



**COMMONWEALTH OF KENTUCKY
TRANSPORTATION CABINET**

Frankfort, Kentucky 40622
www.transportation.ky.gov/

Matthew G. Bevin
Governor

Greg Thomas
Secretary

July 12, 2019

CONTRACT ID NO. 19-9001 ADDENDUM #5

Subject: Boone County
Letting August 16, 2019

- (1) Replace Instructions to Proposers - Pages 27, 60, 62, 74 and 75
- (2) Replace Appendix J
- (3) Add Appendix T

Proposal revisions are available at

<http://transportation.ky.gov/Construction-Procurement/Pages/Design-Build-Projects.aspx>.

If you have any questions, please contact us at 502-564-3500.

A handwritten signature in cursive script that reads "Rachel Mills".

Rachel Mills, P.E.
Director
Division of Construction Procurement

RM:mr
Enclosures



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7. GENERAL PROVISIONS FOR THE SCOPE OF THE WORK

The DBT shall provide for the engineering services, design, and preparation of detailed construction plans for the construction of the proposed project. The DBT shall also provide services as described in Section 10 for the acquisition of right-of-way necessary to construct the proposed project and shall provide for the relocation of utilities impacted by the proposed project as described in Section 11. Further, the DBT shall provide for the furnishing of materials, construction and completion in every detail of all the work described in this RFP in order to fulfill the intent of the contract.

7.1 GOVERNING REGULATIONS

All services, including but not limited to survey, design and construction work, performed by the DBT and all subcontractors, shall be in compliance with all applicable AASHTO Design Standards, KYTC Department of Highway's Standard Specifications for Road and Bridge Construction, Standard Drawings, Manuals and Guidelines. As a part of the DBT's technical proposal submittal, a detailed general schedule outlining the items listed in Section 13.1.2.1 of the ITP shall be submitted. A comprehensive schedule detailing all project milestone dates shall be prepared for Department review and approval within 30 days of the award of the contract. This schedule shall show all major design, right-of-way, utility and construction activities and the critical path to completion. The comprehensive Progress Schedule required for this Project is the CPM schedule. The CPM schedule format shall be as described in the CPM Special Note in Appendix F. The DBT shall designate a Schedule Representative who shall be responsible for coordinating with the Engineer during the preparation and maintenance of the schedule and throughout execution of the entire contract.

The fact that the bid items for this Design-Build project are general rather than specific shall not relieve the DBT of the requirement that all work performed and all materials furnished shall be in reasonable conformity with the specifications. The DBT's Consultant shall reference in the plans the appropriate Construction and Material Specifications Item Number for all work to be performed and all materials to be furnished.

It shall be the responsibility of the DBT to acquire and utilize the necessary KYTC manuals that apply to the design, right-of-way, utility, and construction work required to complete this project. **The DBT shall use all manuals in effect as of 6/21/19, including the 2019 KY Standard Specifications for Road and Bridge Construction.**

7.2 LUMP SUM BID ITEMS

For this project, a single "all-inclusive" Lump Sum bid item is to be utilized. The components that are to be incorporated in this bid item are described throughout the ITP and shall include but are not limited to:

- A. Project Development Services
- B. Right of Way Acquisition Services
- C. Utility Relocation
- D. Grade & Drain
- E. Asphalt Paving
- F. Concrete Paving
- G. Traffic Signals
- H. Signing
- I. Lighting
- J. Structures

12.2.3 DESIGN SPEED CRITERIA

65 mph (I-275)
35 mph (Graves Road & KY 237)

12.2.4 GEOMETRIC CRITERIA

Geometric Criteria for the preliminary design information completed by KYTC is included in Appendix R. The DBT’s final designs shall be equivalent to these criteria or should offer an improvement to these criteria. The entrance grades provided in Appendix R are for information only. Further design may require the grades to be adjusted, however, the grades proposed should be utilized as the maximum grade for that particular entrance. If DBT proposes to utilize a greater grade, then it must be approved by the Engineer.

12.2.5 PAVEMENT

See Appendix E for thickness details

Material Transfer Vehicle Required: Yes X No _____

See Special Note for Materials Transfer Vehicle in the Standard Specifications.

Pavement Ride Quality Required: Yes X No _____

See Section 410 of the Standard Specifications for Asphalt Pavement. Category B shall apply for Asphalt Pavement.

See Section 501 of the Standard Specifications for Concrete Pavement. Category B shall apply for Concrete Pavement.

12.2.6 TYPICAL SECTION

See Appendix E (No variations of typical section dimensions permitted).

12.2.7 DRAINAGE FOLDER REQUIRED

Yes X No _____

In addition to standard guidance within the KYTC Drainage Manual, the DBT shall ensure that the post-development discharge and velocity does not exceed the pre-development discharge and velocity at each final point of discharge from the project. In some instances this will require the use of energy dissipaters and/or detention basin storage before disposal. Also, at any location, on any roadway, where the final design prescribes an existing pipe to be left in place as part of the active storm drainage system and new pavement is to be constructed over the existing pipe or over an extension of the existing pipe, the entire length of the existing pipe shall be lined according to the Cured-In-Place Rehabilitation method defined in Appendix T, or an approved equal.

12.2.8 DESIGN EXCEPTIONS

The current edition of AASHTO’s A Policy on Geometric Design of Highways and Streets Section 6.2.1 and Section 5.2.1 recommends that in rolling terrain, a design speed of 50 mph (rural collectors) and 40 mph (rural locals) respectively should be utilized with average daily traffic (ADT) greater than 2,000. KY 20 and Bullittsville Rd both have a posted speed limit of 35 mph. The horizontal curves and minimum grades required to accommodate these design speeds would have detrimental impacts to the residences surrounding the project. Both roads are also coming to an intersection and shall be required to slow down or stop. The project team has requested a design exception to utilize a 35 mph design speed to minimize impacts and match the conditions of the existing roadway.

The DBT shall advise of any proposed design features that do not meet the minimum design criteria. Due to the sensitive nature of the approval process for a Design Exception, it is a requirement that all design exceptions be submitted for consideration by the KYTC in writing no less than 45 days prior to submittal of the technical proposal. A detailed explanation of the justification for this exception shall be provided with this request. All DBTs shall be made aware of the request as well as approval or disapproval in writing. KYTC does not intend to approve design exceptions after the contract is awarded unless extreme and unforeseen

along with paver mounted temperature profiles and E-ticketing as described in Appendix S.

12.2.12 ADDITIONAL CONSIDERATIONS

In developing the roadway design, gravity retaining walls should be used as a last resort to minimize ROW impacts.

12.3 STRUCTURES

12.3.1 STRUCTURE DESIGN/ADVANCE SITUATION FOLDER

The DBT shall have a consultant DBT member pre-qualified in Structure Design, Bridges under 500 feet. The DBT shall be responsible for preparing any structure plans required. The structure plans shall be developed in accordance with Division of Structure Design Guidance Manual (<http://transportation.ky.gov/bridges/GuidanceManual.htm>). Review times shown in the Guidance Manual shall begin when a submittal is received. Submittals required shall be Advance Situation Folder, Stage 1 Preliminary Plans, Stage 2 Preliminary Plans, Stage 1 Final Plans and Stage 2 Final Plans. The structure plans shall be signed and sealed by a Licensed Professional Engineer. Structures may be submitted individually. The Division of Structural Design shall provide drawing numbers for each structure. The DBT shall present electronic copies in PDF format of plans and calculations for all submittals to the Division of Structural Design. This shall be in addition to any required hard copies.

12.3.2 EXISTING STRUCTURES IDENTIFICATION AND DATA

Plans are available for the existing Graves Road overpass at:

<https://transportation.ky.gov/Construction-Procurement/Pages/Design-Build-Projects.aspx>

The DBT should verify all pertinent information needed to facilitate the design and construction.

12.3.3 DESIGN AND CONSTRUCTION REQUIREMENTS OF STRUCTURE

All design and structure construction shall be in compliance with all applicable AASHTO design criteria as well as current KYTC standards. In addition, the DBT shall ensure and provide evidence that all structure elements are situated outside of the clear zone requirements established by the AASHTO Roadside Design Guide; however, the minimum offset of structure elements shall be 38' from the edge of **mainline or ramp driving lanes** to the face of the structure element **on the outsides of the roadway**.

All Shop Drawings shall be approved by DBT. PDF copies shall be provided to the Division of Structural Design.

12.3.4 FOUNDATION INVESTIGATION AND GEOTECHNICAL INVESTIGATIONS

All geotechnical information needed by the DBT for foundation investigation and all geotechnical investigations necessary to prepare the DBT's technical and price proposals shall be the responsibility of the DBT. The subsequent reports shall be submitted for review and approval by KYTC Geotechnical Branch. Please allow 14 calendar days for this review. Existing Geotechnical Information is for information purposes only.

12.3.5 GEOTECHNICAL, FOUNDATIONS, SLOPES, AND WALLS

All geotechnical information needed by the DBT for roadway and foundation investigation and all geotechnical investigations necessary to prepare the DBT's bid

13.1.2.6 Part F – Utility Coordination and Relocation Plan

Both public and private utilities are present throughout the footprint of the Graves Road Interchange project. The DBT shall be required to coordinate with the utility companies and arrange for any utility relocations necessary.

The Technical Proposal shall address the following utility issues:

- A. Describe the proposed coordination with utility owners.
- B. Demonstrate that the DBT has considered utilities in determining the proposed construction schedule.

KYTC shall use the following criteria to distribute Utilities points:

	Component of Utility Coordination and Relocation Concepts	Percentage of Proposed Utilities Points
F.1	Utility Coordination/Relocation Plan	100

13.1.2.7 Part G – Disadvantaged Business Enterprise (DBE) Plan

Contractors shall include the following certification in the technical proposal. PROPOSALS SUBMITTED WHICH DO NOT INCLUDE CERTIFICATION OF DBE PARTICIPATION WILL NOT BE ACCEPTED. These bids will not be considered for award by the Cabinet and they will be returned to the bidder.

“The proposer certifies that it will secure participation by Disadvantaged Business Enterprises (“DBE”) in the amount of 7% percent of the total value of this contract and that the DBE participation will consist of both a project development component and a construction component and that the DBE participation will be in compliance with the requirements of 49 CFR.”

	Component of DBE Plan	Percentage of Proposed DBE Plan Points
G.1	DBE Statement	Pass / Fail

13.1.3 *TECHNICAL PROPOSAL SCORING*

The following table provides a general indication of anticipated scoring of each evaluation criteria.

Definition	Scoring Range (percentage)
The Technical Proposal component demonstrates an approach that is considered to significantly exceed the ITP requirements and objectives in a beneficial way (providing advantages, benefits, or added value to the Project) and that provides a consistently outstanding level of quality. Must have a significant strength or number of strengths and no weaknesses.	90-100
The Technical Proposal component demonstrates an approach that is considered to exceed the ITP requirements and objectives in a beneficial way (providing advantages, benefits, or added value to the Project) and offers a generally better than acceptable quality. Must have strengths and no significant weaknesses.	80-89
The Technical Proposal component demonstrates an approach that is considered to meet the ITP requirements and objectives and offers an acceptable level of quality. It has strengths even though minor or moderate weaknesses exist.	70-79
The Technical Proposal component demonstrates an approach that is marginally acceptable.	60-69
The Technical Proposal component demonstrates an approach that contains no strengths and contains minor or significant weaknesses.	0-59

13.1.4 *FORMAT OF TECHNICAL PROPOSAL*

The technical proposal is limited to 35 pages 8.5” by 11” which shall meet the same formatting requirements of section 4.2.1 and shall include the information requested in this solicitation. The DBT may provide unlimited 11” by 17” pages for supporting details and graphics (ie plan sheets, profiles, etc). An 11” by 17” sheet shall not contain only text but shall contain pictures, graphs, charts, plans, or other graphics. Preliminary plans shall be completed with a readable scale on 11” by 17” sheets. The DBTs are encouraged to be as concise as possible. The technical proposal shall include preliminary plans in accordance with the following:

Roadway plans shall be at an approximate 30 percent level of completion and shall at a minimum include the following:

- A. Layout Sheet – includes index of sheets
- B. Typical Sections (typical sections shall be provided that reflect the provided options for either asphalt and/or concrete)
- C. Geometric Detail Sheets (As applicable)
- D. Plan and Profile Sheets (Project limits, alignments and profiles, major drainage features, roadside barrier locations, right-of-way)
- E. Construction Detail Sheets – as needed
- F. Conceptual Maintenance of Traffic Plans (typical sections, plans, profiles, construction phasing details, traffic control devices)
- G. Critical Cross Sections: Cross Sections shall be provided electronically. Paper copies are not required.

Bridge plans shall include:

Appendix J -- Utility Company Contacts

AREA FACILITY OWNER CONTACT LIST

<u>Facility Owner</u>	<u>Address</u>	<u>Contact Name</u>	<u>Phone</u>	<u>Email</u>
Boone County Water District	PO Box 18 Burlington KY 41005	Keith Feldhaus	(859) 586-7270	kfeldhaus@fuse.net
Boone Florence Water Commission	2475 Burlington Pike PO Box 998 Burlington, KY 41005	Carl Cassell	(859) 586-5190	ccassell@fuse.net
Cincinnati Bell Telephone - Overhead	221 E Fourth Street Building 121-900 Cincinnati, OH 45201	Dan Springelmeyer	(513) 397-7165	dan.springelmeyer@cinbell.com
Cincinnati Bell Telephone - Underground	221 E Fourth Street Building 121-900 Cincinnati OH 45201	Mark Conner	(513) 565-7043	mark.conner@cinbell.com
Duke Energy Kentucky (Gas) - Natural Gas Distribution	1262 Cox Avenue Erlanger, KY 41018	Gerry Helm	(859) 534-4405	Gerry.Helm@duke-energy.com
Duke Energy Kentucky (Electric) - Distribution	2010 Dana Avenue Cincinnati, OH 45207	Wes Needham	(513) 458-3857	Wes.Needham@duke-energy.com
East Kentucky Power Cooperative	4775 Lexington Road PO Box 707 Winchester, KY 40391	Garry Harvey	(859) 745-9601	garry.harvey@ekpc.coop
Owen Electric Cooperative - Electric	8205 Highway 127 N PO Box 400 Owenton KY 40359	Lucas McNally	(859) 393-9450	lmcnally@owenelectric.com
Sanitation District No. 1 - Sewer	1045 Eaton Drive Fort Wright KY 41017	Andy Aman	(859) 578-6880	aaman@sd1.org
Spectrum Communications	100 Barnwood Drive Edgewood, KY 41017	Chuck McCarty	(859) 687-7045	charles.mccarty@charter.com
Zayo Communications		Ryan Burns	(812) 589-9314	ryan.burns@zayo.com

Appendix T -- Gravity Sewer Pipe Rehabilitation by Cured-In-Place Pipe Method

Appendix T -- Gravity Sewer Pipe Rehabilitation by Cured-In-Place Pipe Method

Part 1 General

1.1 Description of Work

Furnish all labor, material and equipment to provide for the reconstruction of existing sewer pipes using an approved Cured-In-Place Pipe (CIPP) method by forming a new pipe within an existing pipe, which has generally maintained its original shape. This Specification covers the general requirements for the referenced specifications, CIPP manufacturer and installer qualifications, submittal and guaranty guidelines, materials, installation and testing procedures.

1.2 General

Supply all products and perform all work in accordance with applicable American Society for Testing and Material (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI), or other recognized standards. Latest revisions of all standards are applicable. Where discrepancies exist between this specification and referenced product/process standards, this specification shall govern.

1.3 Intent

It is the intent of this specification to provide for the reconstruction of existing sewers by the CIPP method in pipes which have generally maintained their original shape. The CIPP shall provide flow capacity not less than 100% of the original pipe's flow capacity when new. The process is defined as the reconstruction of sewer lines by the installation of a thermosetting resin-impregnated flexible felt-fiber tube coated on one side with an impermeable plastic which is installed into the existing sewer utilizing a hydrostatic head, or air pressure. Curing is accomplished by circulating hot water or the introduction of controlled steam throughout the length of the inverted tube to cure the resin into a hard, impermeable pipe with the plastic coating on the interior surface of the newly formed pipe. The CIPP shall extend the full length of the original pipe segment and shall provide a structurally sound, joint-less, close fitting and corrosion resistant cured-in-place pipe.

1.4 Objective

The primary objective of this section is to rehabilitate those sewers on which failure could be very disruptive and hazardous to public health and, to restore structural integrity to sewers which would be very expensive to repair after failure. The secondary objective of this scope is to reduce the excessive infiltration and inflow of extraneous water into selected sewer segments thereby reducing sewer overflows and the unnecessary treatment and transport costs associated with inflow/infiltration. It is critical that both the Product and the Installer have the ability to meet or exceed all requirements of the Owner.

Part 2 Contractor's General Responsibilities

2.1 Supervision

1. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of KYTC in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.

2. At all times during the progress of the Work, Contractor shall assign a competent foreman or crew leader. The foreman or crew leader will be Contractor's representative at any work site and shall have authority to act on behalf of Contractor. All communications given to or received from the competent foreman or crew leader shall be binding on Contractor.

2.2 Labor

1. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform services as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site and represent KYTC in the most professional manner.

2.3 Services, Materials, and Equipment General Requirements

1. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, coordination, permits, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance and completion of the Work.

2. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of KYTC. If required by KYTC, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

3. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

4. The contractor shall protect, store, and handle the materials during transportation, while on-site and during installation in accordance with manufacturer's recommendations to ensure that they are not damaged.

5. If any materials become damaged before or during installation, they shall be replaced at the contractor's expense before proceeding further.

2.4 Subcontractors, Suppliers, and Others General Requirements

1. Contractor shall be fully responsible to KYTC for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions.

2. Nothing in the Contract Documents shall create for the benefit of any such Subcontractor, supplier, or other individual or entity any contractual relationship between KYTC and any such Subcontractor, supplier or other individual or entity. Nor does anything in the Contract Documents create any obligation on the part of KYTC to pay or to see to the payment of any moneys due any such Subcontractor, supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

3. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.

4. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with KYTC through Contractor.

5. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

6. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of KYTC. Whenever any such agreement is with a Subcontractor or Supplier who is listed as an additional insured on the property insurance, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against KYTC and all other individuals or entities identified to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, consultants and Subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

2.5 Patent Fees and Royalties General Requirements

1. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if to the actual knowledge of KYTC its use is subject

to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by KYTC in the Contract Documents.

2. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless KYTC, and the officers, directors, partners, employees, agents, consultants and Subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

2.6 Permits General Requirements

Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction permits and licenses. KYTC shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges, permits, and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. KYTC shall pay all charges of utility owners for connections for providing permanent service to the Work.

2.7 Laws and Regulations General Requirements

1. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, KYTC shall not be responsible for monitoring Contractor's compliance with any Laws or Regulations.

2. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work.

3. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price.

2.8 Taxes General Requirements

Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

2.9 Related Work at Site

1. KYTC may perform other work related to the Project at the Site with KYTC's employees or via other direct contracts therefore, or have other work performed by utility owners. Notice will be given to Contractor prior to starting any such other work.
2. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner and KYTC, if KYTC is performing other work with KYTC's employees, proper and safe access to the Site, a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and shall properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering their work and will only cut or alter their work with the written consent of KYTC and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between KYTC and such utility owners and other contractors.
3. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Section, Contractor shall inspect such other work and promptly report to KYTC in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

Part 3 General Requirements of CIPP

The finished pipe must be such that when the thermosetting resin cures, the total wall thickness will be a homogeneous, monolithic felt and resin composite matrix that will be chemically resistant to withstand internal exposure to domestic sewage. When cured, the CIPP must form a mechanical bond with the host pipe.

3.1 Reference Specifications

Installation and material tests of cured-in-place pipe (CIPP) must meet the minimum requirements demonstrated in the latest revisions of the following ASTM standards:

Test Method of Flexural Properties of Plastics

ASTM F-1216 Standard Practice for the installation of
Cured-In-Place Pipe by Inversion Lining

ASTM D-790 **Standard Polyester Resin**
Flexural Strength 4,500 psi

Gravity Sewer Pipe Rehabilitation by Cured-In-Place Pipe Method

Flexural Modulus 250,000 psi

Enhanced Polyester Resin

Flexural Strength 4,500 psi

Flexural Modulus 400,000 psi

Any approved process shall strictly adhere to this specification with regard to all standards and requirements. Where discrepancies exist, or any latitude is either inferred or interpreted between this specification and ASTM product and process standards, THIS SPECIFICATION SHALL GOVERN.

3.2 Submittals

1. The Contractor shall furnish three (3) copies of the design calculations establishing the structural capabilities, chemical composition, thickness, curing temperature and period, assumptions, and other mechanical properties of the liner system proposed.
2. The Contractor shall furnish three (3) copies of the manufacturer's brochures giving a complete description of the product proposed, its physical and chemical composition, the same for the thermosetting resin or epoxy hardener, the recommended range of curing temperature, period of cure, cool-down procedures and method of installation.
3. Sampling procedures for obtaining representative restrained or plate (for diameters 15-inch and larger), samples of the finished liner.

Part 4 Materials

4.1 Cured-In-Place-Pipe

1. The CIPP material shall be fabricated from materials which, when cured, will be suitable for the environment intended, i.e., resistant to withstand exposure to sewage gases containing normal levels for domestic sewage of hydrogen sulfide, carbon monoxide, carbon dioxide, methane, traces of mercaptan, kerosene, saturation with moisture, dilute sulfuric acid, external exposure to soil bacteria, and any chemical attack which may be due to materials in the surrounding ground. The final product must not deteriorate, corrode, or lose structural strength in any manner that will preclude meeting the expected design life.
2. The structural performance of the inverted cured-in-place pipe must be adequate to accommodate all internal and external loads (live and dead) over its service life. The CIPP liner shall be designed considering the host pipe is fully deteriorated, a prism loading, a soil loading of 120 pcf, a 2.0 factor of safety, a 2-percent ovality, a 5-percent maximum deflection, a 1,000 psi modulus of soil reaction, a 4,500 psi flexural strength, a 3,000 psi tensile strength, a lining enhancement factor (K) of 7 maximum, H-20 live loads where applicable, 50-percent long-term modulus reduction factor and a hydrostatic load beginning at the surface.

4.2 Acceptable Resin Classes

1. The resin class for CIPP installed under this contract shall be either a Standard Polyester or Enhanced Polyester unless otherwise directed by the Sanitation District due to site-specific field conditions and/or design requirements.

4.3 Standard Polyester Resins

1. The resin used shall be high-grade corrosion resistant isophthalic polyester specifically designed for the CIPP being installed. Only premium, non-recycled resin shall be used. The acceptable resin, (Reichhold PolyLite® 33420 or approved equal) shall have been tested according to ASTM D2990, D5813, and F1216 by accredited, third-party testing facilities. Results of these tests shall be made available to the Sanitation District upon request. **Proper certification shall be submitted with the Contractor's bid. Failure to provide this documentation may be grounds for disqualification.**

2. The resin must be manufactured under ISO 9002 certified procedures. The resin vendor must be able to reference the corrosion scale with the resin itself having a heat deflection temperature greater than 212 degrees Fahrenheit. Only PREMIUM, NON-RECYCLED resins will be accepted. PET resins or those containing enhancement additives and/or fillers will not be accepted.

4.4 Enhanced Polyester Resins

1. The resin used shall be a corrosion resistant enhanced thixotropic, medium reactivity, high viscosity, and rigid, chemical resistant isophthalic resin. These resins contain a mineral filler to enhance mechanical properties and are specifically formulated for use in the cured-in-place pipe (CIPP) industry. **Proper certification shall be submitted with the Contractor's bid. Failure to provide this documentation may be grounds for disqualification.**

2. The acceptable resin, (Reichhold PolyLite® 33420-E or approved equal) shall have been tested according to ASTM D2990, D 5813 and F1216 by accredited third party testing facilities. Results of these tests shall be made available to the Sanitation District upon request.

3. The resin must be manufactured under ISO 9002 certified procedures. The resin vendor must be able to reference the corrosion scale with the resin itself having a heat deflection temperature greater than 224 degrees Fahrenheit. Only PREMIUM, NON-RECYCLED resins will be accepted.

4. The resin shall be shipped directly from the resin manufacturer's facility to the CIPP wet-out facility. The resin shall not be sent to any intermediate mixing facility. Copies of the shipping documents from the resin manufacturer shall be submitted to the Sanitation District indicating dates of shipment, originating and receiving locations

4.5 Quality Assurance

1. In order that the Owner is assured that the specified resin class is used for the duration of the Contract, the following provisions are made part of this specification:

2. The Contractor shall designate a wet-out facility and shall provide wetout liner tubes from this designated facility only. Multiple facilities to supply wet-out liner tubes for the duration of this contract may not be used without prior approval of the Engineer.
3. The Contractor shall place a sampling valve in-line at a point in the resin/catalyst mixing stage so that a sample of non-catalyzed resin may be taken. A second sampling valve shall be placed in-line at a point after the resin/catalyst mixing stage, but prior to catalyzed resin injection into the liner so that a resin sample may be taken. Both sampling valves shall be left in place for the duration of the Contract.
4. The Owner/Engineer shall have the right to inspect the designated wetout facility and draw samples from one or both sampling valves without prior notice to the Contractor for the duration of the Contract.
5. To further assure usage of a specified resin class, the Owner reserves the right to subject resin samples to an infrared analysis (IR Scan). This standard analytical test involves shining a beam of light in the infrared frequency region through a thin sample of subject resin. The frequency of light is then varied across the infrared spectrum. Chemical functional groups present in the resin being analyzed will absorb infrared light at specific frequencies and with characteristic absorption intensities. A spectrum created from the measurement of light transmitted through the sample across the range of infrared frequencies shall be used to determine the resin's chemical fingerprint. An overlaid IR spectrum of the "Acceptable Resin" by class (see sections 4.2, 4.3 and 4.4 of this specification), shall be used as a baseline comparison for the purpose of a resin class test.
6. The Owner/Engineer may perform random Infrared Scans (IR Scans) and/or Composite Burn-offs to insure resin quality and consistency throughout the duration of the Contract and shall be responsible for the cost of IR testing.

4.6 Catalyst Systems

1. The exact mixture ratio of resin and catalyst shall also be submitted. The catalyst system shall be identified by product name. The resin/catalyst ratio shall be approved by the resin manufacturer in writing. The catalyst system shall be made up of a primary catalyst and a secondary catalyst. The primary catalyst shall be Akzo Perkadox 16 or approved equal and shall be added at a maximum of 1% of the resin volume by weight unless otherwise approved by the Engineer. The secondary catalyst shall be Akzo Trigonox or approved equal and shall be added at a maximum of 0.05% of the resin volume by weight unless otherwise approved by the Engineer.
2. "Quick-Cure" or accelerated resin systems including those formulated by substantially increasing the amount of catalysts from that specified above, will not be allowed. Resins, catalysts and resin/catalyst mix ratios shall not be changed or altered during this Contract unless specifically approved by the Engineer in writing.
3. Cure schedules for the CIPP shall be submitted to the Engineer for review. The proposed curing schedules/process shall be approved by the resin manufacturer in writing. Cure schedules

shall include specific information on “step curing” procedures, “cooking times”, duration and “cool down” procedures – all to be approved by the resin manufacturer in writing.

4. The resin shall be shipped directly from the resin manufacturer’s facility to the CIPP wet-out facility. The resin shall not be sent to any intermediate mixing facility. Copies of the shipping documents from the resin manufacturer shall be submitted to the Engineer indicating dates of shipment, originating and receiving locations.

5. The Contractor shall submit a Certificate of Authenticity from the resin manufacturer for each shipment to the wet-out facility to include the date of manufacture and Heat Distortion Temperature. This information shall be submitted before the manufacture or installation of any CIPP.

4.7 Liner Tube

1. The tube shall consist of one or more layers of absorbent non-woven felt fabric and meet the requirements of ASTM F1216. In the event of a discrepancy between the referenced ASTM requirement and this specification, this specification will govern.

2. The tube shall be constructed to withstand installation pressures, have sufficient strength to bridge missing pipe, and stretch to fit irregular shaped pipe sections.

3. The wet-out tube shall have a uniform thickness that when compressed at installation pressures shall meet or exceed design “finished and installed” thickness.

4. The tube shall be manufactured to a size that when installed shall tightly fit the internal circumference and length of the original pipe. In the event that under-sized pipe is present, liner tube shall be manufactured so that overlap folds or wrinkles do not occur. Allowances shall be made for circumferential stretching during inversion.

5. The outside layer of the tube, before installation, shall have an impermeable polyurethane or polyethylene plastic coating. This coating shall be an impermeable, flexible membrane that shall contain the resin and facilitate monitoring of resin saturation during resin impregnation. This coating shall form the inner layer of the finished pipe and is required for enhancement of corrosion resistance, flow and abrasion properties.

6. The tube shall be homogeneous across the entire wall thickness containing no intermediate or encapsulated layers. No material may be included in the tube that may cause de-lamination in the cured liner, and no dry or unsaturated areas or layer shall be evident.

7. The wall color of the interior liner surface after installation shall be a light-reflective color so that a clear, detailed inspection with closed circuit television equipment may be conducted.

8. The outside of the tube shall be marked for distance at regular intervals not to exceed 10 feet. Such markings shall include the Manufacturers name or identifying symbol.

9. The minimum length shall be that deemed necessary by the Contractor to effectively span the distance between manhole sections of the segment to be lined unless otherwise specified. The line lengths shall be verified in the field before impregnation of the tube with resin.

Part 5 CIPP Design

5.1 Liner Thickness

The Contractor shall submit liner thickness calculations to the Engineer for review. The CIPP shall be designed in accordance with the applicable provisions of F1216 and D2412 for “fully deteriorated gravity pipe conditions” and shall meet the following design conditions:

1. AASHTO H-20 Live Load with two trucks passing for CIPP in streets (16,000 lbs.)
2. A soil modulus of elasticity of 1000 psi, soil weight of 120 pounds per cubic foot and a coefficient of friction of $K_u' = 0.130r$.
3. **Standard Polyester** - Short-term flexural modulus of 250,000 psi and long-term modulus of 125,000 psi
4. **Enhanced Polyester** - Short-term flexural modulus of 400,000 psi and long-term modulus of 150,000 psi
5. Safety factor of 2.0 shall be used.
6. Groundwater elevation at the ground surface.
7. Pipe ovality: 2%
8. Poisson ratio of 0.3.
9. Enhancement factor (K) of 7.
10. Service temperature range shall be 40 to 140 degrees

5.2 Minimum Acceptable Pipe Thickness (“Finished and Installed”)

1. The Minimum Acceptable Pipe Thickness (Finished and Installed), shall be based on design parameters in section 5.1 Items 1 through 9 of this Specification adjusted for site-specific field conditions and approved by the Engineer in writing prior to tube manufacture.
2. It is the Contractor’s responsibility to determine the site specific external loads on the liner and increase or decrease its thickness as required. The Contractor shall submit his proposed plan for ensuring that the finished and installed CIPP meets minimum thickness requirements. The plan shall include detailed inversion procedures to reduce stretching and resin loss and to minimize shrinkage.
3. The contractor shall submit his price proposal based on the appropriate length, size, and existing pipe parameters. The deterioration of sewers is an on-going process. In the event pre-construction inspections reveal the sewers to be in substantially different conditions than those in the design considerations, the contractor shall request such changes in reconstruction liner thickness, supporting such requests with the appropriate design data satisfactory to the Engineer. The deviation, if approved, shall be reflected by the appropriate addition or reduction in the unit cost for that size as agreed to by the Owner/Engineer.

4. Any liner that does not meet the specified strength and/or thickness requirements, regardless of the amount below the specified requirements, shall be corrected by the Contractor in a manner approved by the Engineer at no additional cost to the Owner. The Engineer's decision on how to correct deficient CIPP installations shall be final. Options for correcting deficient liners that will be considered by the Engineer include removing the liner and re-lining the sewer, excavating and replacing the sewer from manhole to manhole, or providing the Owner with a substantial credit. The primary option that will be considered will be to re-line the sewer. Credits will only be authorized for CIPP that does not meet required thickness. If a credit is acceptable to the Owner and Engineer, the credit shall be calculated by multiplying the bid price by the percent that the liner thickness is below the required installed thickness as follows:

Credit = (1 – Installed CIPP thickness/required CIPP thickness)
X bid price

The Contractor shall not assume a credit will be acceptable to the Engineer/Owner in any case.

5. The finished CIPP will provide a uniform smooth, interior wall surface and will have at least 100% of the flow capacity of the original pipe before rehabilitation. In lieu of measurements, calculated capacities may be derived using a Manning "n" coefficient of 0.013 for the original pipe material and a Manning "n" coefficient of 0.011 for a joint-less smooth-wall cured-in-place pipe.

Part 6 Execution

6.1 By-Pass Pumping

1. If the sewers to be rehabilitated under this contract convey both sanitary and storm water flows, it shall be incumbent upon the Contractor to complete the installation of CIPP during a time-frame wherein precipitation shall not impact the work process or prevent normal storm water flow into and along the subject sewers. The Contractor shall in any case provide for the bypass pumping of all flows the host pipe is deemed by the Owner to be capable of carrying.

2. The installation methodology contemplated requires the temporary blocking and back-ups of sewers and sewage. Contractor shall be responsible to limit the extent and duration of such blockages and backups so that overflows and spillage onto public or private property and into storm sewers, waterways, and streets does not occur. In the event that such spillage or overflows do occur during the course of or as a result of the Work, the Contractor performing the Work shall immediately eliminate the spillage or overflow and, as necessary, remove the blockage and eliminate the back-up. On elimination of the spillage or overflow, the Contractor is to clean up and disinfect the area. Work to stop or contain such events is to be deemed EMERGENCY in nature and sufficient justification for total mobilization of resources, the use of overtime or double time, and any other reasonable measures to assure correction of the problem without delay. Damages arising from blockages, back-ups, spillage, or overflows of sewage during the course of the Work or because of the Work shall be the sole responsibility of the Contractor.

3. Sewage flow shall be pumped around segments during CIPP installation, lateral service reinstatement and post-installation closed-circuit television inspection.

4. Pumping equipment shall have the capacity to convey 100% of predicted dry and wet-weather flows for a 2 year design storm. Maps with predicated flows are provided to size bypass pumping systems around the construction area.

The flow shall be intercepted at the upstream end of the construction area and shall be pumped through temporary piping of adequate size. The flow shall be discharged into a manhole on the downstream side of the construction area, thus bypassing the sewer segment(s) under construction. The Contractor shall be required to contact all residential and commercial customers whose service lines connect to the sewer main being bypassed and inform them that they will be temporarily out of service. The Contractor shall also advise those customers against water usage until the mainline is back in service. After completing the necessary work on the main line to allow its reuse, the Contractor shall advise those customers that the sewer main is back in service. Should a condition arise that the Contractor cannot restore service within twelve (12) hours of service interruption; the Contractor shall make provisions for pumping all flows within the service interruption area at no cost to the Owner.

5. A standby pump or pumps of the same capacity shall be required on site.

6. The Contractor is responsible for paying all fines imposed for overflow or spills during construction.

6.2 Cured-In-Place-Pipe Rehabilitation

1. All reconstruction of existing gravity sewer mains using an approved CIPP Product and Installer shall be performed in strict accordance with this Specification and the latest revision of ASTM F1216. Where discrepancies exist, or any latitude is either inferred or interpreted between this specification and ASTM product and process standards, this Specification shall govern.

2. Pull-In and Inflate methods of CIPP installations, (reference ASTM F1743), will not in any case be acceptable.

3. The Contractor shall carry out his operations in strict accordance with all applicable OSHA standards. Particular attention is drawn to those safety requirements involving work on an elevated platform and entry into a confined space.

4. The Contractor will be responsible for locating and accessing all manholes and provide access to water hydrants for cleaning, inversion and other work items requiring water.

5. All surfaces, which have been damaged by the Contractor's operations, shall be restored to a condition at least equal to that in which they were found immediately prior to the beginning of the Contractor's operations. Suitable materials and methods shall be used for such restoration. The restoration of existing property or structures shall be done as promptly as practicable and shall not be left until the end of the construction period. Compensation for this work will be included in the Contractor's proposal.

6. The tube shall be fabricated to a size that, when installed, will neatly fit the internal circumference of the conduit(s) designated for CIPP. Allowance shall be made for the circumferential stretching during insertion of the tube. After curing of the resin is completed, the hardened CIPP will extend from manhole to manhole of the section designated providing a structurally sound, corrosion-resistant, watertight conduit that excludes exfiltration and infiltration, is tightfitting within the existing pipe, and is free of voids or annular spaces between the CIPP and the existing pipe walls. K-Factor for tightness shall equal 7.0 or greater. All terminations into manhole walls shall be watertight at the time of final inspection. No annular space shall be visible between the CIPP and manhole wall. In the event that an annular space is present, it shall be completely filled with epoxy or other suitable material to the satisfaction of the Engineer.

7. The Contractor shall be responsible for determining the minimum length to effectively span the distance from the manhole to manhole and shall verify the length of the fabric tube in the field before the tube is either cut to length or wet-out with resin. The tube may run through one or more manholes with the approval of the Owner/Engineer.

6.3 Preliminary Installation Requirements

1. "Normal" Cleaning of Sewers

- a. Sewers shall be cleaned of all debris, roots and other materials that would inhibit proper inversion of CIPP
- b. Utilizing high-pressure jet cleaning equipment, several passes are completed to assure that all debris is removed from the pipe to the satisfaction of the Owner/Engineer.

2. "Heavy" Cleaning of Sewers

If roots are present which require the use of mechanical brushes or dragging devices or, if in the judgment of the Owner/Engineer, the pipe is more than 25% full of debris, the pipe shall be cleaned to the satisfaction of the Owner/Engineer and additional payment authorized under the appropriate Pay Item on the Bid Form. Heavy Cleaning shall be defined as the pipe being more than 25% full of debris or requiring the use of apparatus other than normal high-pressure jetting equipment. The Contractor shall be paid for heavy cleaning on the basis of the distance loosened debris is moved to the nearest point of extrication from the sewer. Payment shall be calculated on a lineal foot basis and will be paid in addition to the normal cleaning rate shown on the Bid Sheet. **Any heavy cleaning must have pre-approval from the Owner/Engineer.**

6.4 Debris Disposal

All debris cleaned from the pipe shall be removed and disposed of at the cost of the Contractor in a dumpsite designated by the Owner. Debris shall not be allowed to wash into any other pipe segment either up or downstream from the pipe segment being cleaned.

6.5 Provision and Usage of Water

The Owner shall provide all water required to perform this Work. The Owner shall provide a fire hydrant meter at no cost to the Contractor beyond the normal security deposit for use on the Project. Contractor shall coordinate connection and usage limits and withdrawal locations with the Owner prior to construction.

6.6 Pre/Post Installation Video Inspection

1. Prior to installation of the CIPP, but not more than 48-hours prior to such installation, the section of sewer designated for CIPP is to be televised its full length using a remote television camera specifically designed for that purpose.
2. Inspection of the sewer pipe shall be performed by the Contractor's experienced personnel trained in location breaks and obstacles by CCTV inspection. Utilizing a color video inspection system with data recording capabilities, the entire pipe section to be lined shall be recorded in a Digital Format and two (2) copies produced. The interior of the pipe shall be carefully inspected to determine the location of any conditions, which may prevent the proper installation of the CIPP, and it shall be noted so that these conditions can be corrected. A DVD/CD-ROM and suitable log shall be submitted to the Owner.
3. Pre and post-installation videos and logs shall be submitted during the course of the Work. The television camera used for this purpose shall be operative in one hundred percent moisture conditions. Lighting for the camera shall be sufficient to yield a clear picture of the entire periphery of the pipe. The camera, television monitor, and other components of the video system shall be capable of producing a five hundred line resolution picture. The camera's rate of travel shall not exceed 20 feet per minute. At each service, the camera shall come to a complete stop and the service shall be panned so that the entire cross sectional area of the service is inspected. The footage meter count shall be clearly visible. Logs shall include date, line size, length, manhole numbers and project number, direction of camera travel, direction of flow, and any observed defects or comments. For each service the log should include the distance from manhole, its location (e.g. 9:00 or 2:00 o'clock), street address or parcel, and distance from mainline to cleanout. Videos between manhole segments shall be continuous; no breaks or "blink-outs" in the video shall be observed. The videos shall be in CD-ROM or DVD format.
4. Sewer service connections shall also be TV inspected from within the sewer main, identifying all service connection locations and conditions. Conditions of service connections shall be noted in the log.
5. The full cross-sectional area of the pipe shall be visible during video inspection except where misalignment of the sewer may have resulted in standing water in bellies or sags.
6. If for any reason the camera becomes disabled inside the sewer and cannot further proceed, the Contractor will be responsible for retrieving the camera at no additional cost to the Owner.

6.7 Identification and Pre-measurement of Lateral Connections

A 360-degree Pan-and-Tilt view camera shall be used to inspect the pipe. At each connection the operator will stop and turn the camera lens toward the lateral thereby inspecting the first 8 to 12 inches of the lateral connection. The Contractor shall be responsible for determining if connection is active or inactive. For each existing service connection determined by the Contractor to be active, the Contractor shall determine the condition of the service connection to the main, make his recommendation for lateral connection repair, and record both items in his log.

6.8 Resin Impregnation of the CIPP Tube (Wet-Out)

The contractor shall designate a location where the tube shall be impregnated or “wet out” with resin, using distribution rollers and a vacuum impregnation system to thoroughly saturate the tube’s felt fiber prior to installation in the field. The impregnated tube shall be free of pinholes, resin voids and other defects. If the cured-in-place pipe is impregnated at the manufacturing plant, it shall be delivered to the job site in a refrigerated truck, and remain refrigerated prior to installation to prevent premature curing. The flexible tube shall be vacuum impregnated with resin under controlled conditions or by such other means provided such means can assure thorough resin impregnation to the full satisfaction of the Owner/Engineer. The volume of resin used shall be sufficient to fill all voids in the tube material at normal or design thickness and diameter. The volume of resin shall be adjusted by adding seven to ten percent excess resin for the change in resin volume due to polymerization and allow for any migration of resin into the cracks and joints in the original pipe.

6.9 Inversion of CIPP

1. The preferred method of curing CIPP shall be by circulated water. The use of controlled steam will be considered on a case-by-case basis only. The Contractor shall submit a written request for the use of steam in sewer segments where the Contractor feels that curing by steam will be beneficial to the Sanitation District. The Contractor shall not assume in any case that the use of controlled steam for the curing of CIPP is acceptable to the Sanitation District without prior written authorization from the Sanitation District. This must be done 2 weeks prior to the installation.
2. The impregnated tube shall be inverted through an existing manhole or other approved access point utilizing a hydrostatic water column or pressurized air until it has fully traversed the designated line length and the inversion face breaches the destination manhole or termination point. The fluid column or air pressure shall have been adjusted and maintained to be sufficient to cause the impregnated tube to hold tight against the existing pipe wall, produce dimples at side connections, and flared ends at the manholes. Lubricant during inversion shall be used as necessary in accordance with the CIPP manufacturer’s recommendations. Thermocouples shall be placed at the top and bottom interface of both ends of the liner for monitoring temperature during the cure cycle. Care should be taken during tube installation not to over-stress the fabric fiber.
3. When using pressurized air, particular attention should be given to the maintenance of the minimum required “finished and installed” thickness of the CIPP. Before the inversion begins, the tube manufacturer shall provide the minimum air pressure required to hold the tube tight against the host pipe and the maximum allowable pressure so as not to damage the tube. Once

the inversion has started, pressure shall be maintained between the minimum and maximum pressures until the inversion has been accomplished

6.10 Curing - Using Circulated Heated Water

1. A suitable source of heat and water recirculation equipment is required to circulate heated water throughout the pipe. The equipment shall be capable of delivering hot water throughout the inverted tube to uniformly raise the temperature required to affect a cure of the resin.
2. Initial cure will occur during temperature heat-up and is completed when exposed portions of the new pipe appear to be hard and sound and the thermocouples indicate that the temperature is of a magnitude to realize an exotherm or cure in the resin. After initial cure is reached, the temperature should be raised to the post-cure temperature recommended by the resin manufacturer. Post-Cure temperature should be held for a period as recommended by the resin manufacturer, during which time the recirculation of the water and cycling of the heat source to maintain the temperature continues.
3. Prior to any inversion, the Contractor shall provide a Post-Cure Hold Time and Temperature Table. This table shall indicate the minimum time and temperature the inverted tube will be held at in order to achieve desired physical properties. The resin manufacturer shall certify both the time and temperatures presented in the table.
4. Curing must take into account the existing pipe material, the resin system, and the ground conditions (temperature, moisture level, and thermal conductivity of the soil).

6.11 Curing - Using Controlled Steam

1. Suitable steam-generating equipment is required to distribute steam throughout the pipe. The equipment shall be capable of delivering steam throughout the inverted tube to uniformly raise the temperature required to affect a cure of the resin.
2. Initial cure will occur during temperature heat-up and is completed when exposed portions of the new pipe appear to be hard and sound and the thermocouples indicate that the temperature is of a magnitude to realize an exotherm or cure in the resin. After initial cure is reached, the temperature should be raised to the post-cure temperature recommended by the resin manufacturer. Post-Cure temperature should be held for a period as recommended by the resin manufacturer, during which time the distribution and control of steam to maintain the temperature continues.
3. Prior to any inversion, the Contractor shall provide a Post-Cure Hold Time and Temperature Table. This table shall indicate the minimum time and temperature the inverted tube will be held at in order to achieve desired physical properties. The resin manufacturer shall certify both the time and temperatures on the table.
4. The Time and Temperature Table submitted when using steam curing shall be identical to time and temperature hold times when curing with heated, circulated water.

5. Curing must take into account the existing pipe material, the resin system, and the ground conditions (temperature, moisture level, and thermal conductivity of the soil).

6.12 Cool-Down

Cool-down of CIPP shall be in accordance with the manufacturer's recommendations. Care should be taken during the cool-down process so as to minimize shrinkage of the CIPP.

6.13 Lateral Service Reinstatement

After the CIPP has been cured, the existing service connections and laterals shall be reinstated. In general, reinstatement of service connections and laterals shall be accomplished internally, without surface excavation, using a remote control cutting device equipped with a television monitor. Reopened services shall be wire brushed to the satisfaction of the Owner/Engineer. In some cases, remote reinstatement may not be possible. In these instances, reinstatement by conventional methods in accordance with the standard Specifications is acceptable. All connections must be reinstated by at least 95-percent of the original opening.

6.14 Appearance of Finished CIPP

All workmanship and materials will meet the standards of the industry. The finished CIPP shall be continuous over the length of pipe between two manholes and shall be an impermeable, joint-less conduit, free from visual defects such as foreign inclusions, dry spots, pin holes, lifts, or delamination. Wrinkles in the CIPP, (other than minor, longitudinal pressure wrinkles) will not be acceptable. The Owner/Engineer shall determine as to the acceptability of pressure wrinkling with that decision being final. In the event the finished liner does not fit tightly against the original pipe at its termination point(s), the space between the liner and the pipe shall be made watertight, utilizing manhole end seals, Hydro-Tite® gaskets, or approved equal.

6.15 Acceptance Testing of CIPP

1. The Owner/Engineer may, at their discretion, direct the Contractor to collect samples of the cured CIPP for laboratory determination of flexural strength, flexural modulus and wall thickness for each test sample during the execution of this Contract. These three individual analyses shall comprise one completed test. All samples shall be collected per the sampling protocols set forth in ASTM F-1216.
2. Upon notification by the Engineer, the Contractor shall remove one restrained sample of the installed liner at least 12 inches in length for testing. For sewers 15 inches and larger, plate samples may be taken and cured in the same water as the installed CIPP. For each sample taken, the Contractor shall cut and deliver a 1-inch wide representative sample (taken at least 2 inches from the end of the specimen) to the Engineer. The sample delivered to the Engineer shall be labeled and removed from any restraining mold. The Engineer may return such samples to the Contractor for disposal.
3. The tests shall be used to verify that the installed CIPP meets these specifications. CIPP thickness shall be measured in accordance with ASTM D5813. Flexural properties shall be determined per ASTM D790. The Contractor shall label and date all samples and deliver the samples directly to the Owner/Engineer. All testing shall be performed by an independent, ASTM-certified testing laboratory of the Owner/Engineer's designation and at the Owner's expense. Payment to the Contractor shall be withheld pending the Owner/Engineer's acceptance of the CIPP test results.
4. Any liner that does not meet the specified strength and/or thickness requirements, regardless of the amount below the specified requirements, shall be corrected by the Contractor in a manner approved by the Owner/Engineer at no additional cost to the Owner. The Owner/Engineer's decision on how to correct deficient CIPP installations shall be final.

6.16 Traffic Control

The Contractor shall be responsible for traffic control during the course of each phase of the Work. Prior to beginning Work, Contractor shall submit a traffic control plan for each section of Work to the Owner for the review and approval. It is the intent that this Work is to be accomplished with as little disturbance to traffic, private property, and the public as is reasonably possible, consistent with timely completion thereof. The traffic control plan shall reflect such requirements where applicable. Signs, signals, and detours shall conform to the Kentucky Department of Highways & Public Transportation requirements for streets and highways within the jurisdiction of the Sanitation District No. 1 of Northern Kentucky.

Part 7 Television Inspection

1.1 Description

1. Contractor shall provide all labor, materials, tools, equipment and incidentals as shown, specified, and required to perform television (TV) inspection of the sewer system. Contractor shall restore the Site to pre-inspection condition at completion of work.

1.2 Definitions

1. TV Inspection: Video inspection conducted before sewer line has been cleaned to determine conditions of the pipe, confirm cleaning, and location of service connections. TV Inspection also includes the pan and tilt inspection of manholes and the inspection of laterals, if required, by launching the camera via a mainline, manhole or cleanout.

1.3 Requirements

1. Contractor shall be aware that this Contract requires work in active sewers and shall follow all federal, state and local requirements for safety in confined spaces.

1.4 Performance Requirements

1. Inspection shall be done one sewer line section (i.e. manhole to manhole) at a time.
2. Quality of inspection recording shall be acceptable to KYTC when viewed on a 24" monitor.
3. Inspection shall be performed by a NASSCO *Pipeline Assessment Certification Program* (PACP) certified operator and shall meet the coding and reporting standards and guidelines as set by PACP. All report annotations, pipe conditions and pipe defects shall be identified properly using PACP codes as defined by or PACP.

1.5 Submittals

1. Submit one copy of Electronic Inspection Reports and TV videos on portable hard drive on a weekly basis. The inspections shall be provided in a tabular spreadsheet or database.

2. Copies of PACP certificates of inspectors completing the work.
3. Submit one copy of the QA/QC reports on portable hard drive.

1.6 Reference Standards

1. NASSCO prepared *Pipeline Assessment and Certification Program (PACP)*, Current Edition Reference Manual. This manual includes a standard TV inspection form and sewer condition codes.

1.7 Television Equipment

1. Closed Circuit TV Equipment: Select and use closed-circuit television equipment that will produce a color recording.
2. Pipe Inspection Camera: Produce a video recording using a pan-and-tilt, radial viewing, pipe inspection camera that pans ± 275 degrees and rotates 360 degrees. Use a camera with an accurate footage counter that displays on the TV monitor the exact distance of the camera from the centerline of the starting manhole. Use a camera with camera height adjustment so that the camera lens is always centered at one-half the inside diameter, or higher, in the pipe being televised. Provide a lighting system that allows the features and condition of the pipe to be clearly seen. A reflector in front of the camera may be required to enhance lighting in large diameter pipe. The camera shall be operative in 100 percent humidity conditions. The camera, television monitor, and other components of the video system shall be capable of producing a minimum 500-line resolution colored video picture. Picture quality and definition shall be to the satisfaction of KYTC.
3. TV Studio: The TV studio is to be contained in an enclosed truck, trailer or van for on-road work. It shall have room and seating for the operator, one District staff member, and at least one standing visitor with the doors closed. The studio shall have air conditioning and heating. Normal operation of all equipment, including the TV camera, monitor, and winches is to be from a control panel in the studio.
4. For off-road work, Contractor shall provide the appropriate vehicle(s) for the terrain in order to access the sewers and allow for proper inspection of the sewers and manholes.
5. Recording: Record all images digitally.
7. Video Capture: Full time live color video files shall be captured for each pipe segment inspected with sound identifying the location and the appropriate defect code. The files shall be stored in industry standard MPEG format viewable from an external hard drive on an external personal computer that utilizes Microsoft Media Player, version 9.0 or higher to view the recording. The MPEG video shall be ISO-MPEG Level 1 (MPEG-1) coding with a resolution of at least 352 pixels (x) by 240 pixels (y) and an encoded frame rate of 29.97 frames per second. System shall perform an automatic disk image/file naming structure to allow saved video/data sections to be saved to a portable hard drive. The video recording shall be free of electrical interference and shall produce a clear and stable image. The digital recordings and inspection data shall be cross-

referenced to allow instant access to any point of interest within the digital recording.

8. Video recording shall include audio location, asset information, and the defect observations related to the inspection of all defects identified during the inspection.

1.8 Television Inspection

1. Televise each sewer line to document the structural and maintenance conditions of the line. The sewer inspections shall be compatible with the SCREAM™ defect coding system for sewers and manholes, which is KYTC's standard defect coding system. The Contractor shall use PACP to conduct the sewer inspections. However, the system selected to be used shall be converted by the Contractor to the SCREAM™ code equivalents for use in importing and scoring in our LucityMS database. An example of the conversion from PACP codes to SCREAM™ codes is included with this specification.

The following data for the defect observations shall be recorded:

- Observation Data
 - Observation#, unique per line
 - Upstream MH#
 - Downstream MH#
 - Date of inspection
 - Direction of inspection
 - 1 = upstream to downstream
 - 2 = downstream to upstream
 - Footage
 - Clock position (1 – 12)
 - Defect/Description (use code or text)
 - Comments
2. In addition to recording the defects for the sewers and manholes, Contractor shall also record the following attribute data as “fields” in their inspections:
 - Upstream MH#
 - Downstream MH#
 - Date of inspection
 - Direction of inspection
 - a. 1 = upstream to downstream
 - b. 2 = downstream to upstream
 - Length of pipe
 - Diameter/height (inches)
 - Shape (use shape code or text)
 - Material (use pipe material code or text)
 - Pipe width, non-circular (inches)
 - Crew
 - Video number (TV inspection only)
 - Start counter (TV inspection only)

- Comments
 - Movie document name (provide extension)
 - Depth of each incoming and outgoing pipe measured from the manhole rim, as well as the manhole invert at the upstream and downstream side of the manhole, to the nearest 1/8".
 - Cleaned: Yes/No
 - Amount of debris removed: cubic yards
3. A NEW inspection shall be started where a manhole, junction, or diversion chamber is located. This includes new manholes, junctions, or diversion chambers identified in the field, but not previously identified in District mapping. Therefore, no manholes, junctions, or diversion chambers shall be at a midpoint of an inspection log, only at the beginning and the end of each inspection. Inspection runs shall begin and end at manholes or junctions unless an obstruction is encountered. Lateral connections from inlets/catch basins, material changes or breaks in grade are not approved locations to begin/end an inspection. Said features shall be logged on the recording. If Contractor uses a lateral connection from inlets/catch basins, material changes or breaks in grade as a begin/end point for televising, District will reject said segment and the sewer data shall be reorganized to match the data requirements at no additional cost to KYTC.
 4. It is critical to obtain maintenance and structural grade for each pipe, therefore the Contractor shall not clean the pipe prior to inspection, unless there is an obstruction that could block the progress of the camera. Upon completion of the sewer inspection, a maintenance score shall be determined. If the sewer scores a 3 or higher using the PACP method, the pipe shall be cleaned immediately after the inspection is completed and this cleaning shall be noted along with the score in the inspection. All debris removed shall be measured by cubic yard and reported for each pipe segment from Manhole to Manhole. After the cleaning is completed the pipe shall be televised to confirm that it has been cleaned properly and all debris has been removed. This inspection shall be per the PACP codes and logged as a separate inspection record for the pipe.

If the Contractor encounters a removable obstruction, such as debris, roots, etc., that blocks the progress of the camera; KYTC shall be notified immediately. The Contractor shall record this obstruction in the inspection. The Contractor shall be responsible for any cleaning (i.e. root sawing, jetting, etc.) that may be required to remove the obstruction in order to complete the inspection. Contractor shall complete the inspection of the remainder of the pipe after the obstruction is removed as part of the original inspection record. The Contractor will be responsible for any pipe damaged due to the use of a cleaning procedure that could have reasonably been expected to present a significant risk of pipe damage or collapse.

If an obstruction is encountered that is not removable and not passable with the camera, such as a broken or collapsed pipe, KYTC shall be notified immediately. The Contractor shall record this obstruction in the inspection. It is expected, however, that if a collapsed pipe, or any other type of impassible structural defect, is encountered within a section of pipe, that this defect will be approached from both the downstream and upstream directions in order to capture inspection data on the most pipe length available. KYTC's crews will be responsible for repairing the obstruction. The Contractor may be required to re-inspect the sewer once

the repair is complete and will be paid according to the terms outlined in this contract. KYTC's crews will re-inspect the sewer upon completion of the repair.

5. Notify KYTC on a weekly basis or each day, as needed, where the Contractor will be working in advance of any TV inspection so that KYTC staff knows the locations of the Contractor's crews and may observe inspection operations.
6. Inspections shall be from center of the starting manhole to the center of the ending manhole. Distances along the pipe should be measured from the center of the manhole. Measurement meters shall be accurate to the nearest foot per 100 feet of sewer being televised within the particular section of pipe (section of pipe being defined as the length of pipe between the upstream and downstream MHs). Measurement meters shall be accurate to two-tenths of a foot over the entire length of the sewer line section being inspected. Prior to recording the location of defects and service connections, slack in the cable of the television inspection camera shall be taken up to ensure metering device is designating proper footage. Accuracy of the measurement meters shall be checked daily by use of a walking meter, roll-a-tape, or other suitable device.
7. Center the camera in the middle of the pipe.
8. Move the camera through the line (in the downstream direction whenever possible) at a uniform rate not to exceed 30 feet per minute. The intent is to perform the inspection per the PACP standards. It may be necessary for a lower rate of speed depending on the defects encountered.
9. Stop at every defective joint for three seconds using a pan and tilt view. When appropriate, stop elsewhere for a length of time long enough to ensure proper documentation of the sewer's structural and maintenance conditions. Pan and tilt to observe and document areas of apparent deteriorated pipe surface.
10. Stop at every lateral connection. Center the camera so that the lighting and the pan and tilt view can be used to inspect as far into the lateral connection as possible. Record all defects found in the service connection. Observe top, bottom and sides of lateral connections. Where lateral flow is observed, observe flows from service connections for a length of time long enough to ascertain if the flow is sanitary or extraneous flow. The video recording may be paused during observation. Record results of the flow observed on the inspection. The inspection of the service lateral is not to be performed and will not be paid for as part of this RFP unless explicit direction is given by KYTC to perform such work.
11. Use manual winches, power winches, TV cable, and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions to move the camera through the sewer line.
12. TV inspection recordings shall be continuous for each pipe segment and include sound identifying the location and type of defect.
13. Contractor is responsible for adjusting light levels, cleaning fouled or fogged lens, and allowing vapor to dissipate from camera lights in order to produce acceptable recordings.

KYTC will not pay for unacceptable CCTV video footage that does not clearly identify the type of defects present in the sewer pipeline.

14. Sewer inspections not meeting the requirements set forth in this specification as determined by KYTC shall be re-performed at no additional cost to KYTC until the inspection meets to KYTC's satisfaction.
15. If a lateral inspection is required and a Contractor finds a defective lateral connection in which a lateral inspection cannot be completed, contact KYTC immediately. Contractor must make 3 attempts to inspect the lateral.

1.9 Flow Control

1. Adequately control the flow in the section being televised. Plugging of the flows may be used to accomplish this. Recordings made where the depth of wastewater flow shown below is exceeded will be rejected:

Pipe Diameter (Inches)	Depth of Flow (Percent of Pipe Diameter)
6-10	50
12-24	30 Over 24

30

It is not expected for the Contractor to provide bypass pumping if the depth of flow listed above is exceeded and TV inspection during minimum flow hours does not result in depths meeting the above requirements. In these cases, KYTC shall be notified and a note in the inspection log shall be provided indicating "Depth of flow exceeds requirements." If it is determined that a sewer segment requires by-pass pumping, by-pass pumping may be performed in accordance with a negotiated amendment to the Contract as directed by KYTC.

See Item 4 below.

2. Whenever flows in a sewer line are blocked, or plugged, sufficient precautions must be taken to protect the sewer lines from damage that might be inflicted by excess sewer surcharging. Further, precautions must be taken to ensure that sewer flow control operations do not cause overflows, flooding or damage to public or private property being served by the sewers involved. No overflows are permitted. Contractor is responsible for all damages.
3. Contractor is responsible for all damages to owned and operated equipment, District facilities, and privately owned facilities caused by malfunctioning plugs, pumps or other Contractor-owned or operated equipment. In the event of a failure or malfunction of Contractor equipment, Contractor is responsible for all work necessary to restore facilities to pre-contraction condition including but not limited to excavation and restoration of sewer lines and roadways required to retrieve malfunctioning cameras, plugs, and hoses.
4. It is anticipated that portions of the sanitary sewer are bowed or bellied and as a result the camera will be submerged. Wherever the camera encounters a submerged condition, or where the wastewater flow depth exceeds the maximum allowable, reduce the flow depth to an

acceptable level by performing the survey TV inspection during minimum flow hours, or by pulling a camera with swab, high-velocity jet nozzle or other acceptable dewatering device. Contractor can request cleaning costs as a result of this depth reduction in accordance with the cleaning specification 02760. Recordings made while floating the camera are not acceptable unless approved by KYTC.

1.10 Passage of TV Camera

1. If during TV inspection of a pipe segment, the camera is unable to pass an obstruction even though flow is unobstructed, televise the pipe segment from the opposite direction in order to obtain a complete recording of the line. Contractor shall also measure the distance between the manholes (centerline to centerline) with a tape or wheel to accurately determine the total length of the manhole segment. See additional requirements in 3.1 above.

1.11 QA/QC Analysis

1. The selected Contractor will be provided a copy of KYTC's sewer and manhole GIS and database to use as a guide when conducting the inspections. The Contractor shall perform a QA/QC analysis on all sewer and manhole data recorded before the data is submitted to KYTC. The Contractor shall provide a summary report of the results of the QA/QC analysis. The QA/QC verification items shall be compared to KYTC's database and shall include, but not necessarily be limited to, the following:
 - Deviations of five feet or greater
 - Any missing or mislabeled sewer or manhole attribute data.
 - Confirmation that applicable continuous defects have a recorded defect length.
 - Any missing or mislabeled attribute or defect data supposed to be recorded for both sewers and manholes.
 - Verification that all necessary defect data is present so that a SCREAM™ sewer and manhole score can be calculated.

1.12 INSPECTION DELIVERABLES

1. The inspections shall be provided in a tabular spreadsheet or database.
2. The attribute and inspection data, CCTV video, and the QA/QC analysis, shall be submitted weekly via portable hard drive. These weekly submissions shall be for one week's worth of work from the two prior weeks. For example the data collected during the week of March 30, 2015 through April 3, 2015 shall be submitted on Monday, April 17, 2015. The intent is to give the Contractor the first week to gather all data, the second week to perform the QA/QC analysis and assemble all of the data, and then deliver the portable hard drive with all information to KYTC on the Monday of the third week. See REPORTING below.
3. The CCTV videos shall be provided as specified in Item 2.1.F for easy import into KYTC's Asset Management Software.
4. All inspections and videos shall be divided into separate files for each manhole to manhole segment and each manhole and shall be labeled based on KYTC's manhole numbering system for easy linkage to KYTC's asset management database.

5. Digital Inspection Recordings

1. Provide digital inspection recordings. Inspection recordings must be viewable on a standard 16" computer monitor.
2. Recording shall be of a quality sufficient for KYTC to evaluate the condition of the sewer and manholes, locate the sewer service connections, and verify cleaning. If KYTC determines that the quality is not sufficient, Contractor shall re-televiser the sewer segment and/or re-inspect the manhole and provide a new recording and report at no additional compensation. Camera distortions, inadequate lighting, dirty lens, or blurred/hazy picture will be cause for rejection Payment for inspection of the sewer and manholes shall not be made until KYTC approves the inspections, re-inspections as required, videos, pictures, and QA/QC reports.
3. Multiple project areas may be included on a given hard drive, but the files must be organized in individual project folders. TV Inspection recordings shall not be edited. Each pipe segment must be its own electronic file. Electronic recording file must allow snap scrolling to allow easy and quick access of the entire recording.
4. Each hard drive must have a file index whose name contains the pipe segment reference number.
5. Contractor shall maintain a master copy of all recordings and Inspection Reports submitted, for two years after delivery of inspections reports and recordings.
6. Label each hard drive with the following information:
 - a. Pipe Segments
 - b. Contractor's Name
 - c. Project Name
 - d. Contract Number
 - e. Inspection Type: Downstream of SSO, within 50' of creek, Phase 1 priority basin, as-needed inspection
 - f. Date Televised

1.13 Supplements

- A. Example of the conversion from PACP codes to SCREAM™ codes may be obtained from KYTC.

Part 7 Warranty

The Contractor shall warrant all work and materials installed under this contract for FIVE (5) years from the date of final acceptance. The date of final acceptance shall be the date final payment is made to the Contractor.

Part 8 Payment for Work

Payment for Cured-In-Place pipe shall be included in the lump sum cost for the project and shall be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

END OF SECTION