or excess multi-conductor cable, detector lead-in cable, loop detector wire, and lighting distribution wire shall be provided in each pull box. The excess cable in service boxes shall be logically grouped, taped, and neatly coiled and placed on the cable hooks. The excess cable in junction boxes shall be logically grouped, taped, and neatly coiled and placed in the bottom of the box. At least 6 feet of excess multi-conductor cable shall be left in each pole base to allow for connection to the terminal block.

Termination of Field Wires In the Cabinet and Pole Bases

The Contractor shall clearly identify the function of each field wire entering the cabinet or

pole base with a permanent label in accordance with the City of Olathe Color Code. Contractor shall leave 15 feet of slack in cabinet and 6 feet of slack in pole bases for termination.

Pole Wiring

Each signal head shall have a separate run of multi-conductor cable from the terminal block in the pole base to the terminal block in the signal head. A separate seven-conductor cable shall run to each three-section signal head. A separate seven-conductor cable shall run to each four- or five-section signal head. A seven-conductor, or three-conductor cable shall run to each pair of pedestrian heads. A separate two-conductor cable shall continuously, without splices, from the push-button to the field terminal in the cabinet. All four-section heads shall have their own neutral run back to the cabinet. The ends of any unused conductors shall be taped.

City of Olathe Color Code

The Contractor shall adhere to the following standardized color code: Westbound-Blue; Northbound-Red; Eastbound-Orange; Southbound-Green; Left Turn-White; Pedestrian-Yellow.

City of Olathe Standard Phasing

The Contractor shall adhere to the following standardized phasing: Westbound - Ø2; Northbound – Ø4; Eastbound – Ø6; Southbound – Ø8; Westbound Left Turn – Ø5; Northbound Left Turn – Ø7; Eastbound Left Turn – Ø1; Southbound Left Turn - Ø3, unless otherwise specified by the City Engineer.

9218 GROUNDING/BONDING

The traffic signal system shall be grounded per the Standard Specifications and as specified herein. All traffic signal poles, pedestals, controller cabinets, and service circuit breakers shall be grounded using a ground wire bolted to the inside of these devices with a 0.5 inch internal ground lug. All ground wires shall be attached to the ground rod with a ground clamp. Ground rods shall be installed as detailed in the approved plans.

The detector lead-in shielding and drain wire shall be electrically floating (not attached to earth ground) at the pull box. Grounding the cabinet shall be in accordance with the manufacturer's recommendations.

9219 DETECTOR LOOP INSTALLATION

Detector loops shall be installed as close as practicable to the locations shown in the approved plans. Loops shall be centered in their respective lanes; or if they cover more than one lane, they shall be centered over the width of the intended zone of detection. The longitudinal orientation of loops installed in concrete pavement shall be adjusted such that no loop begins or ends within twelve (12) inches of a transverse joint.

Pre-Formed Loops

Pre-formed loops shall be used in installations where lanes are being constructed from

concrete, and in accordance with the manufacturer's recommendations. Special care must be taken to place the loops in their proper location in relation to the final lane configuration.

Saw-Cut Loops

Saw-cut loops shall be installed in saw cuts as detailed in the approved plans. The location of each loop shall be clearly marked on the pavement and approved by the City Engineer prior to loop installation. The Contractor shall drill two (2) inch diameter holes centered on each point of intersection of the loop slots prior to cutting the slots. The slots shall be cut using a saw equipped with a depth gauge and horizontal guide to assure proper depth and alignment of the slot. The blade used for the saw cut shall provide a clean, straight, well-defined saw cut of the width and depth indicated in the approved plans without damage to adjacent areas. Where the loop changes direction, the saw cuts shall be overlapped to provide full depth at all points of intersection.

Before installing the loop wire, all rough edges and protrusions shall be removed from the saw cut. The slots must be cleaned and dried to remove cutting dust, grit, oil, moisture or other contaminants. Cleaning shall be achieved by flushing the slot with a high-pressure water jet stream. The slot shall then be cleared of water and dried using oil-free compressed air.

Loop wire shall be installed in the slot using a dull edge wooden paddle or wheel to prevent damage to the loop jacket. Conductors of each loop shall be run continuously from the nearest pull box with no splices permitted. All loops shall be wound in the same direction with the start and end of each clearly marked with a permanent label at the pull box. The loop conductors running from the loop to the adjacent pull box shall be twisted a minimum of 3 turns per foot/10 turns per meter. In addition, each loop conductor shall be permanently identified by the loop number shown in the approved plans. Paired loops shall be joined in the pull box in series or parallel as recommended by the manufacturer to obtain optimum sensitivity at the sensor unit.

After the conductors are installed in the slots, the loops shall be tested for continuity and shorts with a meg-ohm-meter set at 500 volts. Any defective wire shall be replaced. After testing, the slots shall be filled with an approved loop sealant to within 0.125 inches of the pavement surface. Before setting, surplus sealant shall be removed from the adjacent road surfaces without the use of solvents.

The Contractor may, at his own expense, use approved pre-formed loops instead of saw cut loops for installations where pre-formed loops are not already called out in the approved plans.

The loop conductors for each loop shall be spliced in the pull box to a detector lead-in cable in accordance with Section 9217 of these specifications. The detector lead-in cable shall run continuously from the pull box to the field terminal in the cabinet with no splices permitted.

9220 SIGNS

Overhead Street Name Signs

Street name signs shall be installed on mast arms after all other loads are applied to the mast arm. The signs shall be located in accordance with the Standard Details. Signs shall be mounted so that the legend is level, and the final location shall be determined by the City Engineer.

Installation of signs on mast arms shall be accomplished with suitable stainless steel banding, clamps, and brackets capable of withstanding 100 mph winds.

L.E.D. street name signs shall have a separate 1-3c, No.14 AWG cable and shall be a continuous run from the sign to the cabinet, without splices.

Regulatory Signs

The R10-Series signs shall be mounted on the mast arm to the right of the left turn signal head using an approved sign mounting bracket in accordance with the Standard Details.

R10-3E Pedestrian Push-Button Signs

Pedestrian push-button signs shall be mounted to the traffic signal pole above the appropriate pedestrian push-button. Mounting shall be accomplished using suitable stainless steel banding, clamps and brackets capable of withstanding 100 mph winds. As an alternative, the pedestrian sign mounting bracket may be constructed integral to the pedestrian push-button assembly.

9221 PEDESTRIAN PUSH-BUTTONS

Pedestrian push-buttons shall be installed on the poles or pedestals indicated in the approved plans at a height of 3.5 feet above the adjacent sidewalk (or ground if no sidewalk is present). The push-button shall be located on the side of pole nearest the pedestrian walkway, and perpendicular to the intended crossing direction. The push button shall be installed on a level landing area, not in an ADA ramp, and located within twenty-four (24) inch maximum (12" desirable) of the level landing area.

9222 TRAFFIC SIGNAL TURN-ON

Flashing Operation

At locations without previous traffic signal control, the new traffic signals shall be flashed 2 to 3 business days prior to full signal system turn-on.

System Turn-On

The signal system turn-on shall not occur on Mondays, Fridays, weekends, or holidays and shall be completed prior to 3:00 p.m. on the day of the turn-on.

Supplier Representative

The supplier of the control equipment shall have a representative present at the signal system turn-on.

Traffic Engineering Notification

The City Engineer shall be notified at least one week in advance of the date of signal turn-on.

9223 TEST PERIOD

Following completion of all electrical apparatus hook-ups and the system turn-on, the signals shall operate satisfactorily for thirty (30) days under normal conditions prior to acceptance by the City Engineer. During the test period, the signals shall operate trouble-free with no failures of the controller or its components. Should any defect develop under normal and proper operating conditions during the testing period and prior to acceptance by the City Engineer, this malfunction shall be corrected by and at the expense of the Contractor, including all labor, materials, and associated costs. Minor failures, such as lamp failures or loop detector re-tuning, will not be the basis for starting a new test period provided the failures are repaired immediately and the same failures do not recur during the remainder of the test period. A major malfunction or failure of the controller and its components will result in a new thirty (30) day test period being implemented after the repairs have been made.

9224 GUARANTEE

All equipment furnished on a project by the Contractor shall be guaranteed against any imperfections in workmanship and materials. The customary manufacturers' warranties shall be assigned to the City.

9225 MANUALS

A minimum of two (2) manuals shall be provided for each controller and shall include complete nomenclature, wiring diagrams, schematics showing test voltages, functional description of circuits, parts list and cross reference to standard part numbers, appropriate testing procedures, and other pertinent data.

9226 MATERIALS DESCRIPTION

These specifications cover the general materials and miscellaneous hardware for the installation of a traffic signal to be constructed in accordance with and at locations indicated in the contract, shown in the approved plans or designated by the City Engineer.

9227 MATERIAL REQUIREMENTS

General

All equipment supplied for the traffic signal installation shall be listed on the most recent edition of the City of Olathe's APL. In the case of a discrepancy between the product specifications listed below and the APL, the APL shall govern over these specifications. All materials used in the fabrication or assembly of the items listed below shall be new, shall be of the best quality and workmanship and shall be the manufacturer's latest approved design. Major items of electronic equipment installed under this contract shall be of the same type and consist of products supplied by the same supplier.

The traffic signal shall be complete, and the Contractor shall furnish and install all equipment necessary for the satisfactory operation of the signal system whether specifically mentioned or not.

All electrical devices shall be purchased within 90 days of install.

Responsible Parties
Any reference to the State, State of California, or Agency shall mean the local agency responsible for maintaining the traffic signal. Any reference to the Contractor shall mean equipment manufacturer or supplier.

Cabinets
The pole mounted cabinets shall be Model 336A, and the pad mounted cabinets shall be either Model 332BPDA2 single cabinet or Model 332DBLPDA2 double cabinet, in accordance with Chapter 6 of the Caltrans Traffic Signal Control Equipment Specifications (TSCES) with the following additions or modifications.

Finish The cabinet finish shall be natural aluminum.

Lift Eyes The cabinet lift eyes shall be removable and shall be be turned down after installation of the cabinet.

Light Fixtures Cabinets shall be furnished with six (6) L.E.D. light fixtures, each having a length of 21.5 inches. Each of the four doors shall have a lamp installed near the top of its opening, which is controlled by a door-activated switch. The remaining two lamps shall be installed on swivels and mounted to provide illumination of the output file.

AC Surge Suppression The cabinet shall be furnished with a RackPro 20Amp rack mounted AC surge suppressor model 35319 or equivalent. The unit shall be 1U in height and 19" wide, having a minimum 8 rear outlets and 1 front outlet.

Plan Drawer/Work Surface A drawer shall be mounted in the EIA rack between the controller and the top input file. It shall be mounted on sliding tracks with lockout and quick-disconnect features. The drawer shall extend a minimum of 14 inches, and shall be capable of supporting a 40 lb. load when fully extended. The drawer shall be provided with a hinged aluminum top covered with a chemical proof, Formica-type plastic sheet. The interior of the drawer shall have nominal dimensions of 1 inch high, 13 inches deep and 15.75 inches wide.

Additional Model 336 Requirements The Model 336 cabinets shall be furnished with a continuously welded bottom of the same material as the cabinet, and all of the hardware necessary to accommodate mounting to a 12 inch outside diameter pole.

Additional Model 332 Requirements The Model 332 cabinets shall be furnished with the power distribution assembly #2 in lieu of the power supply and power distribution #1 assemblies. The cabinets shall be supplied with the circuit breaker option per Section 6.4.3.9 of the Caltrans TSCES. The cabinet shall be furnished with anchor bolts, nuts, washers, and 8 inch riser.

Additional Output File #1 Requirement The output file #1 supplied with the cabinet shall be modified to provide compatibility with the red monitoring features of the conflict monitor.

Input File Requirements The input files shall be split input files equipped with an RJ-45 connector on the backside of the input file.

Controller
The controller shall be in accordance with the City of Olathe Signals Approved Products List.

Conflict Monitor
The conflict monitor shall be in accordance with the City of Olathe Signals Approved Products List.

Flasher
The flasher shall meet the requirements of a Model 204 flasher per Chapter 3 of the Caltrans TSCES.

Load Switch
The load switch shall have modular switches that can be easily replaced using a screwdriver, and meet the requirements of a Model 200 switch pack per Chapter 3 of the Caltrans TSCES, and shall also be dual indication.

Flash Transfer Relays
The flash transfer relays shall be heavy duty relays meeting the requirements of the Model 430 per Section 6.4.6 of the Caltrans TSCES.

Surge Protector
The surge protector shall be as per City of Olathe Specifications.

DC Isolator
The DC isolator shall meet the requirements of a Model 242, two-channel, DC isolator per Chapter 5 of the Caltrans TSCES.

AC Isolator
The AC isolator shall meet the requirements of a Model 252, two-channel, AC isolator per Chapter 5 of the Caltrans TSCES.

Detector
The detector sensor units provided shall be a Reno A&E Model C-1103-SS or approved equal.

Battery Back-Up System
The Battery Back-Up System (BBS) / Uninterruptable Power Supply (UPS) system shall be comprised as noted below and shall include, but not be limited to: inverter/charger (UPS), power transfer switch (PTS), batteries, a separate manually operated non-electronic bypass switch, 30-amp 4 prong external reverse service plug with weatherproof cover for connection to generator, and all necessary hardware and interconnect wiring.

BBS Output Requirements - The BBS shall be capable of providing continuous, fully conditioned, regulated, sinusoidal (AC) power to selected devices such as: signal controller, modem, communication hub, NTCIP adapters, and video equipment, and be capable of powering the intersection in normal operation for a minimum of three (3) hours. Intersection loads shall be calculated to assess proper battery size and quantity to meet this requirement; 850 Watts for three (3) hours shall be the minimum allowed capacity. The system shall be capable of providing power for full run-time operation, flashing mode operation, and a combination of both full and flash mode operation of an intersection. The operation of the flash mode shall be field programmable to activate at various times, battery capacities, or alarm conditions locally using the pad or using a standard PC interface.

BBS Relay - The BBS shall make available a minimum of four (4) dry contacts rated at 1 Amp @ 120 VAC. Each relay shall be programmable with a minimum being the following: "On Batt", "Low Batt" (40% remaining charge), “Timer", and "Alarm".

BBS Communications - The BBS shall have advanced communication features which allow monitoring, configuration, and control of the system over TCP/IP network communication.

BBS Batteries - Batteries shall be hot-swappable and be comprised of extreme-temperature, deep-cycle, Absorbed Glass Mat/Valve Regulated Lead Acid (AGM/VRLA) batteries. Batteries shall be certified to operate at extreme temperatures from -40C to +74C. The batteries shall be provided with appropriate interconnect wiring and corrosion-resistant mounting trays and/or brackets appropriate for the cabinet in which they will be installed. The interconnect cable shall be protected with abrasion-resistant nylon sheathing and shall connect to the base module via a quick-release circular connector.

Signal Heads
All signal heads on a project shall be supplied by one manufacturer. The signal heads shall be in general conformance with the latest edition of the Equipment and Materials Standards of the Institute of Transportation Engineers - Vehicle Traffic Control Signal Heads, and as specified below.

Standard Vehicle Traffic Signal Heads - The housing for each vehicle traffic signal section shall be made of a durable polycarbonate. The housing shall be black with black doors. The visors for each signal section shall be of the tunnel type, and be made of a durable black polycarbonate of not less than 0.1 inch/2.5 mm in thickness.

Arrow indications shall have an incandescent look.

Pedestrian Traffic Signal Heads - All pedestrian traffic signal heads shall include a countdown display (IDC Model LEDP-HMC-002 or approved equal). The housing shall be a black, one-piece polycarbonate, with a black one-piece polycarbonate door, without the standard Z-Crate visor. Head units shall be installed with the clamshell 2 mounting (Model 4805). The pedestrian signal indications shall be in general conformance with the latest edition of the E.T.L. and Institute of Transportation Engineers - Pedestrian Traffic Control Signal Indications. Pedestrian lenses shall be rectangular, with a dimension of 16 x 18 inches. The message shall consist of a Don't Walk "HAND" symbol in Portland orange, and a Walk "WALKING PERSON" symbol in lunar white and have an incandescent look. The pedestrian symbols shall be a minimum of 9 inches high. The lens housing shall be designed to accommodate 16-inch LEDs.

Pedestrian Light Emitting Diodes (LED) Walk and Don't Walk indications, when specified on the plans, shall be sealed and the hand and walking man shall be filled completely. No outlines will be accepted.

Signal Lamps

All red, yellow, and green vehicle traffic signal indications in each signal head shall be a 12-inch LED lens meeting the requirements of the ETL (http://www.intertek.com/marks/etl/) verified certification program and latest ITE Specifications for LED's for Vehicle Traffic Signals. In addition, they shall be the product of one manufacturer and be pre-approved by the City of Olathe. Contractor shall replace all metal lens clips with G.G.I. Quick Change Kits (QCK).

Signal Mounting Brackets

Mast Arm Bracket - The mast arm signal mounting brackets shall be black coated, band-clamp style, Sky Brackets. They shall provide for rigid mounting of the traffic signal heads while allowing signal aiming adjustment in all planes. The brackets shall be designed to strap to the mast arm using stainless steel banding and buckles, and they shall incorporate wiring channels so that after installation, all signal cables shall be protected from the effects of exposure to the weather.

Side-Of-Pole Brackets - Side-of-pole signal mounting brackets shall be molded of black polycarbonate and shall incorporate a mounting arm and pole plate into a single member which shall include guides to correctly position the banding material on the pole plate. The dimensions of the mounting brackets shall be as required to provide proper signal head alignment. Each bracket shall have molded serrations to assure a positive lock with the signal head and allow positioning of the traffic signal heads in increments of five (5)

degrees. The bracket shall be designed to provide a wiring raceway for signal cable exiting the support pole and entering the signal head.

Backplates

Backplates shall be of sufficient size to provide a minimum of 5 inches/125 mm of dark background for the signal indications. They shall be Pelco Aeroflex backplates that are compatible with the signal heads. Backplates shall be furnished with all necessary hardware to attach to the signal heads.

Pedestrian Push-Button

The pedestrian push button assembly shall be a Polara Bulldog, black in color, with a low-profile mount. It shall contain a silicon or neoprene cover to body gasket. Cover screws shall be stainless steel. The switch and actuator shall be protected from dust and moisture. Assembly shall not contain an L.E.D.

Pedestrian Sign

The pedestrian information signs shall be MUTCD R10-3e as detailed in the approved plans. The sign blank shall be constructed of minimum 0.075-inch-thick aluminum alloy. The sign face shall have a non-reflective black legend direct screened on white, high intensity prismatic sign sheeting. The sign shall be visually accepted by the City Engineer.

Steel Traffic Signal Poles

Tapered Tubular Shafts - Steel traffic signal pole and mast arm shafts shall conform to Division 1600 of the Standard Specifications and the requirements in the approved plans. All pole and mast arm shafts shall be constructed of one of the following methods:

- No Transverse Welds. Pole and mast arm shafts shall be tapered tubular members made only of one length of structural steel sheet of not less than No. 7 Manufacturing Standard Gauge (Exception: Signal arms designed for lengths of 40 feet or greater may have arm extensions of not less than No. 11 gauge steel, with bolted telescopic field joints so as to develop full strength of the adjacent shaft sections to resist bending action). Round (Type I) members shall meet the requirements of the latest edition of A.S.T.M. A595 Grade A or B. Multi-sided (Type II) members have a minimum of 12 sides and meet the requirements of the latest edition of A.S.T.M. A570 or A.S.T.M. A572 with a minimum yield strength of 55,000 psi and a maximum silicone content of 0.06 percent. Only one longitudinal weld, and no transverse welds, shall be permitted in the fabrication of the tubular members consisting only of one length of structural steel.

- Transverse Welds. Pole and mast arm shafts shall be fabricated from hot rolled basic open hearth steel conforming to A.S.T.M. A570 for thickness of No. 11 and No. 7 Manufacturing Standard Gauge, A283 Grade D for No. 3 gauge and A36 modified for 0 gauge. The shaft shall be longitudinally cold rolled to flatten the weld and increase the physical characteristics so that the metal will have minimum yield strength of 48,000 psi. Where transverse full penetration

circumferential welds are used, the fabricator of the shaft shall certify: (1) that all such welds have been magnetic particle tested by an independent testing laboratory using a qualified Nondestructive Testing (NDT) Technician and (2) that the NDT equipment has been calibrated annually.

Poles - The poles shall include a suitable connection for attaching the mast arm to the pole shaft; a reinforced hand hole with gasket cover located near the bottom of the pole and oriented 180 degrees from the mast arm; a grounding lug in the hand hole or inside the pole near the hand hole; a J or C hook wire support inside the pole near the top of the pole; 4 nut covers and a removable pole cap. The poles shall be pre-drilled for the mast arm attachments prior to galvanizing. Rubber grommets shall be furnished for all wire entrances into the pole. A clamp-on connector shall not be permitted.

Combination Poles - When combination lighting and signal poles are specified in the approved plans, the poles shall also have suitable clamps for attaching the luminaire arm to the pole shaft. The pole shaft shall be pre-drilled for the luminaire arm attachment prior to galvanizing, with the luminaire arm to be mounted in the same vertical plane as the signal arm. In addition, a reinforced nominal 3 inch by 5 inch hand hole shall be located 180 degrees from and just above the mast arm, and a J or C hook wire support shall be welded inside the pole immediately above the mast arm.

Mast Arms - All signal mast arms shall have suitable attachment devices for attaching to the pole shaft, and a removable end cap. Clamp-on connectors shall not be permitted. Rubber grommets shall be furnished for all wire entrances into the mast arm.

Luminaire Arms - Luminaire arms shall be either single tube or truss-type arms as indicated in the approved plans. All luminaire arms shall have suitable clamp-on attachment devices for attachment to the pole shaft. Single tube arms shall be welded to one half of the luminaire arm clamp. Truss-type arms shall be furnished with two clamp-on simplex fittings in accordance with the Standard Details.

Galvanizing - The poles, mast arms, luminaire arms and all steel accessories shall be galvanized to the requirements of the latest edition of A.S.T.M. A123.

Epoxy Coating - When epoxy coating for steel poles, mast arms, luminaire arms and all other steel accessories is specified in the approved plans, the Contractor shall conform to Valmont F-306 Rev 1 specifications for epoxy topcoat. Contractor shall repair any damage to the finish of any structure with the base primer and finish coat materials furnished by manufacturer. No other products shall be used unless otherwise approved by the City Engineer.

Design Load - All traffic signal poles shall be designed to accommodate the standard signal head, signing, and luminaire arm loadings established by the Bureau of Traffic Engineering. The design shall conform to the latest edition of AASHTO Specifications for

Structural Supports for Highway Signs, Luminaires, and Traffic Signals handbook with a wind load of 90 mph / 145km/h and a minimum of 1.14 gust effect factor. The poles shall also accommodate wind loadings which may cause deflections of the mast arm in the vertical plane. These deflections shall never result in less than a 15-foot clearance between the roadway and the lowest point of the signal assembly.

Anchor Bolts - High strength anchor bolts, washers, and nuts, conforming to Section 1615, Type II of the Standard Specifications shall be included. The leveling nuts may be either Heavy Square or Heavy Hex nuts. Anchor bolt washers conforming to the requirements of the latest edition of A.S.T.M. F436 shall also be acceptable.

Basis of Acceptance

- Standard Shop Drawings - All traffic signal poles shall be detailed by the manufacturer on shop drawings. The drawings shall include the pole, mast arm and luminaire arm (on combination poles) dimensions, arm attachment details, hand hole details, and anchor bolt details, along with the signal weight, projected areas and mounting arrangement. Design calculations shall be submitted with the shop drawings. Approved shop drawings shall be included with the Pre-qualified Traffic Signal Materials List.

  For traffic signal poles that are not covered by the approved manufacturer's standard shop drawings, the Contractor shall submit three copies of detailed shop drawings and an electronic copy as a PDF, along with the design calculations to the City Engineer for approval.

- Poles and Mast Arms - See Division 1600 of the Standard Specifications for the basis of acceptance.

- Anchor Bolts - See Division 1600 of the Standard Specifications for the basis of acceptance of anchor bolts for traffic signal poles. If Type "B" certification is not provided according to Division 2600 of the Standard Specifications, the City Engineer may require testing of an anchor bolt.

- Traffic Signal Materials List - Along with the Traffic Signal Materials List, the Contractor shall submit the necessary traffic signal pole ordering information. The City Engineer will review the information for compliance with the plan dimensions for pole height, mast arm length and mounting height, and luminaire arm length and mounting height.

Traffic Signal Pedestals

Traffic signal pedestals shall consist of an aluminum shaft of the length specified in the approved plans, a cast aluminum base, anchor bolts with nuts and washers, and shall be provided with a pole cap.

The shaft shall be of Type 6061-T6, 6063-T6 or 6063-T832 aluminum alloy, and shall be a single piece of drawn seamless tubing having a nominal 4.5 inch outside diameter and 0.25-inch wall thickness. The shaft shall be threaded at one end for attaching the shaft to the base. The shaft shall be coated with a smooth, black finish.

The pedestal base shall be AASHTO certified and be cast of Type 356.0-T6 aluminum alloy. It shall have a threaded collar with a set screw, and plastic hand hole cover. The base shall be coated with a smooth, black finish.

Anchor bolts for traffic signal pedestals shall be of the dimensions detailed in the approved plans and shall meet the requirements of the latest edition of A.S.T.M. A36. The threaded ends of the anchor bolts, nuts, and 3/4" x 2" square washers shall be galvanized. Anchor bolts for traffic signal pedestals will be visually accepted by the City Engineer.

Terminal Block

Terminal blocks in the poles shall be U.L. recognized, barrier type or dead-front type terminal strips, with stainless steel screws, having terminals of sufficient size and quantity to connect the individual conductors run between the cabinet and the pole to the conductors run between the pole and the signal heads. Terminal blocks shall be rated for at least 30 amps current.

Junction Boxes (In-Ground)

The junction box shall be of sufficient size to facilitate the conduit and wiring as indicated in the approved plans. Junction boxes shall have nominal dimensions as shown on the approved plans. In-ground junction boxes, along with their covers, shall be in accordance with the City of Olathe Signals Approved Products List, and shall meet ANSI/SCTE-77, Tier 22 rating.

The cover shall bear the logo “TRAFFIC SIGNAL” clearly and permanently molded or etched into the cover.

The cover of junction boxes, that are installed as part of the fiber optic interconnect, shall bear the logo “City of Olathe Fiber” clearly and permanently molded or etched into the cover.

Junction Boxes (Above-Ground)

Above ground junction boxes shall have the nominal dimensions of 12 inch by 12 inch by 6 inch. The junction box shall be made of minimum 0.075 inch/2 mm thick sheet metal (steel) with welded seams, knockouts and weatherproof screw cover. Junction boxes shall be hot dipped galvanized in accordance with ASTM A-123 after fabrication.

Service Boxes

The service box shall have the minimum nominal internal diameter of 24 inches diameter with a minimum depth of 36 inches. Service boxes shall be provided with cable hooks as detailed in the approved plans. The box shall be constructed of polymer concrete with a polymer

concrete cover. Service boxes, along with their covers, shall be in accordance with the City of Olathe Signals Approved Products List, and shall meet the current ANSI/SCTE 77, Tier 22 rating.

The cover shall bear the logo "TRAFFIC SIGNAL" clearly and permanently molded or etched into the cover.

Luminaires
Luminaires shall be in accordance with Section 9000, as well as the City of Olathe Street Light Approved Products List.

Un-Fused Street Light Connector Kit
Un-fused connector kits shall be in accordance with Section 9000, as well as the City of Olathe Street Light Approved Products List.

Fused Street Light Connector Kit
Fused connector kits shall be sized to the conductors specified in the approved plans and shall be in accordance with Section 9000, as well as the City of Olathe Street Light Approved Products List. Each connector shall include all parts and materials necessary to complete its installation, such as fuses, lubricating compound, and assembly devices.

The fuse shall be a minimum of 5-amp cartridge type as recommended by the connector manufacturer.

Overhead Street Name Signs
Overhead street name signs shall bear the message indicated in the approved plans. The legend shall be centered on the sign face. The border shall be 0.75 inches wide.

Blank - The sign blank shall be of 0.125-inch-thick Type 5052-H38 aluminum alloy. All corners on the sign blank shall be rounded.

Sheeting - The sign faces shall be either direct-applied white enclosed lens high performance retro-reflective legend and borders on a green enclosed lens 3M high intensity prismatic sheeting background, or transparent green cuttable film over white enclosed lens 3M high intensity prismatic sheeting. The use of the transparent film shall in no way limit the manufacturer's warranty on the 3M prismatic sheeting over which it is applied. The green sheeting or film shall conform to Federal Color Standard 595A, Color No. 14109.

Lettering – The font size for the legends shall be as follows: 8 inch series E-Modified upper case for ST, RD, BLVD, AVE; 12-inch upper case with 9-inch lower case series E-Modified for names; 12 inch series E-Modified for numerals.

Acceptance - Before final fabrication and shipment, the manufacturer or supplier shall provide, for the City Engineer’s approval, a layout of each sign showing the exact street

name lettering to be placed on the sign. The signs shall be visually accepted by the City Engineer.

Regulatory Signs
The design details (color, letter height, and letter series) for all regulatory signs shall be as shown in the latest edition of the Standard Highway Signs Manual. Special signs not included in the Standard Highway Signs Manual shall be as shown in the approved plans. Sign blanks shall be a minimum of 0.075 inch thick aluminum alloy. The sign face shall be of 3M high intensity prismatic sheeting meeting the requirements of Subsection 2201 of the Standard Specifications.

Regulatory signs shall be accepted in accordance with Section 9228 of these specifications, with additional certification stating that the retro-reflective sheeting used to manufacture the signs in accordance with Subsection 2201 of the Standard Specifications.

Entrance Head
The entrance head shall be of cast aluminum and shall be of the clamp-on type for use with rigid conduit of the type specified in the approved plans. It shall be U.L. listed.

Service Enclosure
The service enclosure shall be in accordance with Section 9000, as well as the Approved Products List.

Circuit Breakers
The circuit breakers shall be standard plug-in, single pole, molded case, of the trip rating as shown in the approved plans.

Ground Rod
The ground rod shall be 0.75-inch diameter by 10-foot-long copper-bonded-steel rod and bear the U.L. label.

Ground Rod Clamp
The ground rod clamp shall be a 0.75-inch clamp cast of high strength copper alloy and be U.L. listed for direct burial.

Service Wire
The service wire shall be Type USE-2 stranded, annealed, copper wire meeting the requirements of ASTM B-8, and be of the size specified in the approved plans.

Lighting Distribution Wire
The lighting distribution wire shall be Type USE-2 stranded, annealed, copper wire meeting the requirements of ASTM B-8, and be of the size specified in the approved plans.

Pole & Bracket Wire
The pole and bracket wire shall be in accordance with Section 9000, as well as the City of Olathe Street Light Approved Products List.

Ground Wire
The ground wire shall be No. 6 AWG solid bare copper wire meeting the requirements of ASTM B-3.

Multi-conductor Cable
The multi-conductor cable shall meet the requirements of IMSA 19-1. Conductors shall be stranded No. 14 AWG. The quantity of conductors shall be in accordance with the approved plans.

Shielded Detector Lead-In Cable
Shielded detector lead-in cable shall be a stranded, four conductor, No. 18 AWG, using water blocking tape with drain wire. Conductors shall be color coded red, green, black, and white. Wire shall not be gel filled and must be pre-approved by the City Engineer.

Detector Loop Wire
The detector loop wire shall meet the requirements of IMSA 51-5. The conductor shall be No. 14 AWG, and the tube shall be polyethylene.

Loop Sealant
The loop sealant shall be a one-part polyurethane, moisture curing, elastomeric compound requiring no mixing or measuring, prior to or during application. It shall be specifically designed for sealing and protecting detector loop wires in both asphalt and concrete pavements. It shall not chemically attack or damage the pavement yet shall sufficiently bond with the pavement to effectively seal the saw cut and prevent the infiltration of moisture into the slot. The cured loop sealant shall exhibit resistance to the normally encountered effects of weather, vehicular abrasion, motor oils, gasoline, antifreeze solution, brake fluid, deicing chemicals, and salt in such manner that the performance of the detector loop is not adversely affected. The loop sealant shall provide compressive yield strength to withstand normal vehicular traffic and prevent the intrusion of rocks, glass, and other road debris into the slot. It shall remain sufficiently flexible at all normally encountered temperatures to withstand normal movement in asphalt and concrete pavements while protecting the loop wire from fracture and shear.

Pre-Formed Loops
Pre-formed loops shall be factory assembled loops having the dimensions and number of turns of wire specified in the approved plans. The loops shall be constructed of a minimum No. 16 AWG Type TFFN/THWN copper wire meeting the requirements of A.S.T.M. B-8 and encased in heavy duty tubing compatible with the paving material being used on the project. The tubing shall be completely filled with asphalt sealant material after the wire is installed. The loop tail shall be of flexible tubing of the length specified in the approved plans and shall

also be filled with asphalt sealant material. The detector wire within the loop tail shall be twisted a minimum of 3 turns per foot/10 turns per meter.

High Density Polyethylene (HDPE) Conduit
Polyethylene conduit shall be coil-able, smooth wall, SDR 9 rated, high density polyethylene duct meeting the requirements of NEMA Standard TC-7. Conduit joints shall be made with either a Shur-Lock II coupler or a fusion welder.

Conduit used for signals shall be black with a red stripe and be in accordance with the Approved Products List.

Conduit used for fiber shall be black with an orange stripe and be in accordance with the Approved Products List.

Expansion Fittings
Expansion fittings shall be as detailed in the approved plans.

9228 BASIS OF ACCEPTANCE

Acceptance of materials furnished under these specifications shall be based upon the following: Any product called for in the Bill of Materials in the approved plans that is being furnished for the project must be approved. A manufacturer or supplier intending to supply traffic signal materials under these specifications shall submit an original copy of any catalog cuts, shop drawings, drawings, and/or data sheets certifying that the material meets the applicable specifications. This information shall be submitted to the City Engineer for approval.

Visual Inspection
Items will be visually inspected by the City Engineer at the job site for condition and conformance with the requirements of these specifications.

Additional Requirements
Additional requirements noted for specific material requirements are provided in Section 9227 of these specifications.

SECTION 9300 - SIGN DETAILS

9301 GENERAL INSTALLATION

In all the following installation sequences, the first hole above the finished grade level must be in line for insertion of the corner bolt. Break-away signposts shall be used only for signs installed in medians.

Pavement Installation Sequence

1. Signpost anchors shall be set into uncured concrete or drilled into existing locations a minimum of twelve (12) inches.
2. All break-away hardware shall be provided by City of Olathe.

Ground Installation Sequence

1. Signpost anchors shall be driven into the ground a minimum of thirty-six (36) inches.
2. Signposts shall be inserted into the signpost anchor and bolted in place.

Break-Away Signpost Installation Sequence

1. Signpost anchors shall be driven into the ground.
2. Sleeves shall be driven into the ground and anchored over the signpost anchor.
3. Signposts shall be inserted into the signpost anchor and bolted in place.

9302 MATERIAL AND REMOVAL NOTES

All corner bolts and nuts for fastening the signs and signpost assembly shall be Grade 5 or higher steel.

All signs shall be made on 0.080 aluminum sheeting.

Street name signs shall be provided by the City of Olathe Traffic Engineering department, a list of needed signs shall be provided to the Traffic Control Supervisor no less than 7 days in advance of installation to allow for fabrication. It shall be the responsibility of the contractor to coordinate pick up of the signs from the City of Olathe Traffic department.

All signs shall be made with high intensity sheeting, and all inks or films used shall carry the same warranty as sheeting.

All street name signs shall be mounted with 5/16-inch carriage bolts, with their ends joined together by cherry mate rivets. All other signs shall be mounted with 5/16-inch carriage bolts.

All existing signs within the project limits shall be removed prior to construction and delivered to: City of Olathe Traffic Operations Center; 301 N. Rogers Road, Olathe, KS.

Backlit street name signs shall be required at all arterial-to-arterial intersections, and at all other locations specified by the City Engineer.

SECTION 9400 – FIBER OPTIC

9401 DESCRIPTION

These specifications are intended to describe the equipment, material, and construction requirements for fiber optic cable installation. Fiber optic components described below are bid separately and shall be provided as shown in the approved plans, or as otherwise required by the City Engineer, in order to provide a fully functioning fiber network.

9402 GENERAL CONSTRUCTION

All fiber optic components shall be constructed per the following specifications as directed by the City Engineer. All incidental parts which are not shown in the approved plans or in the Specifications and which are necessary to complete the fiber optic cable installation shall be furnished and installed as though such parts are shown in the approved plans. The fiber optic network shall be complete and in operation to the satisfaction of the City Engineer at the time of acceptance of the work.

9403 COORDINATION OF TECHNICAL SPECIFICATIONS, PLANS, SPECIAL PROVISIONS, AND PROJECT SPECIAL PROVISIONS

Coordination of discrepancies between the Technical Specifications, Plans, and Special Provisions, shall be in accordance with the City of Olathe *Technical Specifications and Design Criteria for Public Improvement Projects*. In the case of a discrepancy within the Plans, the plan notes shall govern over the standard installation details, and the installation details shall govern over these specifications.

9404 CERTIFICATION OF CONTRACTOR PERSONNEL

All fiber optic work shall be performed by a Contractor with proper design and installation qualifications on staff, which shall include at least one Building Industry Consulting Services International (BICSI) Registered Communications Distribution Designer (RCDD) and an installation crew in which at least 10% of individuals contain BICSI Installer 2 (INSTF) certification. Before starting work, the Contractor shall provide the City Engineer with the names and certification credentials of the BICSI certified personnel assigned to perform fiber optic related work. If the BICSI certified designer(s) or installer(s) are dismissed from the project, all fiber optic installation work shall cease until the names and photocopies of certification cards for replacement personnel are provided to the City Engineer.

9405 FIBER OPTIC RELATED PRODUCTS AND MATERIAL LIST

Prior to commencing fiber optic installation, the Contractor shall submit a complete list of products and materials proposed for said installation for approval by the City Engineer prior to procurement of any materials. The Contractor shall annotate the documentation to reference where materials meet all applicable project specifications. All equipment supplied for the communications installation shall be listed on the most recent edition of the City of Olathe's Approved Products List. Products not included on the Approved Products List shall abide by the specific requirements listed below and be approved for use by the City Engineer prior to construction.

9406 CONDUIT

This section includes information regarding the pre-approved conduit types and installation methods for standard and multi-duct conduit with fiber optic cable.

Standard Conduit

All standard conduit shall meet the minimum requirements set forth in Section 9227 (see "High Density Polyethylene (HDPE) Conduit") of the City of Olathe Technical Specifications in addition to the requirements described below. All fiber conduit shall be HDPE SDR9 rated.

All standard conduit installed with fiber optic cable shall include a locating cable and pull string. The locating cable shall be a #10 A.W.G. stranded use copper locating cable. Locating cable and pull string installed in conduit shall be considered subsidiary to conduit installation, and no direct payment will be made.

Unless otherwise specified, standard conduit installed with fiber optic cable will be 2" or 3" in diameter. The color of standard conduit with fiber optic cable shall be black with orange stripe.

Multi-duct Conduit

As specified on the Plans, multi-duct conduit with pre-installed innerducts ("2-way", "4-way", or "7-way") shall be used. Conduits shall contain a 0.1 inch (2.5 mm) thicker oversheath option, with either two, four, or seven innerducts. The color of multi-duct conduit with fiber optic cable shall be orange or black with orange stripe. Conduits and innerducts shall meet the following specifications:

Conduit with 2 Pre-installed Innerducts ("2-Way")	Two (2) 22 mm OD / 16 mm ID HDPE Innerducts
	Ripcord
	#20 Insulated Copper Wire
	Total Oversheath Weight 0.333 lb/ft (495 g/m)
	Total Innerduct Weight lb/ft (196 g/m)
Conduit with 4 Pre-installed Innerducts ("4-Way")	Four (4) 22 mm OD / 16 mm ID HDPE Innerducts
	Two (2) Ripcords
	#20 Insulated Copper Wire
	Total Oversheath Weight 0.613 lb/ft (912 g/m)
	Total Microduct Weight lb/ft (393 g/m)
Conduit with 7 Pre-installed Innerducts ("7-Way")	Seven (7) 22 mm OD / 16 mm ID HDPE Microducts
	Two (2) Ripcords
	#20 Insulated Copper Wire
	Total Oversheath Weight 1.047 lb/ft (1558 g/m)
	Total Microduct Weight lb/ft (687 g/m)

Installation and Testing

The following requirements are applicable for all conduit installation with fiber optic cable. In addition to the requirements listed below, conduit installation shall conform to the conduit installation and testing procedures recommended by the manufacturer for each product used on this project.

All conduits shall meet the installation requirements set forth in Section 9212 of the Technical Specifications unless approved by the City Engineer. The Contractor may reroute proposed conduit

and/or adjust proposed conduit depth to a minimum of 20 inches from grade when proposed conduit installation is near and/or in conflict with an existing underground utility line and as approved by the City Engineer. The minimum vertical clearance for a utility crossing shall be 24 inches. The conduit depth shall be adjusted only in the area of the conflict.

All newly installed conduit and all existing conduit used under this Contract shall be blown and/or rodded clean to the satisfaction of the City Engineer prior to the installation of any cable or wire in that conduit.

As described in Section 9010 and Section 9022 of the Technical Specifications, all areas disturbed by conduit installation (either by trenching or boring) shall be replaced to match existing conditions. This may include (but not limited to) the repair to sidewalk, roadway sections, or re-sodding of green space. All sidewalk ramps disturbed during construction shall be replaced to meet City ramp requirements included in Sections 2000 and 2100 of the Technical Specifications, and all applicable Standard Details. All repair work shall be approved by the City Engineer.

As described in Section 9206 of the Technical specifications, existing utilities shown on the Plans are an approximate location only and are for the Contractor's information. The Contractor shall be fully responsible for any and all damage caused by the Contractor's failure to exactly locate and preserve all utilities Placement of conduit and pull boxes may be adjusted in the field to avoid obstructions but must be approved by the City Engineer prior to construction.

Installation into New and Existing Pull Boxes

All conduits shown in the Plans to be installed into new or existing pull boxes shall follow the specifications illustrated in the Standard Details and as described under Section 9213 (see "Conduit Entrances") of the Technical Specifications.

The Contractor shall maintain the existing pull box, provide general maintenance and cleaning out as required, and shall restore the surrounding area to a condition equivalent to that prior to when work began. The Contractor shall immediately notify the City Engineer if the Contractor determines that the existing pull box is unacceptable for reuse. If the existing pull box needs to be temporarily removed or otherwise disturbed for the new conduit installation, new gravel shall be installed in the base of the reinstalled existing pull box as required for new pull boxes as described in the Standard Details and described under Section 9213 (see "Bedding") of the Technical Specifications.

The costs of all labor, materials, and equipment necessary to complete the installation of new conduit into existing pull boxes or foundations as required in this Technical Specification shall be included in the quantities shown in the Plans for conduit installation.

The cost of payment, base, sub-base, restoration of sidewalk, driveway, and curb restoration shall be included in the quantities shown in the Plans for conduit installation.

Installation for Bridge Attachment

Attachment to bridges shall be as shown and detailed in the Plans. Conduit attached to bridges shall be rigid metallic conduit (RMC). Conduit attached to bridges shall have expansion fittings installed at the end of the bridge and at each expansion joint on the bridge. Payment for conduit attached to bridges shall include all items including mounting brackets, expansion fittings, and preformed conduit bends as required to complete the work. Conduit hangers shall be supplied to meet the loading requirements and support the conduit without sag.

Attachments to bridges shall not compromise the integrity of the structure. All attachment material submittals and proposed methods shall be reviewed and approved by the applicable regulatory agency. The Contractor shall coordinate with the City and Railroad to determine if a flagger will be required for work completed over railroad lines.

9407 FIBER OPTIC CABLE

This section includes information regarding the pre-approved fiber optic cables in addition to general bidding, installation, and testing requirements.

The Contractor shall furnish and install fiber optic cable as shown on the Plans and in accordance with the requirements specified herein. All fiber shall be shipped on reels of marked contiguous length. No splices shall be permitted within the fiber jacket.

The following standards are applicable to this item and are hereby incorporated by reference:

Organization	Standard	Applicability
RUS	PE-90	Cable Construction
TIA/EIA	598-D	Color Coding
TIA/EIA	472D0000	OSP Fiber Optic Cable
TELCORDIA	GR-20, Issue 4	Core
TIA/EIA	526-7	Fiber Optic Cable Testing

As shown in the Plans, fiber optic cable may either be standard fiber or microfiber.

Standard Fiber Optic Cable

Standard fiber shall include glass that meets or exceeds International Telecommunication Union (ITU) specification G.652D.

Standard fiber optic cables shall be single-mode, graded loose tube dielectric cable constructed with industry standard 3mm buffer tubes stranded around a central strength member. The buffer tubes shall be compatible with standard hardware, cable routing and fan-out kits. The cable core shall be filled with a water blocking material (either dry or gel-filled) to improve access and handling of individual tubes. The cables shall be designed for point-to-point applications as well as provide for mid-span access. The cable shall be single-mode, dispersion-unshifted fiber. The fiber shall be fully capable of handling existing and legacy single-mode applications which traditionally operate in the 1310 nm and 1550 nm regions. It shall also be designed to handle the new and emerging applications that utilize the "Extended" E-band, 1360 nm to 1460 nm. The fiber shall be designed to provide optimum performance from 1265 nm to 1625 nm intended for 16-channel Course Wavelength Division Multiplexing applications.

Standard fiber shall consist of 12, 24, 48, 96, 192, or 288 fibers as shown in the Plans, arranged in color-coded buffer tubes of 12 individually color-coded fibers. When less than six buffer tubes are required for the number of fibers, polyethylene filler rods shall be used to maintain cable integrity. Each buffer tube shall be filled with a water blocking material (either dry or gel-filled) for protection of the fibers from impact and moisture ingress. Aramid strength members shall be bundled with the buffer tubes and the filler rods and the jacket shall also contain a water blocking material (either dry or gel-filled) installed inside the cable jacket.

Standard fiber optic cables shall be specified on the City's Approved Products List or shall meet or exceed the following optical specifications:

Attenuation at 1310 nanometers	≤ 0.32 dB/km
Attenuation at 1550 nanometers	≤ 0.18 dB/km
Point Discontinuity	≤ 0.05 dB
Core Diameter	8.2 µm
Cladding Diameter	125.0 ± 0.7 µm
Core-clad Concentricity	≤ 0.5 µm
Coating Diameter	242 ± 5 µm
Numerical Aperture	0.14
Index of Refraction (1310 nm)	< 1.47
Index of Refraction (1550 nm)	< 1.47
Temperature Range (Operation and Storage)	-40 ^{o}C to 70 ^{o}C (-40 ^{o}F to 158 ^{o}F)
Temperature Range (Installation)	-15 ^{o}C to 60 ^{o}C (5 ^{o}F to 140 ^{o}F)
Maximum Tensile Strength (Short-term)	Per Manufacturer's Specification
Minimum Bend Radius (Operation)	15 times nominal cable O.D.
Minimum Bend Radius (Installation)	20 times nominal cable O.D.

Microfiber Optic Cable

Microfiber shall meet the requirements of ANSI/ICEA 744 and IEC 60794-5-10 and shall be compliant with ITU-T G.657.A1 and G.652.D, IEC 60793-2-50, and TIA/EIA-492CSSB specifications. The microfiber shall be fully backwards compatible with legacy G.652 compliant fiber types. Microfiber shall be single-mode and consist of 288 fibers arranged in loose color-coded buffer tubes of 24 individually color-coded fibers. Buffer tubes shall have a nominal diameter between 1.4-1.7 mm and have a dual-layer construction with PC inner layer and polybutylene terephthalate (PBT) outer layer. The central member shall consist of a dielectric, glass reinforced plastic (GRP) rod. Each buffer tube shall be filled with a water blocking material (either dry or gel-filled) for protection of the fibers from impact and moisture ingress. Microfiber shall be sheathed with polyethylene (PE) with a nominal jacket thickness of 0.5 mm. Jacket material shall be defined by ASTM D1248, Type III, Class D, Category 3 and Grade J4.

Microfiber optic cables shall meet or exceed the following specifications:

Attenuation at 1310 nanometers	≤ 0.32 dB/km
Attenuation at 1550 nanometers	≤ 0.18 dB/km
Point Discontinuity	≤ 0.05 dB
Core Diameter	8.2 µm
Cladding Diameter	125.0 ± 0.7 µm

Core-clad Concentricity	≤ 0.5 µm
Coating Diameter	200 ± 5 µm
Numerical Aperture	0.14
Index of Refraction (1310 nm)	< 1.47
Index of Refraction (1550 nm)	< 1.47
Temperature Range (Operation and Storage)	-40 °C to 70 °C (-40 °F to 158 °F)
Temperature Range (Installation)	-15 °C to 60 °C (5 °F to 140 °F)
Crush Resistance	1000 N/10 cm (570 lbf/in)
Maximum Tensile Strength (Short-term)	1334 N (300 lbf)
Minimum Bend Radius (Operation)	15 times nominal cable O.D.
Minimum Bend Radius (Installation)	20 times nominal cable O.D.

Installation and Testing

All fiber shall be installed in underground or bridge mounted conduit. Standard fiber shall be pulled in place either by hand or by an approved mechanical pulling machine. If a mechanical pulling machine is used, it must be equipped with a monitored or recording tension-meter. Microfibers shall be "jetted" following the manufacture's recommended procedures and jetting equipment in order to minimize fiber tension during installation. At no time shall the manufacturer's recommended maximum pulling tension be exceeded.

Where pulling through pull boxes, approved pulleys and sheaves shall be used or the excess cable must be coiled in a figure eight and fed by hand. If sheaves are to be used, the contractor shall provide the City Engineer with a drawing of the proposed layout showing that the cable will never be pulled through a radius less than the manufacturer's minimum bending radius.

Fiber optic cable shall be looped neatly in all pull boxes shown in the Plans. A minimum of 50 feet of coil shall be provided when passing through a pull box and 100 feet of coil shall be provided at each splice case (50 feet on each side of the splice case). This fiber is for future additions or repairs to the fiber network.

1. Fiber-Optic Cable Acceptance Testing Methods

    a. Visually inspect fiber-optic cable prior to installation. Report any defects to the City Engineer. All fiber connectors must be cleaned and checked for dirt, scratches or chips prior to installation and testing. All dust covers must be installed after testing is complete.

    b. The test equipment shall meet the requirements found in the TIA/EIA-568-D series of standards.

    c. Prior to installation, all fiber optic cable shall be tested in a single direction with an Optical Time Domain Reflectometer (OTDR) at 1310 nm and 1550 nm to verify attenuation and continuity. If the cable fails to meet the requirements provided herein, the Contractor shall replace the entire reel at no additional cost.

    d. Post installation, all terminated strands of fiber shall be tested bi-directionally, and non-terminated fibers shall be tested in a single direction with an OTDR at 1310 nm and 1550

nm to verify attenuation, continuity and splice loss of strands for the entire length of cable. In addition, an Optical Loss Test Set (OLTS) shall be used to test all terminated fiber. The contractor shall perform all tests in the presence of the City Engineer and provide the City Engineer with up to five copies of any software required for viewing electronic files of the OTDR traces. OLTS results shall be submitted in Excel format. Fiber test results submitted to the City Engineer that exceed the max attenuation loss specification will be identified as Out-of-Specification (OOS).

e. The fiber-optic cable is to have a maximum attenuation of 0.34 dB/km at 1310 nm and 0.20 dB/km at 1550 nm when measured with an OTDR. Fiber test results submitted to the City Engineer that exceed the max attenuation loss specification will be identified as OOS.

f. Each splice shall have an averaged loss value of 0.07 dB or less when measured bi-directionally with an OTDR at 1310 nm and 1550 nm. Fibers not meeting the 0.07 dB or less specification will be identified as OOS.

g. Each connector is to have an averaged loss value of 0.25 dB or less when measured bi-directionally with an OTDR at 1310 nm and 1550 nm. Connector test results submitted to the City Engineer that exceed the max loss of 0.25 dB specification will be identified as OOS.

h. All fiber optic cable and connector tests that are submitted to the City Engineer that are OOS are subject to penalties of $150.00 for each trace.

i. OTDR testing shall use a launch and receiving cables that are a minimum 1,000 meters or greater than the dead zone for the OTDR used for this test.

j. Contractor shall replace, as directed by the City Engineer, any defect discovered during final acceptance at no additional cost to the City of Olathe. Consider a defect to be any cable with an OTDR measured length that differs from the actual cable footage, excluding manufacturer's helicity.

k. All splicing and test equipment shall be factory certified within the last year. The Contractor shall provide copies of the certification ten days prior to testing.

l. Testing summary results shall be recorded by the Contractor and submitted to the City Engineer in PDF format through the meter manufacturer's software. No additional alteration using software from the Contractor beyond the meter manufacturer's software will be allowed. Completed test forms shall be supplied for each fiber. Contractor shall also provide native test (electronic version) with no alterations and meter software for viewing of fiber traces. At a minimum, test results shall show the following:

- Cover Sheet with the words "Project Test Documentation", project name, project number, and the date of completion (month and year)
- Cable and fiber identification (as approved by City Engineer)
- Cable Location – begin and end point
- End-to-end cable length in meters calculated from cable markings
- Operator Name
- Date and Time

- Measurement direction
- Setup and test parameters including wavelength, pulse width, range, refractory index, scale and ambient temperature.

m. Test results for OTDR test averaged for total fiber trace, splice loss/gain (dB), connector loss (dB), all events greater than 0.05 dB, and total length from OTDR.

n. When repairs and re-tests are performed, the reported problem(s) and the corrective action(s) taken shall be noted. Both the failed and passed test results shall be documented.

9408 PATCH CABLE

This section includes information regarding the pre-approved patch cables in addition to general bidding, installation, and testing requirements.

The patch cables shall be impact-resistant single-mode duplex fiber cables. All patch cable fiber and connectors shall conform to the exact specifications included herein for fiber and connectors. Patch cables supplied at the traffic signal controller cabinets shall be one meter in length and shall be LC to LC or as specified on the Plans. Quantities for patch cables are detailed in the plans.

9409 SPLICE ENCLOSURES

Splice enclosures shall have the following characteristics:

a. Meet or exceed the specifications of the model illustrated on the City's Approved Products List.

b. Supply environmental protection of cable and splices from water and dirt and that is designed to be submersed in water and installed underground outside plant use for splicing fiber-optic cables in handholes. Water-blocking techniques shall be used to ensure that the splice closure and cable entry locations do not leak when immersed in 19 feet of water for 30 days.

c. The splice closure shall be compatible with all sizes of fiber cables used on the project and large enough to accommodate the number of splices called for plus an additional 12 fibers (or an additional 10 percent, whichever is greater).

d. The closures shall be a dome type splice closure manufactured from a high-density polyethylene or approved equivalent nonmetallic material with the following properties:

- Cable entry shall be manufactured of similar material to the dome body and shall seal the closure with re-usable compressed gel cable sealing components that accommodate a wide range of cable sizes.
- Closures shall be re-enterable and re-sealable without the need for specialized tools or equipment or any additional parts.
- No encapsulated materials shall be allowed.
- Be provisioned for a minimum of six cable entries.
- Hinging splicing trays that provide controlled access to splices and slack storage. Splice trays shall be labeled for content.
- Splice and storage compartments accessible via a removable dome-clamp system.

- The closure shall be sized to allow for the storage of all unopened buffer tubes.
- Splice enclosures shall also be supplied with all hardware necessary to provide solid mounting to wall structures. The Contractor shall wall mount the splice enclosure at the request of the City Engineer.

e. The splice closure shall contain all splice trays, storage, splice sleeves, organizing materials, and any other incidental materials required to complete the splices at the locations shown in the plans.

f. After splicing is complete, the fiber-optic cable and closure shall be flash tested for leaks.

It shall be the responsibility of the Contractor to determine where underground splice enclosures are required for the termination of underground cable at the end of a cable reel. Underground splice enclosures for end-of-reel splicing shall not be spaced less than 20,000 feet unless otherwise approved by the City Engineer. All splice enclosures shall be Type IV, 30" x 48", double lid junction box. The cost of the enclosure and all additional splicing used for this purpose shall be considered incidental to the installation of the fiber optic cable.

9410 FIBER DISTRIBUTION UNIT (FDU)

This section includes information regarding the pre-approved fiber distribution units (FDU) in addition to general bidding, installation, and testing requirements.

This item is paid for per each unit.

An FDU shall be used for either trunk fibers, or branch fibers, which are terminated at node locations or building facilities. FDU's shall not be used for terminations in traffic signal cabinets unless otherwise approved by the City Engineer.

Traffic signal cabinet terminations will be made using the following components: Single Panel OptiTip Housing; 150 foot non-pinned-to-non-pinned OptiTip runner; 50 foot pinned OptiTip pigtail (for splicing). Signal cabinet termination components shall be in accordance with the City of Olathe Signals Approved Products List.

Sufficient bulkheads shall be installed for all individual strands of the fiber to be connected and space for additional bulkheads shall be provided. At node locations and building facilities, twenty (20) percent spare bulkheads shall be provided.

If an existing FDU is in the traffic signal cabinet, then the Contractor shall remove the FDU and replace it with the updated SPH unit. The Contractor is responsible for proper disposal of the FDU.

The FDU to be installed at building facilities shall meet or exceed the specifications of the model illustrated in the City's Approved Products List. An FDU at building facilities shall allow for either wall mount or rack mounting (EIA 19-in. rack type) and provide SC connectors. The ultimate FDU location (including mounting type) and number of SC connectors shall be determined by the City Engineer. If a rack mountable FDU is required at a location and no usable cabinet space is available, the Contractor shall also provide an FDU cabinet at no additional cost. The FDU cabinet shall meet or exceed the specifications of the model illustrated in the City's Approved Products List.

9411 PIGTAILS

Quantities are shown in the Plans for installation, fabrication, and installation of factory pigtail with connectors (including splices). The Contractor is responsible for ensuring that the fiber optic cable used in the pigtail and drop cable has the same or compatible physical and optical characteristics as the fiber optic cable to which it is being spliced.

FDU Pigtail

The Contractor shall be responsible for the installation and termination of the pigtail. The pigtail shall consist of a factory-terminated and polished connector with a protective sleeve that will be fusion spliced to the fiber optic drop cable and placed into the splice tray within the FDU. The Contractor shall provide documentation to the City Engineer verifying that the pigtails were factory made. A breakdown of how many fibers that must be spliced is included in the approved plans.

The Contractor shall provide pre-terminated pigtails with SC connectors as designated in the approved plans.

Single Panel Housing (SPH) Pigtail

The Contractor shall utilize a SPH pigtail with multiterminal (MT) hardened connections capable of connecting up to 12 fibers as designated in the approved plans. SPH pigtails shall meet the following minimum specifications:

Axial Pull, Plug to Cable	100 lb
Axial Pull, Plug to Adapter Coupling	50 lb
Insertion Loss	≤ 0.35dB
Reflectance	≤ -65 dB

SPH pigtails shall be a minimum of 50 feet in length to provide underground connection from the splice enclosure to a SPH located in the controller cabinet. The SPH shall be DIN rail mounted to the cabinet, support LC compatible connectors, and accommodate a minimum of 12 fibers (See Section 9410 of the Technical Specifications).

The Contractor shall follow manufacture's recommended procedures for installation, connections, and cleaning.

9412 JUNCTION BOXES

Fiber optic junction boxes shall be either Type III or Type IV composite junction box as shown in the Standard Details and on the plans. The installation of fiber optic junction boxes shall be consistent with that which is described in Section 9213 of the Technical Specifications and all applicable Standard Details. All splice closures shall be housed in Type IV, 30" x 48", double lid junction box.

9413 LABELING

At all entries to pull boxes, traffic cabinets, splice enclosures and all other permanent facilities, the Contractor shall label fiber optic cables, splice enclosures (including splice trays), and FDU's with self-adhesive permanent polyester label with minimum 3/16" high characters. Labels shall be black print on white tape labels. Unless otherwise approved by the City Engineer, one of the following labeling products shall be used:

- Dymo Rhino 18766
- Brother TZ221
- Panduit T038X000VPC-BK

Labels shall be machine-printed. Hand-lettered labels will not be considered as acceptable.

All fiber optic cables and connectors must be clearly labeled in accordance with EIA/TIA standards. Labels shall include "City of Olathe – Fiber Optic."

Prior to installation of fiber optic cable, the contractor shall submit for the City Engineer's approval a proposed labeling scheme to ensure consistent naming of cables and termination points throughout the project. After installation, each run of fiber optic cable shall be marked within one foot of each splice and/or termination with the location of the opposite end of the cable. The nomenclature shall be used on the OTDR sweep test results (described under "Installation and Testing" of Section 9407 of the Technical Specifications). All fiber shall be labeled with the sequential length at a maximum of every three (3) feet. After installation, the distance markings at each end of each run and within each pull box shall be logged and provided to the City Engineer in a form acceptable to the City Engineer.

All fiber optic cable shall contain imprinted lettering displaying "City of Olathe – Fiber Optic" on the outside of the conduit/cable wall.

9414 DOWNTIME

The Contractor shall ensure continuous operation of the existing fiber networks and systems during construction of the project.

The Contractor shall not work on splicing, disconnecting and/or in any way disrupting normal operation of the existing fiber network or systems without approval from the City Engineer and all affected parties. The Contractor shall provide a written request to all respective parties for approval at least ten calendar days before work is done near an existing fiber network or equipment. A copy of the written request shall be submitted to the City Engineer. In addition to the written request, the Contractor shall submit the work plan and anticipated schedule for approval by the City Engineer. The work plan shall include all fiber strands and the parties possibly affected.

Planned disruptions to the existing fiber network shall be approved by the City Engineer. A "cut-over" plan shall be documented by the Contractor and submitted to the City Engineer two weeks prior to the proposed date. Time frames for completion of the fiber work shall not exceed an 8-hour window. At the sole discretion of the City Engineer, the Contractor may be restricted to night or weekend work to minimize disruption to the system. Requirements for night or weekend work and downtime, if required, will be detailed in the plans for each project individually.

In the event it is suspected that cable damage has occurred prior to final acceptance, Contractor shall test the cable with an OTDR within 72 hours after notification and submit a copy of the OTDR test to the City Engineer upon completion.

In the event of an unplanned disruption, the contractor shall simultaneously notify the City Engineer and affected parties, immediately stop all work in progress, and expend all efforts to restore the disrupted system(s) and/or correct the problem causing the disruption. The notice shall include the type of facility damaged and the extent of the damage. The Contractor shall remain on site until the City and/or Engineer determines that the disrupted systems are fully operational.

Unplanned disruptions shall result in the assessment of liquidated damages. In addition, the Contractor will not be granted an extension of time for delays caused by repairing disrupted systems. Should an unplanned disruption to the existing network occur, the Contractor may be subject to:

1. Pay $250.00 in liquidated damages per 15 minutes, for each 15-minute period that the Contractor fails to restore the proper operation of an existing fiber-optic network element following an unplanned disruption.
2. Authorize the City Engineer to deduct these liquidated damages from any money due or coming due to the Contractor.

The Contractor shall be responsible for repairing, to the satisfaction of and at no cost to the City, any damage the Contractor causes to the existing fiber networks and systems during the life of the project. If the Contractor is unable to perform the proper repairs in a timely manner to the satisfaction of the City Engineer, the City reserves the right to contact their ATMS fiber on-call Contractor to assist and/or perform the needed repairs. Any additional costs associated with this procedure shall be the sole responsibility of the original Contractor. See Fiber System Damage procedure document.