PART 1 - GENERAL

It is the intent of this specification to provide the requirements for the rehabilitation of the existing sanitary sewer structures (manholes, wetwells, and junction chambers) shown on the drawings, and/or specified and directed by CCU. The rehabilitation shall consist of a spray applied urethane resin system, 100% solids epoxy system, polymorphic resin or pure-fused calcium aluminate mortar rehabilitation systems as specified herein.

1.1 SCOPE

1.1.1 General:

The work includes mobilization, bypass pumping, removal of any existing deteriorated coating, preparation of sanitary sewer structures to be lined, furnishing and applying the specified coating materials to the interior surface areas of the sanitary sewer structures, testing, clean-up, and demobilization.

The intent of sanitary sewer structure coating is to rehabilitate the existing structures in a manner which shall correct the following deficiencies:

- Cracked/broken/collapsed structures which may have been caused by poor construction, unstable soil, earth movement, infiltration, root damage, destructive loading, cleaning tool damage, etc.
- Corrosion of the structures caused by acid attack above flow level.
- Erosion of the structures caused by abrasion below the flow level.
- Degradation/deformation of the structures caused by loss of masonry.
- Infiltration of groundwater and soil through leaking structures and structural defects.
- Exfiltration of sewage through leaking structures and structural defects.
- Inflow of surface water and infiltration of groundwater through abandoned or illegal connections.
- Root re-growth after removal.

1.1.2 Work Included

The Contractor shall, unless specified otherwise, furnish all labor, materials, equipment, supervision, tools, and all other associated appurtenances necessary to rehabilitate the designated sanitary sewer structures as stipulated herein and as shown on the Contract Documents, all in accordance with the Specifications for the purpose of eliminating infiltration, providing corrosion protection, repair of voids, and restoration of the structural integrity of the sanitary sewer structures as required under the contract.

The Contractor shall also furnish all labor, materials, equipment, tools, and all other associated appurtenances required to notify affected residents, prepare the work site, including cleaning

and flushing of existing sanitary sewer structures; flow control bypass pumping; pre-application (post-preparation) and post-application closed-circuit television inspections, protection of existing conditions during rehabilitation work; unloading; hauling; distributing and coating application; testing of all sanitary sewer structures and accessories as required for the proper rehabilitation; protection of the site during the life of the contract, including providing of necessary watchmen, warning lights, barricades, traffic control, dust control and maintenance of detours, as needed; and finally the cleanup of the work site, including maintenance of surfaces such as paving, and seeding, sodding and graveling, as needed, if damaged and all other item required to complete the rehabilitation.

1.1.3 Location of the Work

The area of work and the type of maintenance or rehabilitation to be performed shall be at those locations shown on the tables and/or drawings and made part of the specifications and contract documents.

The potential project sites may be located at any of the existing sanitary sewer structures that are a part of Charlotte County Utilities (CCU) sanitary sewer collection and pumping system.

The accessibility to the work sites shall vary, as sanitary sewer structures may be located in streets, alleys, utility easements, residential backyards, and various other locations. Accessibility to all sanitary sewer structures shall be the responsibility of the Contractor, and all expenses associated with work site accessibility should be taken into consideration as part of the Contractor's bid pricing. Damage to existing pavement surfaces and base courses, and/or other surface improvements, as a result of the Contractor's activities, shall be restored to like-new condition by the Contractor at his sole expense. The Contractor shall implement all required measures to provide CCU personnel and equipment with complete access to all work site areas during the entire course of performing this project.

1.1.4 Coordination of the Work

The Contractor shall be responsible for the satisfactory coordination of the sanitary sewer structures rehabilitation with other construction and activities in the area. Delays in work resulting from lack of such harmony shall not in any way be a cause for extra compensation by any of the parties.

1.1.5 Responsibilities

a) Safety: All aspects of the rehabilitation shall be done in strict accordance to the manufacturer’s instructions and the requirements of NASSCO, the National Association of Sewer Service Companies. It is also the Contractor’s responsibility to comply with OSHA standards and all regulations pertaining to work in confined space entry.

b) Notice of resident: The contractor shall be responsible for notifying affected residents by the mean of door hangers to alert residents that a sanitary sewer structure rehabilitation installer will be working on their street and what they can expect as far as service outages, water usage and unusual odors.

c) Licenses and Permits: The contractor shall be responsible for obtaining municipal and other Licenses and Permits and assistance in obtaining approvals or consent from utilities or carriers such as the telephone company or other persons or organizations upon whose property or authority performance of work under the contract might impinge or a written release from responsibility for the performance of work under the contract if and to the extent such work is precluded by the inability to obtain approvals or consent.

d) Work Access: The contractor shall be responsible for obtaining legal access to site of work to the extent that CCU is legally able to so provide or, if not so able, a written release from responsibility for the performance of work at sites where access cannot be made available.

e) Clearance of Blockages or Obstructions in the Sewer System: The contractor shall be responsible for obtaining clearance of blockages or obstructions in the sewer system, if any, if such clearance is required for performance of work under the contract and if such clearance is not otherwise provided for within the contract.

f) Location and Exposure of sanitary sewer structures: CCU shall be responsible for providing locations of all sanitary sewer structures. It shall be the responsibility of CCU to locate and designate all sanitary sewer structure access points, and to provide rights of access to these points. It shall be the responsibility of the Contractor to expose all sanitary sewer structure access points.

g) Sanitary sewer structure numbering system: CCU shall be responsible for a numbering system for all sanitary sewer structures to be rehabilitated under the project.

h) Pump Stations: CCU shall be responsible for shutting down or manually operate certain pump stations if such becomes necessary for performance of the work.

i) Water Access: The contractor shall be responsible for obtaining water access necessary for performance of work under the contract from fire hydrants at the site of work or other suitable designated sources.

j) Disposal: The Contractor shall be responsible for disposal of all materials removed from the sanitary sewers during the performance of the work at an appropriately permitted disposal site.

k) Secure Storage Area: The contractor shall be responsible for finding secure storage areas of a size adequate to accommodate the required vehicles, equipment and materials for the period of performance of the contract.

1.1.6 Working Hours

The work shall be carried out in accordance with local ordinance and not to cause any unreasonable nuisance to affected residents. Under emergency conditions, this limitation may be waived by the consent of CCU.

1.2 METHOD OF MEASUREMENT & PAYMENT

1.2.1 General:

Payments to the Contractor shall be made on the basis of the proposal Bid Form as full and complete payment for furnishing all materials, labor, tools, and equipment, and for performing all operations necessary to complete the work included in the Contract Documents. Such compensation shall also include payments for any loss or damages arising directly or indirectly from the work, or from any discrepancies between the actual quantities of work and those shown in the Contract Documents, or from any unforeseen difficulties which may be encountered during the prosecution of the work until the final acceptance by the County.

The prices stated on the Bid Form include all costs and expenses for taxes, labor, equipment, materials, commissions, transportation charges and expenses, patent fees and royalties, labor for handling materials during inspection, together with any and all other costs and expenses for performing and completing the work as shown on the details and specified herein. The Basis of Payment for an item at the price shown in the Bid Form shall be in accordance with its description of the item in this section and as related to the work specified. Unit prices shall be applied to the actual quantities furnished and installed in conformance with the Contract Documents.

The bids for the various items of work are intended to establish a total price for completing the work in its entirety. Should the Contractor feel that the cost for any item of work has not been established in the Bid Form or this section, the cost for that work shall be included in some other applicable Bid Item, so that 're bid for the project reflects the total price for completing the work in its entirety.

1.2.2 Measurement

The quantities for payment shall be full compensation determined by actual measurement of the completed items, in place, ready for service and accepted by CCU unless otherwise specified. CCU will witness all field measurements.

The quantities stated in the Bid Form are approximate only and are intended to serve as a basis for the comparison of bids and to fix the approximate amount of the cost of the project. CCU does not expressly or impliedly agree that the actual amount of the work to be done in the performance of the contract will correspond with the quantities in the Bid Form; the amount of work to be done may be more or less than the said quantities and may be increased or decreased by CCU as circumstances may require. The increase or decrease of any quantity shall not be regarded as grounds for an increase in the unit price or in the time allowed for the completion of the work, except as provided in the Contract Documents.

It is intended that all work required to complete the sanitary sewer structure rehabilitation project will be included in the various bid items as described in the following paragraphs.

a) Sewer Bypass operations with Tanker Truck:

These pay items provide complete compensation for operations required for the sanitary sewer structure coating application, the Contractor shall first attempt to perform the sewer rehabilitation work without bypass operations.

However, if the Contractor deems bypass operations to be necessary and if CCU agrees with the reasons, this request for bypass operations will be paid for with these pay items.

Further, if bypass operations are required due to difficulties caused by or encountered during the rehabilitation process, the Contractor shall be held responsible for all bypass operations at no additional cost to CCU. If this situation requires CCU to perform all or some of the by-pass operations, the Contractor shall compensate CCU accordingly.

Plugging or blocking of sewer lines shall be included in the appropriate bid item for which the flow must be stopped; this is considered incidental work and no additional payment shall be considered for the activities under this item.

Plugging or blocking of the sewer lines and bypass operations for the reinstatement of service laterals, if required, shall be considered incidental to the work and shall not be considered for payment.

The Contractor shall furnish all materials, labor, and equipment to operate the sewer tanker truck(s), which will effectively collect, pump, transport and discharge all sewage entering the construction area during work. The discharge location shall be designated by CCU.

The use and quantity of a tanker truck(s) for sewer bypass must be approved in advance by the County. Precautions must be taken to make certain that sewer flow control operations do not cause flooding or damage to public or private property being served by the sewers involved.

The number of days for sewer bypass operations with Tanker Truck to be included for payment under the Contract Item will be the total number of 24-hour days or fraction thereof during which bypass operations is ordered by CCU in writing.

Payment for sewer bypass operations with Tanker Truck will be made at the appropriate Contract Item Unit Price per day of truck use.

b) Sewage Bypass Pumping:

These pay items provide complete compensation for operations required for the sanitary sewer structures coating application, the Contractor shall first attempt to perform the sewer rehabilitation work without bypass pumping.

However, if the Contractor deems bypass pumping to be necessary and if CCU agrees with the reasons, this request for bypass pumping will be paid for with these pay items.

Further, if bypass pumping is required due to difficulties caused by or encountered during the rehabilitation process, the Contractor shall be held responsible for all bypass pumping

operations at no additional cost to CCU. If this situation requires CCU to perform all or some of the by-pass pumping, the Contractor shall compensate CCU accordingly.

Plugging or blocking a sewer lines shall be included in the appropriate bid item for which the flow must be stopped; this is considered incidental work and no additional payment shall be considered for the activities under this item.

Plugging or blocking of the sewer line and bypass pumping for the reinstatement of service laterals, if required, shall be considered incidental to the work and shall not be considered for payment.

These items shall include, but are not limited to all necessary or required traffic controls; pumps; piping; gasoline/diesel fuel; maintenance; transportation and storage; temporary bypass and service piping; labor; materials and/or any other costs associated with bypass pumping.

The pay item is a one (1) time charge per day for all bypass pumping operations during coating application, regardless of the number of pumps required or the duration of the pumping period, Bypass pumping of sewers shall be bid on the basis of sewer size which is bypassed.

c) Sanitary Sewer Structure Rehabilitation by Coating System:

The Contractor shall furnish all labor, materials and equipment to rehabilitate the existing sanitary sewer structures as shown on the Plans, specified, and directed by CCU and in accordance with this specification.

The sanitary sewer structures rehabilitation shall conform to the Workmanship and Materials section of this specification and to the requirements shown on the drawings.

The work comprises installing an approved coating system as specified including cleaning to a degree acceptable for inspection, chemical sealing (grouting), surface preparation, application of hydraulic cement or other means to fill voids and stop infiltration, curing, visually inspecting finished coating system; maintenance of traffic; flow control; disposal of material, protection of adjacent facilities, restoring all disturbed areas to preconstruction condition or better, and all appurtenant work.

Payment for the rehabilitation of existing sanitary sewer structures will be made at the Contract Unit Price per square feet of internal sanitary sewer structure surfaces rehabilitated.

d) Installation of New and/or resetting of existing Manhole Cover/Ring Assembly

Payment shall be made on the basis of the contract unit price bid in the Itemized Proposal for each manhole cover/ring assembly that is replaced or reset.

CCU shall supply new manhole rings, cover/ring assembly.

CCU shall be responsible for deciding whether or not a manhole cover/ring assembly needs to be replaced or reset.

e) Reconstructing Existing Manhole Bench & Invert Channels

Payment will be made on the basis of the contract unit price bid in the Proposal for each manhole bench and invert channel that is fully reconstructed.

CCU shall be responsible for deciding whether or not a bench and invert channel need to be fully reconstructed.

1.3 REFERENCED STANDARDS (LATEST REVISION)

Wherever reference is made to any published standards, codes, or standard specifications, it shall mean the latest standard code, specification, or tentative specification of the technical society, organization, or body referred to, which is in effect at the date of the opening of bids.

This specification references standards from:

- OSHA Standard and Regulations
- NAASCO Publications & Specifications
- The American Society for Testing and Materials (ASTM), such as:

C-31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
C-33	Standard Specification for Concrete Aggregates
C-39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
C-94	Standard Specification for Ready-Mixed Concrete
C-109	Standard Test Method for Compressive Strength of Hydraulic Cement Mortars
C-143	Standard Test Method for Slump of Hydraulic-Cement Concrete
C-150	Standard Specification for Portland Cement
C-260	Standard Specification for Air-Entraining Admixtures for Concrete
C-293	Standard Test Method for Flexural Strength of Concrete
C-321	Standard Test Method for Bond Strength of Chemical Resistant Mortars
C-494	Standard Specification for Chemical Admixtures for Concrete
C-496	Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens
C-579	Standard Test Method for Compressive Strength of Chemically Setting Silicate and Silica Chemical Resistant Mortars
C-596	Standard Test Method for Drying Shrinkage of Mortar Containing Cement
C-666	Standard Test Method for Resistance of Concrete to Rapid Freezing *I* Thawing
C-827	Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures
C-1042	Standard Test Method for Bond Strength of Latex Systems Used With Concrete By Slant Shear
C-1244	Standard Test Method for Concrete Sewer Manholes by Negative Air Pressure (Vacuum) Test

D-543	Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents
D-638	Standard Test Method for Tensile Properties of Plastics
D-695	Standard Test Method for Compressive Properties of Rigid Plastics
D-790	Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
D-2240	Standard Test Method for Rubber Property—Durometer Hardness
D-2584	Standard Test Method for Ignition Loss of Cured Reinforced Resins
D-4414	Standard Practice for Measurement of Wet Film Thickness by Notch Gages
D-4541	Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
D-5832	Standard Test Method for Volatile Matter Content of Activated Carbon Samples

The Contractor shall, when required, furnish evidence satisfactory to CCU that materials and methods are in accordance with such standards where so specified. In the event any questions arise as to the application of these standards or codes, copies shall be supplied on site by the Contractor. In case of conflicting requirements between this specification and these referenced documents, this specification will govern.

1.4 PARTIAL LISTING OF RELATED SECTIONS

001570 - Erosion and Sediment Control
002930 - Grassing

Note: This is only a partial listing of related sections. The Contractor shall be responsible to review the entire contract documents.

1.5 SUBMITTALS

1.5.1 General

a) All sanitary sewer structure rehabilitation products shall meet this specification.

b) All submittals listed in this section must be provided in writing prior to the start of the project by the contractor to CCU for approval.

c) Submittals include but are not limited to signed copies of:

- engineering data covering product,
- manufacturer/installer qualification requirements,
- progress schedule,
- design and installation of the materials to be used on the site.

d) Submittal shall be made in a timely manner so that the project schedule can be met.

e) The Contractor submittals shall include the statement that the submittals have been reviewed and meet the contract specifications and/or standard details. All submissions shall bear the Contractor's stamp certifying that they have been checked for conformance and accuracy. Submissions without the Contractor's stamp of approval will not be reviewed by CCU and will be returned to the Contractor.

f) All required submittals must be satisfactory to CCU.

1.5.2 Contractor /Equipment Qualification Requirements

Acceptable documentation of the minimum requirements listed below must be submitted to CCU. These requirements include detailed resume of the field superintendent and applicator(s).

a) Contractor Qualifications:

- The Contractor shall be specialized in the design and application method of the rehabilitation system for a minimum of 5 years.
- The Contractor shall submit a list of at least five (5) significant project references in the State of Florida (one of which must be a minimum of 5 years old), including project name, location, work performed, contract amount, completion date, contact person and phone number, where similar work, in quantity and quality, as specified herein has been performed successfully.
- The applicator shall be trained, approved and certified in writing by the manufacturer in the handling, mixing and application of the products to be used including leak repair and surface preparation.
- The on-site supervisor must have a minimum of 2 years of the product application experience and must be present during the entire rehabilitation process.
- The Contractor shall initiate and enforce quality control procedures consistent with applicable ASTM, NAASCO, NACE and SSPC standards and the coating manufacturer's recommendations.

b) Equipment Certifications:

The contractor shall provide the following for CCU approval:

- Description of all the equipment to be used for the rehabilitation
- Certification that the equipment to be used for applying the products has been manufactured or approved by the product manufacturer and Applicator personnel have been trained and certified for proper use of the equipment.
- Safety plan describing all safety equipment to be utilized in compliance with OSHA standards pertaining to work in confined space entry.

1.5.3 Progress Schedule

A progress schedule shall be prepared and be submitted to CCU for review and comments within fourteen (14) days of date issue of Purchase Order.

The schedule shall detail the proposed sequence of the work and identify pertinent work activities of each Bid Item. The schedule shall be time-scaled, identifying the estimated date of starting and completion of each bid item in order to complete the Purchase Order within the time specified in the Purchase Order.

Subsequent changes to the schedule shall be accompanied by a letter of explanation with appropriate reference and revision date on the schedule.

Review of schedule by Engineer does not relieve the Contractor of any errors or omissions.

1.5.4 Product Data

a) Technical data sheet on each product proposed to be furnished demonstrating compliance with the latest revisions of the ASTM requirements including independent ASTM test results indicating the product conforms to the published technical data. Bids containing exceptions to the material requirements shall be considered non-responsive.

b) Material Safety Data Sheets (MSDS) for each product proposed to be furnished.

1.5.5 Application Procedures

a) The rehabilitation plan shall detail the methods, materials and procedures proposed for the rehabilitation of all sanitary sewer structures, even if the process is named in the specification. Any proposed changes in application procedures shall require submittal of revised procedures for acceptance by CCU.

b) The Contractor shall submit a work plan to CCU for acceptance. The work plan shall address preparation steps required for pre-application.

c) All approved application instructions and procedures submitted shall be carefully followed during application. Any proposed changes in application procedures shall require submittal of revised procedures and acceptance by CCU.

d) Project specific guidelines and recommendations.

e) Proof of any required federal, state or local permits or licenses necessary for the project.

f) Design details for any ancillary systems and equipment to be used in site and surface preparation, application and testing.

1.5.6 Schedule of Payment Values

a) The Contractor shall submit a separate Schedule of Payment Values for the work in accordance with the "Method of Measurement and Payment" section of this specification for all items in the bid that are to be paid for on unit bid item basis. The schedule shall contain the installed value of the component parts of work for the purpose of making progress payments during the work period.

b) The schedule shall be given in sufficient detail for the proper identification of work accomplished. Each item shall include a complete installation with all installation costs, the Contractor's overhead, contingencies and profit. The sum of all unit bid items multiplied by their respective quantities shall equal the total value of the Contract.

1.5.7 Television recordings

The Contractor shall submit all pre-application (post-preparation) and post-application closed-circuit television inspections recordings in color DVD format to CCU for acceptance prior to payment.

1.5.8 Written warranty.

The Contractor shall warrant all work against defects in materials and workmanship for a minimum period of five (5) years or as otherwise specified, from the date of final acceptance of the project. This warranty shall be a guarantee against failure for the warranty period. Failure shall be defined to occur if the rehabilitation system fails to:

a) Prevent the internal damage or corrosion of the structure.

b) Prevent groundwater infiltration.

c) Adhere to existing structure wall.

If any failures occur within the specified warranty period after final acceptance, the Contractor shall repair or restore the structure to CCU standard specifications including all materials, labor, and at no additional cost to CCU. Repair shall be completed within 30 days of written notification of the failure.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 General

a) All materials, products, or devices incorporated in this project shall be new and unused and shall conform to the requirements of all applicable laws, ordinances, and codes unless indicated otherwise in the Contract Documents and shall be the products of reliable manufacturers, which unless otherwise specified, have been regularly engaged in the manufacture of such material or devices. Procedures and additional requirements

regarding manufacturer's experience and substitutions are included in the “Submittals" section of this specification.

b) All materials and equipment to be incorporated into the work shall be properly designed for the use intended. Materials and/or equipment which, in the opinion of CCU, are inferior or of a lower grade than specified, or required, will not be accepted and shall be removed .immediately from the project site.

c) Materials to be incorporated in the work shall be delivered sufficiently in advance of their use and use to prevent delay in the execution of the work, and they shall be delivered as nearly as feasible in the order required for executing the work.

d) The Contractor shall protect all devices and materials from deterioration and damage. All materials and equipment shall be handled and stored in strict accordance with the manufacturer's recommendations. Products shall also be stored and handled according to their Material Safety Data Sheets (MSDS). The materials shall be handled and stored by the manufacturer, fabricator supplier and Contractor before, during, and after shipment to prevent any injury, damage or theft of any kind whatsoever. Any material exhibiting any of the above shall be removed and replaced at the Contractor's expense for both labor and materials.

e) The Contractor shall store his equipment and materials at the Contractor's base of operations in a secure storage area of a size adequate to accommodate the required vehicles, equipment and materials for the period of performance of the contract and in accordance with the manufacturer's recommendations.

f) Only materials that meet the latest revisions of the applicable American Society of Testing and Materials (ASTM) material standards are acceptable for this work.

g) CCU approved sanitary sewer structures rehabilitation systems are as follow:

- Sprayed applied Urethane resin
- Sprayed applied 100% Solids Epoxy
- Sprayed applied Polymorphic resin
- Sprayed applied pure-fused calcium aluminate mortar

h) All CCU approved sanitary sewer structure rehabilitation systems shall conform to the minimum physical standards

i) The Contractor shall provide certified independent, third party test results verifying the minimum physical properties. The tests shall be in conformance with the ASTM specifications listed.

j) The coating system application methodology shall be in strict accordance with the manufacturer’s instructions and shall provide a uniform smooth surface.

k) The coating system shall be capable of being applied over wet/damp surfaces without degrading the final product.

l) The finished coating product shall be resistant to sulfuric acid attack associated with domestic sewage.

m) The finished coating product shall be cured in strict accordance with the manufacturer's instructions.

n) The existing sanitary sewer structures shall be prepared for the application of the coating system by cleaning and stoppage of infiltration. Prior to applying the coating product, the entire sanitary sewer structure surface and benches shall be patched and grouted to the extent needed to provide a smooth and even surface to which the coating product will adhere.

2.1.2 Urethane Resin System

a) The sprayed applied urethane resin system shall be SprayWall as manufactured by Sprayroq, Inc, Birmingham, Alabama.

b) A minimum thickness of 250 mils (1/4") shall be applied for structural integrity.

c) The cured urethane system shall conform to the minimum physical standards, as listed below:

CURED URETHANE	STANDARD	LONG-TERM DATA
Tensile Strength	ASTM D-638	5,000 psi
Flexural Stress	ASTM D-790	10,000 psi
Flexural Modulus	ASTM D-790	550,000 psi

2.1.3 Epoxy Coating System

a) The Epoxy Coating System shall be Raven 405 as manufactured by Raven Lining Systems, a 100% solids, solvent-free two-component epoxy resin system thixotropic in nature and filled with select fillers to minimize permeability and provide sag resistance acceptable to this specification.

b) A minimum thickness of 125 mils shall be applied for structural integrity.

c) The Epoxy Coating System shall conform to the minimum physical standards, as listed below:

Epoxy Coating	STANDARD	LONG-TERM DATA
Tensile Strength	ASTM D-638	5,000 psi
Flexural Strength	ASTM D-790	10,000 psi
Flexural Modulus	ASTM D-790	550,000 psi

2.1.4 Polymorphic Resin Systems

a) The sprayed applied Polymorphic Resin system shall be as manufactured by Integrated Environmental Technologies, Santa Barbara, California. The Polymorphic Resin shall be a solvent-free 100% solids epoxy, two component, highly modified isothalic polyester resin material.

b) The material shall form a mechanical and chemical bond to the sanitary sewer structure surface with <0,08% shrinkage (ASTM C596) in 28 days. The material shall have a minimum twenty-eight (28)-day compressive strength of 9,000-psi. The three coat system is:
1. Prime Coat: OS-101 5-10 mils thick
2. Intermediate Coat: OS-301 50-70 mils thick
3. Final Coat: OS-401 5-10 mils thick

c) The cured resin system shall conform to the minimum physical standards, as listed below:

CURED RESIN	STANDARD	LONG-TERM DATA
Tensile Strength	ASTM D-638	5,000 psi
Flexural Strength	ASTM D-790	8,630 psi
Flexural Modulus	ASTM D-790	15,120 psi

2.1.5 Pure-fused calcium aluminate mortar

a) The sprayed applied Pure-fused calcium aluminate mortar shall be SewperCoat as manufactured by Lafarge Calcium Aluminates, Inc.

b) The material shall form a mechanical and chemical bond the sanitary sewer structure surface with less than 0.08% shrinkage (ASTM C596) in 28 days. The product shall have a minimum twenty-eight (28) day compressive strength of 9,000 psi. The product is a one coat application. The product shall be spray applied directly to the damp the sanitary sewer structure surface, trowel smooth, and "brushed" finished.

c) The material shall completely cover the interior surface of the sanitary sewer structures with a minimum thickness of 1,000 mils (1 inch) as measured at the thinnest application point. The maximum thickness for per single lift application is 3 inches.

2.1.6 Chemical Grouting of Sanitary Sewer Structures

Materials, additives, mixture ratios, and procedures utilized for the grouting process shall be in accordance with the grout manufacturer's recommendations.

a) General - All chemical grout shall be a chemical sealant solution containing principal chemical sealant constituent, initiator (trigger) and catalyst specifically recommended for purpose of sealing leaks in sanitary sewer structures. The chemical sealant constituent, initiator (trigger) and catalyst shall be compatible when mixed. The solution shall have ability to tolerate dilution and react in moving water. After final reaction, it shall be a stiff, impermeable, yet flexible gel. The chemical sealant shall be designed to be a soil stabilizing grout.

b) Material Composition - Intimate mixtures in such proportions that dilute aqueous solutions, when properly catalyzed, will form a firm but flexible gel. Grout shall make true solution at concentrations as high as three (3) pounds per gallon of water. Solution shall have ability to accept dilution by groundwater of at least 50% by volume, without significantly changing sealing ability of gel when at rest or in motion. Solutions shall gel in predetermined time when exposed to normal groundwater Ph ranges, and be capable of formula adjustments to compensate for changing conditions. Solution as mixed shall have viscosity of less than two (2) centipoises. Reaction time shall be controllable from ten (10) seconds to sixty (60) minutes at temperatures from 320 F to 1400 F. Viscosity shall remain constant throughout induction period. The minimum concentration of chemicals mixed in tank, (computed as liquid or dry weight percentage of total solution weight) shall be 10%. Higher concentration may be used, when desirable, to increase strength or offset dilution during the induction period. Final reaction shall produce continuous, irreversible, impermeable stiff gel at chemical concentrations as low as 0.4 pounds per gallon of water. Gel shall not be rigid or brittle. Gel shall have negligible corrosion rate on mild steel plates. Only the following chemical grout alternatives will be accepted:

- AV-100 as manufactured by Avanti International, 822 Bay Star Boulevard, Webster, Texas 77589.
- AV-118 as manufactured by Avanti International, 822 Bay Star Boulevard, Webster, Texas 77589.
- 5610 (GEL) as manufactured by 3M Contractor Products, St. Paul, Minnesota 55144.
- AV-254 as manufactured by Avanti International, 822 Bay Star Boulevard, Webster, Texas 77589.

c) Initiator (Trigger) - initiator shall be in accordance with the manufacturer's recommendations.

d) Catalyst - Catalyst shall be in accordance with the manufacturer's recommendations.

e) Insoluble (particulate) Additives - Inactive solids such as diatomaceous earth may be mixed with grout as filler only upon written approval of CCU.

f) Other Additives - The Contractor must justify the use of other additives. The effects of additives shall be determined by test on project site, prior to approval for use.

2.2 QUALITY CONTROL

2.2.1 Review at Place of Manufacture

Unless otherwise specified, all products, materials, and time and equipment may be subject to review by CCU at the place of manufacture.

The presence of CCU at the place of manufacture, however, shall not relieve the Contractor of the responsibility for furnishing products, materials, and equipment which comply with all requirements of the Contract Documents, and said duty shall not be avoided by any act or omission on the part of CCU.

2.2.2 Sampling and Testing

Unless otherwise specified, all sampling and testing shall be in accordance with the methods prescribed in the current standards of the ASTM, as applicable to the class and nature of the article or materials considered.

The Contractor shall pay for all costs of retests made necessary by the failure of the samples of specimens to meet the specified ASTM requirements.

Any waiver by CCU of any specified testing or other quality assurance measures, whether or not waiver is accompanied by a guarantee of substantial performance as a relief from the specified testing or other quality assurance requirements as originally specified, and whether or not such guarantee is accompanied by a performance bond to assure execution of any necessary corrective or remedial work, shall not be construed as a waiver of any requirements of the Contract Documents.

Notwithstanding the existence of such waiver, CCU reserves the right to make independent additional investigations and tests and failure of any portion of the work to meet any of the requirements of the Contract Documents, shall be reasonable cause for CCU to require the removal or correction and reconstruction of any such work in accordance with the General Conditions.

2.2.3 Site Investigation and Control

The Contractor shall verify all dimensions in the field and shall check field conditions continuously during construction. The Contractor shall be solely responsible for any inaccuracies built into the work due to his failure to comply with this requirement. The Contractor shall inspect related and appurtenant work and shall report in writing to CCU any conditions which will prevent proper completion of the work. Failure to report any such conditions shall constitute acceptance of all site conditions, and any required removal, repair, or replacement caused by unsuitable conditions shall be performed by the Contractor within the scope of the project.

2.2.4 Additional Review and Testing

CCU reserves the right to employ and pay for the services of an independent testing laboratory for additional specified testing.

The work or actions of the testing laboratory shall in no way relieve the Contractor of his obligations under the Contract. The laboratory testing work shall include such review and testing required by the Contract Documents, existing laws, codes, and ordinances. The testing laboratory will have no authority to change the requirements of the Contract Documents, nor perform, accept, or approve any of the Contractor's work.

The Contractor shall allow CCU ample time and opportunity for review and testing materials to be used in the work. The Contractor shall advise CCU promptly upon placing orders for materials so that arrangements may be made, if desired, for review before shipment from the place of manufacture. The Contractor shall at all times furnish CCU and his representatives, facilities including labor, and allow proper time for reviewing and testing materials, equipment, and workmanship. The Contractor must anticipate that possible delays may occur in the

execution of its work due to the necessity of materials and equipment being reviewed and accepted for use. The Contractor shall furnish, at his own expense, all samples of materials required by CCU for testing, and shall make his own arrangements for providing dater, electric power, or fuel for the various reviews and tests of the sanitary sewer structures.

CCU will bear the costs of all tests, reviews, or investigations undertaken by the order of CCU for the purpose of determining conformance with the Contract Documents if such tests, reviews, or investigations are not specifically required by the Contract Documents, and if conformance is ascertained thereby. Whenever nonconformance is determined by CCU as a result of such tests, reviews, or investigations, the Contractor shall bear the full costs of any additional tests and investigations, which are ordered by CCU to ascertain subsequent conformance with the Contract Documents.

2.2.5 Right of Rejection

CCU or its representative shall have the right, at all times and places, to reject any articles or materials to be furnished hereunder which, in any respect, fail to meet the requirements of the Contract Documents, regardless of whether the defects in such articles or materials are detected at the point of manufacture or after completion of the work at the site. If CCU or its representative, through an oversight or otherwise, has accepted materials or work which is defective or which is contrary to the Contract Documents, such materials, no matter in what stage or condition of manufacture, delivery, or erection, may be subsequently rejected by CCU or its representative.

The Contractor shall promptly remove rejected articles or materials from the site of the work after notification or rejection. All costs of removal and replacement of rejected articles or materials as specified herein shall be borne by the Contractor.

2.2.6 Weather Conditions

Work that may be affected by inclement weather shall be suspended until proper conditions prevail. In the event of impending storms, the Contractor shall take necessary precautions to protect all work, materials and equipment from exposure.

2.2.7 Fire Protection

The Contractor shall take all necessary precautions to prevent fires at or adjacent to the work, including his own equipment and trailers. Adequate fire extinguisher stations shall be provided throughout the work area.

2.2.8 Final Remedy:

If testing results do not meet the specifications, the Contractor shall be required to replace the liner.

PART 3 - EXECUTION

3.1 GENERAL

All phases of the sanitary sewer structure rehabilitations such as surface preparation, bench reconstruction, coating application, annulus sealing, grouting, etc., will be inspected by the Department's Field Engineering personnel for conformance to the specifications, submittals and liner manufacturer's instructions. The Contractor shall, therefore, coordinate his schedule for the coating application of the structural coating system with the field office, and with due regard for site and weather conditions prevailing at the time.

3.2 SURFACE PREPARATIONS

3.2.1 General: Surface preparation shall be in strict accordance with the approved coating manufacturer's instructions. All surfaces to be coated shall be cleaned with a high pressure water spray (minimum 4000 psi). The use of acid for cleaning purposes will not be allowed. All deteriorated concrete and loose or protruding brick and mortar shall be removed from the wall and benches in order to obtain a substrate suitable for the proposed coating system. All infiltration shall be stopped with hydraulic cement or other approved means to a smooth, uniform surface before application of the coating system. Any voids in the sanitary sewer structure walls shall be sealed with hydraulic cement.
The Contractor shall install plugs in order to prevent extraneous material from entering the sewer lines.

3.2.2 Applicator shall inspect all specified surfaces prior to surface preparation. Applicator shall notify CCU of any noticeable disparity in the surfaces that may interfere with the proper preparation or application of the specified repair materials.

3.2.3 Applicator personnel shall directly perform all aspects of surface preparation and shall not subcontract any element of surface preparation.

3.2.4 All contaminants including: oils, grease, incompatible existing coatings, waxes, form release, curing compounds, efflorescence, sealers, salts, or other contaminants shall be removed. All concrete or mortar that is not sound or has been damaged by chemical exposure shall be removed to a sound concrete surface or replaced.

3.2.5 Surface preparation method(s) and repair materials should be based upon the conditions of the substrate, service environment and the requirements of the coating material to be applied. Surfaces to receive repair materials shall be cleaned and abraded to produce a sound surface with adequate profile and porosity to provide a strong bond between the repair materials and the substrate.

3.2.6 Infiltration shall be stopped by using a material that is compatible with the coating material to be applied. Moderate to severe infiltration control may require the use of chemical injection grouting. All costs associated with infiltration control shall be considered inclusive with the cost of the application of the appropriate coating application.

3.2.7 All surfaces shall be examined by the Inspector both during and after preparation and before the coating application.

3.3 TEMPORARY UTILITIES

3.3.1 General: The Contractor shall provide for utilities and services for his own operations. These shall include electrical power, water, ventilation, sanitary facilities and telephone service. The Contractor shall furnish, install and maintain all temporary utilities during the Contract period including removal upon completion of the work. Such facilities shall comply with regulations and requirements of the national Electrical Code, OSHA, Florida Power and Light, and applicable Federal, State, and Local codes, rules and regulations.

3.3.2 Temporary Water: The Contractor shall supply all water necessary for performance of work under the contract. The Contractor shall provide and maintain all piping, fittings, adapters, and valving required. It is the Contractor's responsibility to arrange through the water department for a water meter. A deposit to be paid by the Contractor is required or meter rental and all water shall be purchased by the Contractor at the prevailing rate.

3.3.3 Temporary Ventilation: The Contractor shall provide and maintain adequate ventilation for a safe working environment. In addition, forced air ventilation shall be provided for the curing of installed materials, humidity control, and the prevention of hazardous accumulations of dust, gases, or vapors.

3.3.4 Temporary Sanitary Facilities: The Contractor shall provide and maintain adequate and clean sanitary facilities for the construction work force and visitors. The facilities shall comply with Local codes and regulations and be situated at approved locations.

3.4 TEMPORARY ENVIRONMENTAL CONTROLS

3.4.1 Chemicals

All chemicals used during project construction or furnished for testing of project operations, whether herbicide, pesticide, disinfectant, polymer, reactant of other classifications, will be required to show approval of either EPA or HUD. The handling, use, storage and disposal of such materials, containers or residues shall be in strict conformance with manufacturer and/or supplier's secured storage. Copies of antidotes shall be kept at the storage site and at the job site. The Contractor shall be responsible for any leaked chemical that has permeated into the soil. Costs incurred for cleanup of any such contamination shall be borne by the Contractor.

3.4.2 Dust

During all work for this Contract, the Contractor shall be responsible for the application of water and/or calcium chloride or other means, acceptable to CCU, to eliminate dust annoyance to adjacent property CCUs and business establishments.
The Contractor shall take all protective measures, to the satisfaction of CCU, necessary to ensure that dust and debris does not enter any of the mechanical or electrical equipment. The Contractor shall be responsible for the cleanup of existing buildings and property which have become soiled due to the lack of proper dust control as determined by CCU.

3.4.3 Rubbish Control

During the progress of the work, the Contractor shall keep the site of the work and other areas used by it in a neat and clean condition, and free from any accumulation of rubbish. The Contractor shall dispose of all rubbish and waste materials of any nature occurring at the work site, and shall establish regular intervals of collection and disposal of such materials and waste. The Contractor shall also keep its haul roads free from dirt, rubbish, and unnecessary obstructions resulting from its operations. Disposal of all rubbish and surplus materials shall be off the site of construction in accordance with local codes and ordinances governing locations and methods of disposal, and in conformance with all applicable safety laws, and to me particular requirements of Part 1926 or the OSHA Safety and Heath Standards for Construction.

3.4.4 Toilet Facilities

Fixed or portable chemical toilets shall be provided wherever needed for the use of employees. Toilets at construction job sites shall conform to the requirements of Part 1926 of the OSHA Standards for Construction.

Such facilities shall be made available when the first employees arrive on the work, shall be properly secluded from public observation, and shall be constructed and maintained in suitable numbers and at such points and in such manner as may be required.

The Contractor shall maintain the sanitary facilities in a satisfactory and sanitary condition at all times and shall enforce their use. He shall rigorously prohibit the committing of nuisances on the site of the work, on the lands of the County, or an adjacent property.

CCU and CCU shall have the right to review any building or other facility erected, maintained, or used by the Contractor, to determine whether or not the sanitary regulations have been complied with.

3.4.5 Sanitary and Other Organic Wastes

The Contractor shall establish a regular daily collection of all sanitary and organic wastes. All wastes and refuse from sanitary facilities provided by the Contractor or organic material wastes from any other source related to the Contractor's operations shall be disposed of away from the site in a manner satisfactory to CCU and in accordance with all laws and regulations pertaining thereto.

3.4.6 Noise

Noise resulting from the Contractor's work shall not violate the local noise ordinances or exceed the noise levels and other requirements relating to noise abatement. The Contractor shall be responsible for curtailing noise resulting from his operation. He shall, upon written notification from CCU or the noise control officers, make any repairs, replacements, adjustments, additions, and furnish mufflers when necessary to fulfill requirements.

3.4.7 Erosion Abatement and Water Pollution

It is imperative that the Contractor's dewatering operations not contaminate or disturb properties adjacent to the work sites in accordance with the regulatory agencies having jurisdiction. The Contractor shall, therefore, schedule and control his operations to confine all runoff water from disturbed surfaces, water from dewatering and/or from excavation below the ground water table operations that becomes contaminated with lime silt, mulch, and other deleterious matter, fuels, oils, bituminous, calcium chloride, chemicals and other polluting materials.

The Contractor shall construct temporary stilling basin(s) of adequate size and provide all necessary temporary materials, operations and controls including, but not limited to, filters, coagulants, screens and other means necessary to attain the required discharge water quality.

The Contractor shall be responsible for providing, operating, and maintaining materials and equipment used for conveying the clear water to the point of discharge. All pollution prevention procedures, materials, equipment, and related items shall be operated and maintained until such time as the dewatering operation is discontinued.
Upon the removal of the materials, equipment, and related items, the Contractor shall restore the area to the condition prior to his commencing work.

3.4.8 Precautions During Adverse Weather

During adverse weather, and against the possibility thereof, the Contractor shall take all necessary precautions so that the work may be properly done and satisfactory in all respects. When required, protection shall be provided by use of tarpaulins, wood and building paper, shelters, or other acceptable means. The Contractor shall be responsible for all changes caused by adverse weather.

3.4.9 Hurricane and Storm Warnings

The Contractor shall be required to remove from and/or secure all loose construction materials and equipment and protect structures under construction at the job site in the event of a hurricane watch. The Contractor shall also remove all plugs in pipelines that would impede drainage in case of flooding. Structures that may be in danger of floatation shall be flooded.

3.4.10 Pests and Rodents

The Contractor shall be responsible for maintaining the job site free from litter, rubbish, and garbage. He shall provide containers for the disposal of garbage and other materials that attract and are breeding places for pests and rodents. The Contractor shall provide the services of an exterminator to inspect the job site if pest and rodents are suspected and shall provide service.

3.4.11 Periodic Cleanup: Basic Site Restoration

During construction, the Contractor shall regularly remove from the site all accumulated debris and surplus materials of any kind which result from his operations. Unused equipment and tools shall be stored at the Contractor's yard or base of operations for the project.

When the work involves installation of sewers, drains, water mains, manholes, underground structures, or other disturbance of existing features in or across streets, rights-of-ways, easements, or private property, the Contractor shall (as the work progresses) promptly backfill, compact, grade, and otherwise restore the disturbed area to a basic condition which will permit resumption of pedestrian or vehicular traffic and any other critical activity or function consistent with the original use of the land. Unsightly mounds of each large stones, boulders, and debris shall be removed so that the site presents a neat appearance.

The Contractor shall perform the cleanup work on a regular basis and as frequently as requested by CCU. Basic site restoration in a particular area shall be accomplished immediately following the rehabilitation or completion of the required facilities in that area. Furthermore, such work shall also be accomplished, when ordered by CCU, if partially completed facilities must remain incomplete for some time period due to unforeseen circumstances.

Upon failure of the Contractor to perform period clean-up and basic restoration of the site to CCU's satisfaction, CCU may, upon five (5) days prior written notice to the Contractor, employ such labor and equipment as he deems necessary for the purpose, and all costs resulting there from shall be charged to the Contractor and deducted from the amounts of money that may be due him.

Upon acceptance of the rehabilitation work and testing, the Contractor shall restore the project area affected by the operations to a condition at least equal to that existing prior to the work.

3.5 WASTEWATER FLOW CONTROL

3.5.1 Scope of Work

The work specified in this section includes all labor, materials, accessories, equipment, and tools for performing all operations required to bypass pump sewage around a sanitary sewer structure or any sewer section in which work is to be performed. The Contractor shall be prepared to bypass pump sewage as a part of his operations.

The Contractor shall provide all pumps, piping, and other equipment to accomplish this task; perform all construction; obtain all permits; pay all costs; and perform complete restoration of all existing facilities or equal or better condition to the satisfaction of CCU.

3.5.2 General

In some applications, the wastewater flow may be plugged and contained within the capacity of the collections system. This shall only be done when it has been determined the system can accommodate the surcharging without any adverse impact.

When sewer line flows at the upstream manhole of the structure being rehabilitated, in the opinion of CCU, are too excessive to plug while the rehabilitation is being performed; the Contractor shall submit a written plan and pump/bypass the flow as acceptable to CCU.

3.5.3 Submittals

The Contractor shall submit complete, detailed plans for this aspect of the work to the work to CCU for review in accordance with the “Submittals” section of this specification.

3.5.4 Workmanship

a) Plugging and Blocking

A sewer line plug shall be inserted into the line at a manhole upstream from the structure being inspected, rehabilitated and/or repaired. The plug shall be so designed that all or any portion of the operation flows can be released. During the inspection portion of the operation, flows shall be shut off or reduced to within the maximum flow limits specified. During rehabilitation and/or repairs, the flows shall be shut off or pumped/bypassed, as acceptable to CCU. After the work tasks have been completed, flows shall be restored to normal.

b) Pumping and Bypassing

When pumping/bypassing is required, as determined by CCU, the Contractor shall supply the necessary pumps, conduits, and other equipment to divert the flow of sewage around the structure in which work is to be performed. The bypass system shall be of sufficient capacity to handle existing flows plus additional flow that may occur during periods of rain storms. The Contractor shall be responsible for furnishing the necessary labor and supervision to set up and operate the pumping and bypassing system. A "setup" consists of the necessary pumps, conduits and other equipment to divert the flow of sewage around a sanitary sewer structure section, from the start to finish of work performed in the sanitary sewer structure section.

Pumps and equipment shall be continuously monitored by a maintenance system capable of starting, stopping, refueling and maintaining these pumps during the rehabilitation. If pumping is required on a 24-hour basis, engines shall be equipped in a manner to keep noise to a minimum.

Any requirement for bypass pumping shall be submitted by the Contractor to CCU for review and approval prior to commencement of actual sewer bypass. CCU shall have sole discretion in determining the necessity for any bypass pumping. No bypass pumping shall be executed without prior approval of CCU.

c) Surcharging Sewers

Where the raw sewage flow is blocked or plugged, sufficient precautions must be taken to protect the public health. The sewer lines shall also be protected from damage. The following occurrences shall not be allowed:

c1) No sewage shall be allowed to back up into any homes or buildings,

c2) No sewage shall overflow any sanitary sewer structure, clean-outs, or any other access to the sewers.

c3) Users upstream of the repair area shall be able to use all their water and sewer utilities without interruption.

If any of the above occur or are expected to occur, the contractor shall bypass pump to alleviate one (1) or all of the conditions. Additionally, the Contractor is required to observe the conditions upstream of the plug and be prepared to immediately start bypassing pumping, if needed.

d) Pumps discharge material

Any sump pumps, bypass pumps, trash pumps, or any other type pump which pulls sewage/water or any type of material out of the sanitary sewer structure shall discharge this material into another manhole, or appropriate vehicle or container acceptable to CCU. Under no circumstances shall this material be discharged, stored, or deposited on the ground, swale, or open environment.

e) Traffic Control

The Contractor shall take appropriate steps to ensure that all pumps, piping, and hoses that carry raw sewage are protected from traffic. Traffic control shall be performed in accordance with the contract documents.

f) Sanitary Sewer Overflow (SSO) and/or Discharge

- In case of an SSO and/or discharge, the Contractor is responsible for immediately notifying CCU and supplying all information pertaining to the incident.

- The Contractor is solely responsible for all fines, labor, materials, equipment, and all other associated costs incurred by the Contractor and CCU associated with an SSO and/or discharge to the environment resulting from the Contractor's actions or the Contractor's negligence.

- In the event, during any work task(s) involved in "Sewage Flow Control," that raw sewage is spilled, discharged, leaked, or otherwise deposited in the open environment, due to the Contractor's work, the Contractor also shall immediately control, contain, and stop the spill or discharge and shall repair any damage. The Contractor is responsible for any clean up of solids and disinfection of the area affected.

- This work shall be performed at the Contractor's sole expense with no additional cost to CCU.

3.6 **RESETTING OF EXISTING MANHOLE RING AND COVER ASSEMBLY**

3.6.1 General

If directed by CCU, some manholes will require the contractor to perform a grade adjustment and/or resetting of the existing manhole ring and cover assembly prior to manhole the rehabilitation. This work shall involve both unpaved and paved areas.

3.6.2 Provided by the Contractor

All materials, equipment, and work required to reset existing ring and cover assembly in unpaved or paved areas shall be provided by the Contractor.

3.6.3 Items included

This item shall include sawcutting existing asphalt or concrete and disposing of material (in paved areas only), any required excavation, manhole wall and ring preparation, removal and off-site disposal of existing materials, backfilling and compaction per CCU specifications and details, accessing manholes as specified, traffic control, coordination with and location of existing utilities, complete restoration of asphalt and concrete or grass, and for all else incidental thereto for which separate payment-is not provided under other bid items.

3.7 INSTALLATION OF NEW MANHOLE RING AND COVER ASSEMBLY

3.7.1 General

If directed by CCU, some manholes will require the Contractor to remove and replace the existing manhole ring and cover assembly prior to manhole rehabilitation. This work shall involve both unpaved and paved areas.

3.7.2 Provided by CCU

When manhole ring and cover assembly replacement is required, the new assembly shall be provided to the Contractor by CCU.

3.7.3 Provided by the Contractor

All additional materials, equipment, and work required to replace the existing manhole ring and cover assembly shall be provided by the Contractor.

3.7.4 Items included

This item shall include sawcutting existing asphalt or concrete and disposing of material (in paved areas only), any required excavation, manhole wall and ring preparation, new ring and cover assembly, removal and off-site disposal of existing materials, backfilling and compaction per the specifications and details, accessing manholes as specified, traffic control, coordination with and location of existing utilities, complete restoration of asphalt and concrete or grass, and for all else incidental thereto for which separate payment is not provided under other bid items.

3.8 REBUILDING EXISTING MANHOLE BENCH & INVERT CHANNELS

3.8.1 General

If directed by CCU, some manholes will require the Contractor to perform a rebuild of the existing manhole bench and invert channel prior to manhole rehabilitation.

3.8.2 Preconditions

Repairs shall be performed on all manhole benches and inverts that exhibit visible damage and/or infiltration, or require such repairs in order to facilitate successful manhole liner performance testing.

3.8.3 Items included

This item includes all materials, equipment, and work required to rebuild existing manhole bench areas. All manhole bench and invert channel repairs shall be approved by CCU prior to commencement of work. Prior to repairs, flow through the manhole shall be arrested via the use of either pipe plugs, flow-through plugging systems, or manhole by-pass pumping as required.

3.8.4 Cleaning

After manhole flow has been diverted, remove all loose material from manhole bench and invert areas and pressure wash using a minimum 4000 psi hydrablast.

3.8.5 Finishing and flow restoration

The quick setting patching and invert repair material shall be applied to the invert in an expeditious manner. The mix shall be troweled uniformly onto the invert at a minimum thickness of 0.5 inches, extending out onto the bench sufficiently to create an adjoining tie in region for the spray applied monolithic cementitious liner material. Care should be taken in the finishing of invert channel, so as to maintain the hydraulic performance of the manhole. The finished invert should be smooth and free of any ridges or other surface irregularities that might impede flow. Flow in the manhole should be restored as soon as the quick setting invert repair material achieves its initial set and not longer than 30 minutes from the time of initial service interruption.

3.9 CHEMICAL GROUTING OF SANITARY SEWER STRUCTURES

3.9.1 General

Sanitary sewer structures that exhibit moderate to severe groundwater infiltration will require the use of chemical injection grouting to arrest leakage prior to rehabilitation. The Contractor shall submit said structures to CCU for approval of the grouting procedure prior to commencement of work.

3.9.2 Scope

The work specified in this section includes all labor, materials, accessories, equipment, and tools necessary for chemical grouting/sealing the sanitary sewer structures.

3.9.3 Sealing Procedure

In the preparation and application of the sealing grout, the recommendations of the manufacturer of the grout materials shall be followed. Injection holes shall be drilled through

the manhole wall at locations as recommended by the grout manufacturer. Grout shall be injected through the holes under pressure with a suitable probe. Injection pressure shall not cause damage to the manhole structure or surrounding surface features. Grout shall be injected through the lowest holes first. The procedure shall be repeated until the manhole is externally sealed with grout. Grouting from the ground surface shall not be allowed. Grout travel shall be verified by observation of grout to defects or adjacent injection holes. The contractor shall provide additional injection holes, if necessary to ensure grout travel. Injection holes shall be cleaned with a drill and patched with a waterproof quick setting mortar for brick and concrete manholes.

3.9.4 Visual Testing:

- After the grouting work has been completed, the sanitary sewer structure shall be visually reviewed by the contractor in the presence of CCU.
- Visual review shall be for water tightness against leakage of water into the structure.
- All visible leaks and defects observed during the review shall be repaired to CCU's satisfaction. There shall be no visible infiltration.

3.10 INSPECTION OF THE WORK AND TESTING

3.10.1 Coating Thickness Verification and Inspection

The Contractor shall provide a method of verifying the actual coating thickness installed to ensure it meets or exceeds the minimum values specified. The proposed liner thickness verification method shall be submitted to CCU for approval.

The Contractor may utilize a wet film thickness gage meeting ASTM D-4414 to ensure monolithic coating and uniform thickness during application. A minimum of three readings per 200 square foot area shall be recorded. Documentation on thickness readings shall be conveyed to the Inspector on a daily basis when the coating application occurs.

The final sanitary sewer structures shall be completely free of defects.

3.10.2 Spark Testing

The coating system shall be spark tested prior to acceptance. After the coating has set hard to touch, it shall be inspected with high-voltage holiday detection equipment. An induced holiday shall be made onto the coated concrete surface and will serve to determine the minimum/maximum voltage to be used to test the coating for holidays at that particular area. The spark tester shall be initially set at 100 volts per 1 mil (25 microns) of minimum specified (not average) film thickness applied but may be increased if it is insufficient to detect the induced holiday. All detected holidays shall be marked and repaired per the manufacturer's recommendations. All costs associated with the testing shall be born by the Contractor.

3.10.3 Television Survey

a) General:
Sanitary sewer structures shall be visually inspected by means of closed-circuit television pole camera after cleaning (Pre-application/post-preparation) and after rehabilitation (post-coating application).

Television inspection shall be performed in the presence of CCU or its representative.

All television inspections shall be performed and documented in accordance with the NASSCO Pipeline Assessment Certification Program (PACP).

b) Scope:

The work consists of furnishing all labor, materials, accessories, equipment tools, transportation services, and technical competence for performing all operations required to execute the internal closed circuit television inspection.

c) Equipment:

The television pole camera used for the inspection shall be one specifically designed and constructed for such inspection. Lighting for the camera shall be suitable to allow a clear picture of the entire periphery of the structure. The camera shall be operative in 100% humidity conditions. Color picture quality and definition shall be to the satisfaction of CCU; and if unsatisfactory, equipment shall be removed and replaced with adequate equipment.

The video camera shall include a title feature capable of showing on the DVD recordings the following information:

- City and State
- Date
- Contractor's name
- CCU Sewer basin number
- CCU sanitary sewer structure identification numbers

d) Electronic media recording

- VHS video tapes are not acceptable.

- Only high quality color DVDs shall be supplied for all television inspections. All taping shall be performed at SP (Standard Play, 2hrs/DVD).

- DVD recordings playback shall be at the same speed that was recorded. Slow motion or stop motion playback features shall be supplied by the Contractor.

- The Contractor shall have all DVD recordings and necessary playback equipment readily accessible for review by the County' representative during the project.

- Each original DVD recording shall be delivered to CCU upon completion of the project. All DVD recordings shall be submitted to CCU and will become the property of the County.

e) Pre-application (post-preparation) and post-application closed-circuit television inspections

The entire sanitary sewer structure shall be televised. The camera shall be moved through the structure at a moderate rate, stopping when necessary to permit proper documentation of pre and post conditions.

Contractor shall repair deficiencies before acceptance for payment.

END OF SECTION