

GUAM WATERWORKS AUTHORITY Gloria B. Nelson Public Service Building • 688 Route 15, Mangilao, Guam 96913 • Tel. (671) 300-6035

Invitation To Bid:	IFB-06-ENG-2020 Asan-Adelup-Hagatna, Route 1 Sewer Rehabilitation and Replacement- Phase II GWA Project No. S15-002-EPA
Addendum No.:	03
Date:	July 31, 2020

All Qualified Bidders:

This addendum is issued to modify the previously issued bid documents and/or given for informational purposes, and is hereby made a part of the bid documents. Failure to acknowledge receipt of this addendum shall be grounds for the bidder's disqualification and rejection of the bidder's proposal.

1. Part A – Bid Documents – Invitation to Bid and other sections of the bid documents where applicable:

Bid proposals deadline has been extended from 3:00 p.m., August 7, 2020 to 3:00 p.m., August 27, 2020.

The deadline for questions or clarifications has been extended *from no later than July 22, 2020* to no later than August 7, 2020.

2. Part B – GWA Request for Information Response No. 1 to Contractor Inquiries

GWA's response No. 2 to contractor RFI inquiries is attached to this Addendum.

3. Part C – Modifications to Contract Bid Documents

a. Division 00410 - Bid Form

Remove and Replace in its entirety Division 00410 – Addendum 3 Attached.

Bid form revisions include:

- Base Bid Item No. 18 Revise quantity to 16.
- Base Bid add Item 19 Installation of cured-in-place lateral liner for sewer laterals from 4-6 inches in diameter. (Includes 4 Ea. to be installed on sewer laterals associated with the Route 4 Relief Sewer Line Rehabilitation and Replacement at approximately Sta. 2+20, 4+04, 5+99, and 7+06).

- Base Bid add Item 20 Chemical Grouting for each installation up to 1 gallon, including all cleaning, CCTV, sewer bypass, and all other items as necessary to complete the work.
- Base Bid add item 21 Chemical Grouting for all installations over 1 gallon, including all cleaning, CCTV, sewer bypass, and all other items as necessary to complete the work.
- Base Bid renumber Items 19 through 29 to 22 through 32.
- Additive Bid No. 4 Item 6 revise quantity to 410.
- b. Specification 33 01 30.72

Remove and Replace in its entirety Specification 33 01 30.72 – WATER AND STEAM CURED IN PLACE PIPE LINING as attached to this Addendum.

c. Specification 33 01 30.73

Remove and Replace in its entirety Specification 33 01 30.73 – ULTRAVIOLET (UV) CURED IN PLACE PIPE LINING as attached to this Addendum.

d. Specification 33 01 30.76

Add Specification 33 01 30.76 – CURED-IN-PLACE (CIPP) LATERAL SEALS.

e. Specification 33 01 30.77

Add Specification 33 01 30.77 – CHEMICAL GROUTING.

f. Specification 33 37 23

Remove and Replace in its entirety Specification 33 37 23 – SEWER FLOW CONTROL as attached to this Addendum.

4. Part D – Reference Documents

- a. The following documentation is provided for reference information:
 - 1) Record Drawings Sheets C-113, C-114 & C-115 from the Route 4 Sewer Line Relief Rehabilitations and Replacement Project.

Bidders are also notified to visit GWA website: www.guamwaterworks.org to ensure that addenda to the bid, answers to questions, and reminders are communicated to all bidders throughout the solicitation process.

MIGUEL C. BORDALLO, P.E. General Manager

Attachment(s):

MCB;gb

Part C

Modifications to Contract Bid Documents

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ARTICLE 1 - BID RECIPIENT

1.01 This Bid is submitted to:

<u>Guam Waterworks Authority</u> <u>Gloria B. Nelson Public Service Building</u> <u>688 Route 15, Mangilao, Guam 96913</u>

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into a Contract with Buyer in the form included in the Bidding Documents to furnish the Goods and Special Services as specified or indicated in the Bidding Documents, for the prices and within the times indicated in this Bid, and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2 - BIDDER'S ACKNOWLEDGMENTS

2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 60 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Buyer.

ARTICLE 3 - BIDDER'S REPRESENTATIONS

- 3.01 In submitting this Bid, Bidder represents that:
 - A. Bidder has examined and carefully studied the Bidding Documents, the related data identified in the Bidding Documents, and the following Addenda, receipt of which is hereby acknowledged:

Addendum No.	Addendum Date

- B. Bidder has visited the Point of Destination and site where the Goods are to be installed or Special Services will be provided and become familiar with and is satisfied as to the <u>observable</u> local conditions that may affect cost, progress, or the furnishing of Goods and Special Services, if required to do so by the Bidding Documents, or if, in Bidder's judgment, any local condition may affect cost, progress, or the furnishing of Goods and Special Services.
- C. Bidder is familiar with and is satisfied as to all Laws and Regulations in effect as of the date of the Bid that may affect cost, progress, and the furnishing of Goods and Special Services.

- D. Bidder has carefully studied, considered, and correlated the information known to Bidder; information commonly known to sellers of similar goods doing business in the locality of the Point of Destination and the site where the Goods will be installed or where Special Services will be provided; information and observations obtained from Bidder's visits, if any, to the Point of Destination and the site where the Goods will be installed or Special Services will be provided; and any reports and drawings identified in the Bidding Documents regarding the Point of Destination and the site where the Goods will be installed or where Special Services will be provided; and any reports and drawings identified in the Bidding Documents regarding the Point of Destination and the site where the Goods will be installed or where Special Services will be provided, with respect to the effect of such information, observations, and documents on the cost, progress, and performance of Seller's obligations under the Bidding Documents.
- E. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution (if any) thereof by Engineer is acceptable to Bidder.
- F. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for furnishing the Goods and Special Services for which this Bid is submitted.

ARTICLE 4 - BIDDER'S CERTIFICATIONS

- 4.01 Bidder certifies that:
 - A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;
 - B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;
 - C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and
 - D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:
 - 1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process;
 - 2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Buyer, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Buyer of the benefits of free and open competition;
 - 3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Buyer, a purpose of which is to establish bid prices at artificial, non-competitive levels; and
 - 4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process.

ARTICLE 5 - BASIS OF BID

5.01 Bidder will furnish the Goods and Special Services in accordance with the Contract Documents for the following price(s):

ASAN-ADELUP-HAGATNA, ROUTE 1 SEWER REHABILIATION AND REPLACEMENT – PHASE II GWA Project No. S15-002-EPA

UNIT PRICE BID FORM

Base Bid Description: Line B Work (SMH 13Asan to SMH 350AHaga and SMH 350BHaga to SMH339Haga)

Work consists of cleaning and rehabilitating existing 16-inch, 24-inch and 27-inch diameter gravity sewer lines with cured-in-place pipe (CIPP) liner, reinstating sewer laterals after CIPP rehabilitation is complete, replacing sewer manhole concrete collars, and providing temporary bypassing and traffic control as necessary to complete the rehabilitation work.

ltem No.	Description	Unit	Unit Price	Qty	Bid Amount
1	Mobilization and Demobilization	Lump Sum	\$	1	\$
2	Light Sewer Line Cleaning of existing 16-inch Asbestos Cement Pipe (ACP) and 16-inch Polyvinyl Chloride (PVC) pipe sewer lines, including removal and disposal of debris, and other items as necessary to complete the inspection and rehabilitation work.	Lin. Ft.	\$	2,648	\$
3	Light Sewer Line Cleaning of existing 24-inch Asbestos Cement Pipe (ACP) sewer lines, including removal and disposal of debris, and other items as necessary to complete the inspection and rehabilitation work.	Lin. Ft.	\$	3,628	\$
4	Light Sewer Line Cleaning of existing 27-inch Asbestos Cement Pipe (ACP) sewer lines, including removal and disposal of debris, and other items as necessary to complete the inspection and rehabilitation work.	Lin. Ft.	\$	3,706	\$

5	Heavy Sewer Line Cleaning of existing 16-inch Asbestos Cement Pipe (ACP) and 16-inch Polyvinyl Chloride (PVC) pipe sewer lines, including removal and disposal of debris, and other items as necessary to complete the inspection and rehabilitation work.	Lin. Ft.	\$ 559	\$
6	Heavy Sewer Line Cleaning of existing 24-inch Asbestos Cement Pipe (ACP) sewer lines, including removal and disposal of debris, and other items as necessary to complete the inspection and rehabilitation work.	Lin. Ft.	\$ 127	\$
7	Heavy Sewer Line Cleaning of existing 27-inch Asbestos Cement Pipe (ACP) sewer lines, including removal and disposal of debris, and other items as necessary to complete the inspection and rehabilitation work.	Lin. Ft.	\$ 249	\$
8	Specialty Cleaning of all pipe size sewer lines, including removal and disposal of debris, and other items as necessary to complete the inspection and rehabilitation work.	Hour	\$ 40	\$
9	Closed-Circuit Television (CCTV) inspections for initial assessment of existing 16" sewer line and sewer manholes, including reports, documentation, and other items as necessary to complete the work.	Lin. Ft.	\$ 646	\$
10	Closed-Circuit Television (CCTV) inspections for initial assessment of existing 24" sewer line and sewer manholes, including reports, documentation, and other items as necessary to complete the work.	Lin. Ft.	\$ 1,814	\$
11	Closed-Circuit Television (CCTV) inspections for initial assessment of existing 27" sewer line and sewer manholes, including reports, documentation, and other items as necessary to complete the work.	Lin. Ft.	\$ 1,853	\$

12	Closed-Circuit Television (CCTV) inspections for pre- and post- rehabilitation of existing 16" sewer line and sewer manholes, including reports, documentation, and other items as necessary to complete the work.	Lin. Ft.	\$ 1,292	\$
13	Closed-Circuit Television (CCTV) inspections for pre- and post- rehabilitation of existing 24" sewer line and sewer manholes, including reports, documentation, and other items as necessary to complete the work.	Lin. Ft.	\$ 3,628	\$
14	Closed-Circuit Television (CCTV) inspections for pre- and post- rehabilitation of existing 27" sewer line and sewer manholes, including reports, documentation, and other items as necessary to complete the work.	Lin. Ft.	\$ 3,706	\$
15	Installation of cured-in-place pipe (CIPP) lining in existing 16-inch sewer line, including wet out, preparation, testing of installed liner, sealing at manholes, reconstructing manhole transition sections and benches, and other items as necessary to complete the work.	Lin. Ft.	\$ 646	\$
16	Installation of cured-in-place pipe (CIPP) lining in existing 24-inch sewer line, including wet out, preparation, testing of installed liner, sealing at manholes, reconstructing manhole transition sections and benches, and other items as necessary to complete the work.	Lin. Ft.	\$ 1,814	\$

17	Installation of cured-in-place pipe (CIPP) lining in existing 27-inch sewer line, including wet out, preparation, testing of installed liner, sealing at manholes, reconstructing manhole transition sections and benches, and other items as necessary to complete the work.	Lin. Ft.	\$ 1,853	\$
18	Reinstatement of existing sewer laterals upon completion of CIPP lining installation, and all incidentals, in place complete.	Ea.	\$ 16	\$
19	Installation of cured-in-place lateral liner for sewer laterals from 4-6 inches in diameter. (Includes 4 Ea. to be installed on sewer laterals associated with the Route 4 Relief Sewer Line Rehabilitation and Replacement at approximately Sta. 2+20, 4+04, 5+99, and 7+06)	Ea.	\$ 4	\$
20	Chemical Grouting for each installation up to 1 gallon, including all cleaning, CCTV, sewer bypass, and all other items as necessary to complete the work.	Ea.	\$ 5	\$
21	Chemical Grouting for all installations over 1 gallon, including all cleaning, CCTV, sewer bypass, and all other items as necessary to complete the work.	Gal.	\$ 250	\$
22	Sewer manhole concrete collar, including reinforcing steel, borrow material, where required, and all other items as necessary to complete the work.	Ea.	\$ 3	\$

23	Sewer Flow Control for Sewer Rehabilitation, including diversion and bypass pumping plan, temporary bypass piping and pumps, pipe plugs, bypassing at sewer laterals (including locating and exposing cleanouts), temporary trenches (including pavement demolition, excavation, backfill, trench covers, temporary and permanent AC pavement and concrete pavement), electrical and standby power/pumps, monitoring, spill containment/mitigation, additional traffic control, all related restoration work, in place complete.	Lump Sum	\$ 1	\$
24	Traffic Control Work, including obtaining approvals, redesign/modification of traffic control plans for the contractor's convenience, traffic control work, all traffic control devices, placement and removal of devices and detours, cleanup, restoration, and incidentals.	Lump Sum	\$ 1	\$
25	Point Repair for 16-inch diameter PVC sewer pipe, including pavement demolition, shoring, or bracing, underpinning, positive groundwater control, protection and support of structures and utilities, removal of trench support, select fill, flowable fill, traffic covers, and all incidentals required to complete the work. (4 LF pipe section or less, per line segment)	Ea.	\$ 2	\$
26	Extra Length Point Repair for 16- inch diameter PVC sewer pipe, all depths; in excess of 4 LF (Typ.)	Lin. Ft.	\$ 40	\$

27	Point Repair for 24-inch diameter PVC sewer pipe, including pavement demolition, shoring, or bracing, underpinning, positive groundwater control, protection and support of structures and utilities, removal of trench support, select fill, flowable fill, traffic covers, and all incidentals required to complete the work. (4 LF pipe section or less, per line segment)	Ea.	\$ 1	\$
28	Extra Length Point Repair for 24- inch diameter PVC sewer pipe, all depths; in excess of 4 LF (Typ.)	Lin. Ft.	\$ 20	\$
29	Point Repair for 27-inch diameter PVC sewer pipe, including pavement demolition, shoring, or bracing, underpinning, positive groundwater control, protection and support of structures and utilities, removal of trench support, select fill, flowable fill, traffic covers, and all incidentals required to complete the work. (4 LF pipe section or less, per line segment)	Ea.	\$ 1	\$
30	Extra Length Point Repair for 27- inch diameter PVC sewer pipe, all depths; in excess of 4 LF (Typ.)	Lin. Ft.	\$ 20	\$

31	Sewer Flow Control for Point Repairs of 16-inch, 18-inch, 24- inch, and 27-inch for every 4 LF of point repair, including diversion and bypass pumping plan, temporary bypass piping and pumps, pipe plugs, bypassing at sewer laterals (including locating and exposing cleanouts), temporary trenches (including pavement demolition, excavation, backfill, trench covers, temporary and permanent AC pavement and concrete pavement), electrical and standby power/pumps, monitoring, spill containment/mitigation, additional traffic control, all related restoration work, in place complete.	Ea.	\$	4	\$
32	Traffic Control Work for each Point Repair, including traffic control work, all traffic control devices, placement and removal of devices and detours, cleanup, restoration, and incidentals.	Ea.	\$	4	\$
	BASE BID (TOTAL Items 1	through	32, inclusive)		\$
(Please write out total bid amount in words below)					
\$					

ASAN-ADELUP-HAGATNA, ROUTE 1 SEWER REHABILIATION AND REPLACEMENT – PHASE II GWA Project No. S15-002-EPA

UNIT PRICE BID FORM

Additive Bid #1 Description: Line B Work (SMH 339Haga to SMH 335Haga)

Work consists of cleaning and rehabilitating existing 27-inch diameter gravity sewer lines with cured-in-place pipe (CIPP) liner, reinstating sewer laterals after CIPP rehabilitation is complete, replacing sewer manhole frame and covers, sewer manhole concrete collars, and providing temporary bypassing and traffic control as necessary to complete the rehabilitation work.

ltem No.	Description	Unit	Unit Price	Qty	Bid Amount
1	Mobilization (For costs associated with bonding, insurance and permits)	Lump Sum	\$	1	\$
2	Light Sewer Line Cleaning of existing 27-inch Asbestos Cement Pipe (ACP) sewer lines, including removal and disposal of debris, and other items as necessary to complete the inspection and rehabilitation work.	Lin. Ft.	\$	2,118	\$
3	Specialty Cleaning of all pipe size sewer lines, including removal and disposal of debris, and other items as necessary to complete the inspection and rehabilitation work.	Hour	\$	40	\$

ltem No.	Description	Unit	Unit Price	Qty	Bid Amount
4	Closed-Circuit Television (CCTV) inspections for initial assessment of existing 27" sewer line and sewer manholes, including reports, documentation, and other items as necessary to complete the work.	Lin. Ft.	\$	1,059	\$
5	Closed-Circuit Television (CCTV) inspections for pre- and post-rehabilitation of existing 27" sewer line and sewer manholes, including reports, documentation, and other items as necessary to complete the work.	Lin. Ft.	\$	2,118	\$
6	Installation of cured-in-place pipe (CIPP) lining in existing 27-inch sewer line, including wet out, preparation, testing of installed liner, sealing at manholes, reconstructing manhole transition sections and benches, and other items as necessary to complete the work.	Lin. Ft.	\$	1,059	\$
7	Reinstatement of existing sewer laterals upon completion of CIPP lining installation, and all incidentals, in place complete.	Ea.	\$	8	\$
8	Cast iron manhole frame and cover, 25-inch diameter, including grade adjustment rings where required, and other items as necessary to complete the work.	Ea.	\$	1	\$
9	Sewer manhole concrete collar, including reinforcing steel, borrow material, where required, and all other items as necessary to complete the work.	Ea.	\$	1	\$

ltem No.	Description	Unit	Unit Price	Qty	Bid Amount	
10	Sewer Flow Control for Sewer Rehabilitation, including diversion and bypass pumping plan, temporary bypass piping and pumps, pipe plugs, bypassing at sewer laterals (including locating and exposing cleanouts), temporary trenches (including pavement demolition, excavation, backfill, trench covers, temporary and permanent AC pavement and concrete pavement), electrical and standby power/pumps, monitoring, spill containment/mitigation, additional traffic control, all related restoration work, in place complete.	Lump Sum	\$	1	\$	
11	Traffic Control Work, including obtaining approvals, redesign/modification of traffic control plans for the contractor's convenience, traffic control work, all traffic control devices, placement and removal of devices and detours, cleanup, restoration, and incidentals.	Lump Sum	\$	1	\$	
	ADDITIVE BID #1 (TOTAL I	tems 1 th	rough 11, inclusive)		\$	
(Please write out total bid amount in words below)						
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ASAN-ADELUP-HAGATNA, ROUTE 1 SEWER REHABILIATION AND REPLACEMENT – PHASE II GWA Project No. S15-002-EPA

UNIT PRICE BID FORM

Additive Bid #2 Description: Line B Work (SMH 335Haga to SMH 327Haga)

Work consists of cleaning and rehabilitating existing 27-inch diameter gravity sewer lines with cured-in-place pipe (CIPP) liner, replacing sewer manhole concrete collars, and providing temporary bypassing and traffic control as necessary to complete the rehabilitation work.

ltem No.	Description	Unit	Unit Price	Qty	Bid Amount
1	Mobilization (For costs associated with bonding, insurance and permits)	Lump Sum	\$	1	\$
2	Light Sewer Line Cleaning of existing 27-inch Asbestos Cement Pipe (ACP) sewer lines, including removal and disposal of debris, and other items as necessary to complete the inspection and rehabilitation work.	Lin. Ft.	\$	2,192	\$
3	Specialty Cleaning of all pipe size sewer lines, including removal and disposal of debris, and other items as necessary to complete the inspection and rehabilitation work.	Hour	\$	40	\$
4	Closed-Circuit Television (CCTV) inspections for initial assessment of existing 27" sewer line and sewer manholes, including reports, documentation, and other items as necessary to complete the work.	Lin. Ft.	\$	1,096	\$

ltem No.	Description	Unit	Unit Price	Qty	Bid Amount
5	Closed-Circuit Television (CCTV) inspections for pre- and post-rehabilitation of existing 27" sewer line and sewer manholes, including reports, documentation, and other items as necessary to complete the work.	Lin. Ft.	\$	2,192	\$
6	Installation of cured-in-place pipe (CIPP) lining in existing 27-inch sewer line, including wet out, preparation, testing of installed liner, sealing at manholes, reconstructing manhole transition sections and benches, and other items as necessary to complete the work.	Lin. Ft.	\$	1,096	\$
7	Sewer manhole concrete collar, including reinforcing steel, borrow material, where required, and all other items as necessary to complete the work.	Ea.	\$	1	\$
8	Sewer Flow Control for Sewer Rehabilitation, including diversion and bypass pumping plan, temporary bypass piping and pumps, pipe plugs, bypassing at sewer laterals (including locating and exposing cleanouts), temporary trenches (including pavement demolition, excavation, backfill, trench covers, temporary and permanent AC pavement and concrete pavement), electrical and standby power/pumps, monitoring, spill containment/mitigation, additional traffic control, all related restoration work, in place complete.	Lump Sum	\$	1	\$

ltem No.	Description	Unit	Unit Price	Qty	Bid Amount			
9	Traffic Control Work, including obtaining approvals, redesign/modification of traffic control plans for the contractor's convenience, traffic control work, all traffic control devices, placement and removal of devices and detours, cleanup, restoration, and incidentals.	Lump Sum	\$	1	\$			
	ADDITIVE BID #2 (TOTAL I	<u>tems 1 th</u>	rrough 9, inclusive)		\$			
(Please write out total bid amount in words below)								
\$								

ASAN-ADELUP-HAGATNA, ROUTE 1 SEWER REHABILIATION AND REPLACEMENT – PHASE II GWA Project No. S15-002-EPA

UNIT PRICE BID FORM

Additive Bid #3 Description: Line B Work (SMH 327Haga to SMH 323Haga)

Work consists of rehabilitating existing 27-inch diameter gravity sewer lines with cured-in-place pipe (CIPP) liner, replacing sewer manhole concrete collars, and providing temporary bypassing and traffic control as necessary to complete the rehabilitation work.

ltem No.	Description	Unit	Unit Price	Qty	Bid Amount
1	Mobilization (For costs associated with bonding, insurance and permits)	Lump Sum	\$	1	\$
2	Light Sewer Line Cleaning of existing 27-inch Asbestos Cement Pipe (ACP) sewer lines, including removal and disposal of debris, and other items as necessary to complete the inspection and rehabilitation work.	Lin. Ft.	\$	2,184	\$
3	Specialty Cleaning of all pipe size sewer lines, including removal and disposal of debris, and other items as necessary to complete the inspection and rehabilitation work.	Hour	\$	40	\$

ltem No.	Description	Unit	Unit Price	Qty	Bid Amount
4	Closed-Circuit Television (CCTV) inspections for initial assessment of existing 27" sewer line and sewer manholes, including reports, documentation, and other items as necessary to complete the work.	Lin. Ft.	\$	1,092	\$
5	Closed-Circuit Television (CCTV) inspections for pre- and post-rehabilitation of existing 27" sewer line and sewer manholes, including reports, documentation, and other items as necessary to complete the work.	Lin. Ft.	\$	2,184	\$
6	Installation of cured-in-place pipe (CIPP) lining in existing 27-inch sewer line, including wet out, preparation, testing of installed liner, sealing at manholes, reconstructing manhole transition sections and benches, and other items as necessary to complete the work.	Lin. Ft.	\$	1,092	\$
7	Sewer manhole concrete collar, including reinforcing steel, borrow material, where required, and all other items as necessary to complete the work.	Ea.	\$	3	\$
8	Sewer Flow Control for Sewer Rehabilitation, including diversion and bypass pumping plan, temporary bypass piping and pumps, pipe plugs, bypassing at sewer laterals (including locating and exposing cleanouts), temporary trenches (including pavement demolition, excavation, backfill, trench	Lump Sum	\$	1	\$

ltem No.	Description	Unit	Unit Price	Qty	Bid Amount		
	covers, temporary and permanent AC pavement and concrete pavement), electrical and standby power/pumps, monitoring, spill containment/mitigation, additional traffic control, all related restoration work, in place complete.						
9	Traffic Control Work, including obtaining approvals, redesign/modification of traffic control plans for the contractor's convenience, traffic control work, all traffic control devices, placement and removal of devices and detours, cleanup, restoration, and incidentals.	Lump Sum	\$	1	\$		
	ADDITIVE BID #3 (TOTAL I	tems 1 th	rough 9, inclusive)		\$		
(Please write out total bid amount in words below)							
\$							

ASAN-ADELUP-HAGATNA, ROUTE 1 SEWER REHABILIATION AND REPLACEMENT – PHASE II GWA Project No. S15-002-EPA

UNIT PRICE BID FORM

Additive Bid #4 Description: "Line B Work (SMH 323Haga to Hagatna Pump Station Wetwell)

Work consists of rehabilitating existing 27-inch diameter gravity sewer lines with cured-in-place pipe (CIPP) liner, replacing sewer manhole concrete collars, and providing temporary bypassing and traffic control as necessary to complete the rehabilitation work.

ltem No.	Description	Unit	Unit Price	Qty	Bid Amount
1	Mobilization (For costs associated with bonding, insurance and permits)	Lump Sum	\$	1	\$
2	Light Sewer Line Cleaning of existing 27-inch Asbestos Cement Pipe (ACP) sewer lines, including removal and disposal of debris, and other items as necessary to complete the inspection and rehabilitation work.	Lin. Ft.	\$	820	\$
3	Specialty Cleaning of all pipe size sewer lines, including removal and disposal of debris, and other items as necessary to complete the inspection and rehabilitation work.	Hour	\$	40	\$

ltem No.	Description	Unit	Unit Price	Qty	Bid Amount
4	Closed-Circuit Television (CCTV) inspections for initial assessment of existing 27" sewer line and sewer manholes, including reports, documentation, and other items as necessary to complete the work.	Lin. Ft.	\$	410	\$
5	Closed-Circuit Television (CCTV) inspections for pre- and post-rehabilitation of existing 27" sewer line and sewer manholes, including reports, documentation, and other items as necessary to complete the work.	Lin. Ft.	\$	820	\$
6	Installation of cured-in-place pipe (CIPP) lining in existing 27-inch sewer line, including wet out, preparation, testing of installed liner, sealing at manholes, reconstructing manhole transition sections and benches, and other items as necessary to complete the work.	Lin. Ft.	\$	410	\$
7	Cast iron manhole frame and cover, 30-inch diameter, including replacement of manhole cone section, grade adjustment rings where required, replacement of concrete sidewalk, curb and other items as necessary to complete the work.	Ea.	\$	1	\$

ltem No.	Description	Unit	Unit Price	Qty	Bid Amount		
8	Sewer Flow Control for Sewer Rehabilitation, including diversion and bypass pumping plan, temporary bypass piping and pumps, pipe plugs, bypassing at sewer laterals (including locating and exposing cleanouts), temporary trenches (including pavement demolition, excavation, backfill, trench covers, temporary and permanent AC pavement and concrete pavement), electrical and standby power/pumps, monitoring, spill containment/mitigation, additional traffic control, all related restoration work, in place complete.	Lump Sum	\$	1	\$		
9	Traffic Control Work, including obtaining approvals, redesign/modification of traffic control plans for the contractor's convenience, traffic control work, all traffic control devices, placement and removal of devices and detours, cleanup, restoration, and incidentals.	Lump Sum	\$	1	\$		
	ADDITIVE BID #4 (TOTAL I	tems 1 th	rough 9, inclusive)		\$		
(Please write out total bid amount in words below)							
\$							

ASAN-ADELUP-HAGATNA, ROUTE 1 SEWER REHABILIATION AND REPLACEMENT – PHASE II GWA Project No. S15-002-EPA

UNIT PRICE BID FORM

Additive Bid #5 Description: Line C Work (SMH 398Asan to 355AAsan)

Work consists of abandoning an existing 12-inch ACP sewer line, installing a new 12-inch diameter polyvinyl chloride (PVC) sewer line, and providing temporary bypassing and traffic control as necessary to complete the work.

ltem No.	Description	Unit	Unit Price	Qty	Bid Amount
1	Mobilization (For costs associated with bonding, insurance and permits)	Lump Sum	\$	1	\$
2	Abandonment of 12-inch diameter ACP pipe, and all incidentals required to complete the work.	Lin. Ft.	\$	123	\$
3	New Pipe install new 12" PVC pipe (AWWA C-900, DR 25) by open trenching, including pavement demolition, unclassified trench excavation, shoring, underpinning, crushed rock bedding material, piping, fittings, select fill, compaction, testing, warning/identification tape, and all incidentals, in place complete. (10'-20' Depth)	Lin. Ft.	\$	80	\$
4	A.C. Pavement Resurfacing, including pavement transitions, prime coat, tack coat, traffic striping, miscellaneous restoration, and all necessary labor, materials and equipment, in place complete.	Sq. Yds.	\$	74	\$

ltem No.	Description	Unit	Unit Price	Qty	Bid Amount
5	Milling Asphalt Friction Course, including all necessary labor, materials and equipment, in place complete.	Sq. Yds.	\$	109	\$
6	Asphalt Friction Course, including pavement transitions and all necessary labor, materials and equipment, in place complete.	Sq. Yds.	\$	183	\$
7	Sewer manhole concrete collar, including reinforcing steel, borrow material where required, and other items as necessary to complete the work.	Ea.	\$	1	\$
8	Install new Plain Precast Concrete Manhole, including plugging or bypass pumping, excavation and backfill, crushed rock base, reinforced concrete base, precast concrete riser(s) and cone, flexible pipe seals and connectors, grade adjustment ring(s), Type "SA" frame and cover, channelized invert, testing, incidentals, and all necessary labor, materials, and equipment, in place complete.	Ea.	\$	1	\$
9	Sewer Flow Control for Sewer Rehabilitation, including diversion and bypass pumping plan, temporary bypass piping and pumps, pipe plugs, bypassing at sewer laterals (including locating and exposing cleanouts), temporary trenches (including pavement demolition, excavation, backfill, trench covers, temporary and permanent AC pavement and concrete pavement), electrical	Lump Sum	\$	1	\$

ltem No.	Description	Unit	Unit Price	Qty	Bid Amount
	and standby power/pumps, monitoring, spill containment/mitigation, additional traffic control, all related restoration work, in place complete.				
10	Traffic Control Work, including obtaining approvals, redesign/modification of traffic control plans for the contractor's convenience, traffic control work, all traffic control devices, placement and removal of devices and detours, cleanup, restoration, and incidentals.	Lump Sum	\$	1	\$
	ADDITIVE BID #5 (TOTAL Items 1 through 10, inclusive)				\$
(Please write out total bid amount in words below)					
\$					

ASAN-ADELUP-HAGATNA, ROUTE 1 SEWER REHABILIATION AND REPLACEMENT – PHASE II GWA Project No. S15-002-EPA

UNIT PRICE BID FORM

Additive Bid #6 Description: Line B Work (SMH 350AHAGA to SMH 350BHAGA)

Work consists of rehabilitating one siphon consisting of two (2) - 18-inch barrels and providing temporary bypassing and traffic control as necessary to complete the rehabilitation work.

ltem No.	Description	Unit	Unit Price	Qty	Bid Amount
1	Mobilization (For costs associated with bonding, insurance and permits)	Lump Sum	\$	1	\$
2	Sewer Line Cleaning of Inverted Siphon (2 - 18" Cast Iron Barrels, approximately 124 linear feet each, 22.5 degree bends), including removal and disposal of debris, and all incidentals necessary to complete work.	Lump Sum	\$	1	\$
3	Closed-Circuit Television (CCTV) inspections for pre- and post rehabilitation of existing inverted siphon (2 - 18" Cast Iron Barrels, approximately 124 linear feet each, 22.5 degree bends) and sewer manholes, including reports, documentation, and other items as necessary to complete the work.	Lin. Ft.	\$	248	\$
4	Installation of cured-in-place pipe (CIPP) lining in existing 18-inch sewer line, including wet out, preparation, testing of installed liner, sealing at manholes, reconstructing manhole transition sections and benches, and other items as necessary to complete the work.	Lin. Ft.	\$	248	\$

ltem No.	Description	Unit	Unit Price	Qty	Bid Amount
5	Sewer Flow Control for siphon inspection and cleaning, including diversion and bypass pumping plan, temporary bypass piping and pumps, pipe plugs, bypassing at sewer laterals (including locating and exposing cleanouts), temporary trenches (including pavement demolition, excavation, backfill, trench covers, temporary and permanent AC pavement and concrete pavement), electrical and standby power/pumps, monitoring, spill containment/mitigation, additional traffic control, all related restoration work, in place complete.	Lump Sum	\$	1	\$
6	Traffic Control Work, including obtaining approvals, redesign/modification of traffic control plans for the contractor's convenience, traffic control work, all traffic control devices, placement and removal of devices and detours, cleanup, restoration, and incidentals.	Lump Sum	\$	1	\$
	ADDITIVE BID #6 (TOTAL I	tems 1 th	rough 6, inclusive)		\$
(Please write out total bid amount in words below)					
\$					

SUMMARY OF BIDS		
BASE BID (TOTAL Items 1 through 29, inclusive)	\$	
ADDITIVE BID #1 (TOTAL Items 1 through 11, inclusive)	\$	
ADDITIVE BID #2 (TOTAL Items 1 through 9, inclusive)	\$	
ADDITIVE BID #3 (TOTAL Items 1 through 9, inclusive)	\$	
ADDITIVE BID #4 (TOTAL Items 1 through 9, inclusive)	\$	
ADDITIVE BID #5 (TOTAL Items 1 through 10, inclusive)	\$	
ADDITIVE BID #6 (TOTAL Items 1 through 6, inclusive)	\$	
<u>GRAND TOTAL BASE BID + ADDITIVE BID #1 TO ADDITIVE</u> <u>BID #6</u>	\$	
(Please write out grand total bid amount in words below)		
۶		

Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all unit price Bid items will be based on actual quantities, determined as provided in the Contract Documents. Bidder also acknowledges that each unit price includes an amount considered by Bidder to be adequate to cover Bidder's overhead and profit for each separately identified item.

ARTICLE 6 - TIME OF COMPLETION

- 6.01 Bidder agrees that the furnishing of Goods and Special Services will conform to the schedule set forth in Article 5 of the Agreement.
- 6.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 7 - ATTACHMENTS TO THIS BID

- 7.01 The following documents are attached to and made a condition of this Bid:
 - A. Required Bid security in the form of ______.
 - B. List of Proposed Major Suppliers;
 - C. Required Bidder Qualification Statement with Supporting Data; and

ARTICLE 8 - DEFINED TERMS

8.01 The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 9 - BID SUBMITTAL

9.01 This Bid submitted by:

If Bidder is:

An Individual

Name (typed or printed): _____

By: _____

(Individual's signature)

Doing business as: _____

Business address: _____

Phone:	Facsimile:	

E-mail address: ______

Section 00410 Bid Form – Addendum 3

A Partnership

Partnership Name:	_ (SEAL)
Bv:	
(Signature of general partner - attach evidence of authority to sign)	
Name (typed or printed):	
Business address:	_
Phone: Facsimile:	
E-mail address:	
<u>A Corporation</u>	
Corporation Name:	
State of Incorporation:	
Type (General Business, Professional, Service, other):	
Bv:	
, (Signature - attach evidence of authority to sign)	
Name (typed or printed):	
Title:	
(CORPORATE SEAL)	
Attest	_
(signature of corporate secretary)	
Business address:	_
Phone:Facsimile:	
E-mail address:	
A Limited Liability Company (LLC)	
LLC Name:	
State in which organized:	
Bv:	
(Signature - attach evidence of authority to sign)	
Name (typed or printed):	
Title:	
Business address:	_
Phone:Facsimile:	
E-mail address:	

First Joint Venturer Name:	(SEAL)
Ву:	
(Signature - attach evidence of a	authority to sign)
Name (typed or printed):	
Title:	
Business address:	
Phone:	Facsimile:
E-mail address:	
Second Joint Venturer Name:	(SEAL)
Ву:	
(Signature - attach evidence of a	authority to sign)
Name (typed or printed):	
Title:	
Business address:	
Phone:	Facsimile:
E-mail address:	
Phone and Facsimile Number, and Address	for receipt of official communications to Joint Ventur

(Each joint venturer must sign. The manner of signing for each individual, partnership, corporation, and limited liability company that is a party to the joint venture should be in the manner indicated above.)
SECTION 33 01 30.72

WATER OR STEAM CURED-IN-PLACE PIPE LINING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. The rehabilitation of existing sewer line by the installation of water or steam cured-in-place pipe (CIPP).
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. GWA Bid Submission Requirements
 - 2. GWA Standard General Conditions of the Construction Contract
 - 3. GWA Supplementary Conditions
 - 4. Division 01 General Requirements.
 - 5. Section 33 01 30.11 Television Inspection of Sewers.
 - 6. Section 33 01 30.41 Cleaning of Sewers.
 - 7. Section 33 01 30.76 Cured-In-Place (CIPP) Lateral Seals.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. American Society for Testing and Materials (ASTM):
 - a. ASTM C109, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. Cube Specimens).
 - b. ASTM C293, Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Center-Point Loading).
 - c. ASTM C307, Standard Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic SurfJustacings.
 - d. ASTM C496, Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens.
 - e. ASTM C580, Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
 - f. ASTM C881, Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
 - g. ASTM C882, Standard Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete by Slant Shear.
 - h. ASTM D2990, Standard Test Methods for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics.
 - i. ASTM D5813, Standard Specification for Cured-In-Place Thermosetting Resin Sewer Piping Systems.
 - j. ASTM F1216, Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin Impregnated Tube.
 - k. ASTM F1417-11a, Standard Practice for Installation Acceptance of Plastic Nonpressure Sewer Lines Using Low-Pressure Air.
 - 1. ASTM F1743, Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting resin Pipe (CIPP)
 - National Association of Sewer Service Companies (NASSCO):
 a. NASSCO standards, latest edition and revision thereof.

1.3 SYSTEM DESCRIPTION

A. The CIPP shall be formed by inserting a resin-impregnated flexible felt tube into an existing sewer line, expanding the tube to fit against the existing sewer line walls, and then curing the resin as required using heated water. The finished product within the lined pipe section shall be a continuous, jointless, structural pipe that is formed to the existing sewer line and, unless

otherwise indicated, shall provide a minimum of 100% of the existing sewer line's original structural and hydraulic design capacities.

1.4 CLOSED-CIRCUIT TELEVISION INSPECTIONS OF PIPE

- A. The Contractor is advised that closed-circuit television (CCTV) inspections were performed on the sewer segments to be rehabilitated from May 2015 to June 2015 and from February 2016 to May 2016. Additional limited amounts of CCTV inspections were performed in 2018 on line segments from SMH 329Haga to the Hagatna Pump Station. Viewing of the video recordings is mandatory.
- B. Some of the sewer lines have incomplete CCTV inspections because the camera was not able to traverse the entire pipe segment from manhole to manhole. As shown on the Contract drawings, for those sewer lines that has incomplete CCTV inspections, the resulting rehabilitation or replacement for the sewer pipe will be determined after the Contractor's initial CCTV work is completed.
- C. Conditions in the sewer are likely to have changed since the date when CCTV information was collected and conditions as depicted therein is not guaranteed to be current.
- D. Bidders shall provide a portable hard drive for the downloading of the files. Obtaining a copy of the video recording files shall be coordinated with Ms. Gloria Bensan of the Guam Waterworks Authority (GWA) at telephone number (671) 300-6042. The portable hard drive shall be dropped off at GWA's office, located at:

Gloria B. Nelson Public Service Building 688 Rt. 15 Mangilao, Guam 96913

A transmittal letter and label on the hard drive indicating the Bidder's name and phone number shall be included. The portable hard drive shall have a minimum capacity of 500 GB. The Bidder shall allow for a minimum of five days for copying of the files.

1.5 SUBMITTALS

- A. Contractor Qualification:
 - 1. The Contractor shall submit documentation that the Contractor is qualified to properly install the proposed product. The following minimum experience requirements shall be met and provided on the documentation:
 - a. CIPP Contractor workforce is to have at least one (1) qualified CIPP work supervisor, one (1) CIPP work crew member, and one (1) lateral reinstatement remote cutter operator. Qualified work crew members must directly provide the specific work for which they have been qualified until such work has been completed and accepted by the Owner.
 - b. Successfully completed projects completed by the Contractor shall have involved the successful installation of a cumulative total of 100,000 linear feet and/or 300 line segments of CIPP liner into sewer main host pipes of 18-inch or larger diameter.
- B. Contractor Personnel Qualifications:
 - 1. The Contractor shall submit documentation that the Contractor's personnel are qualified to properly install the proposed product. The following minimum experience requirements shall be met and provided on the documentation:
 - a. All phases of the CIPP work shall be performed under the direct supervision of an experienced supervisor who has field experience on at least three (3) successfully completed projects performed in the United States or its Territories and in which the supervisor had direct supervision over CIPP lining installation work.
 - b. Successfully completed projects completed by the CIPP supervisor shall have involved the successful installation of a cumulative total of 30,000 linear feet and/or 100 line segments of CIPP liner into sewer main host pipes of 18-inch or larger diameter.

- c. Besides the CIPP work supervisor, at least one other CIPP work crew member shall have direct experience installing CIPP liner for sewer mains. The work crew member shall have field experience on a minimum of two (2) successfully completed CIPP liner projects performed in the United States or its Territories. The two (2) successfully completed projects shall each have involved the successful installation of a minimum of 10,000 linear feet of CIPP liner into sewer host pipes of 18-inch or larger diameter. The work crew member shall have directly participated in liner wet-out and insertion on the two (2) qualifying projects.
- d. The remote cutter operator shall have directly performed a minimum of 50 successful sewer lateral connection reinstatement by remote cutter on CIPP liner projects performed in the United States or its Territories.
- 2. If the Contractor desires to reassign or replace personnel who have been qualified by the Owner, a written request to the Owner naming the replacement personnel shall be made The request shall include documentation of replacement personnel work qualification and experiences which demonstrates that the minimum qualification of this section are met. Written favorable review from the Owner of the replacement personnel's qualifications shall be obtained prior to employing such personnel on the Project.
- 3. If qualified personnel leave the Contractor's or Specialty Subcontractor's employment during the Contract, the Contractor shall provide replacement personnel that meet the minimum qualifications established by the Owner.
- C. Design Analysis:
 - 1. Provide sufficient detail to allow the Owner to judge whether or not the proposed materials, equipment, forms, and procedures will meet the Contract requirements.
 - 2. All design calculations and shop drawings shall be prepared and stamped by a Civil Engineer licensed in Guam, unless otherwise approved by the Owner.
 - 3. No materials shall be manufactured prior to approval of the submittals by the Owner.
 - 4. The CIPP shall be designed per ASTM F1216. The design used for the product shall be submitted in a report for review and approval. The report shall document the design criteria and assumptions for a fully deteriorated pipe section. Physical properties used in design equations shall be validated by independent testing.
- D. Manufacturing and Quality Control:
 - 1. Engineering design guides and detailed quality control procedures for rehabilitation materials, manufacturing, shipping, handling and storage, and installation shall be submitted for review. This shall include inspection requirements, product sampling procedures, testing procedures, material safety data sheets (MSDS) for materials and allowable manufacturing tolerance levels.
 - 2. The Contractor shall submit certification provided by the product Manufacturer as to the country of manufacture of all major components to be used to produce the final installed work.
- E. Installation Qualification
 - 1. The Contractor shall submit documentation provided by the Manufacturer that the Contractor is qualified to properly install the proposed product. The documentation shall consist of evidence of Contractor training, testing and/or certification of being trained to install the Manufacturer's product.
 - 2. The above documentation of Contractor's training shall be delivered to the Owner within fourteen (14) calendar days after the Notice to Proceed date.
- F. Product Qualification
- The Contractor shall submit documentation that the proposed product meets the minimum linear footage and years of service requirements indicated in Paragraph 2.1 Materials. The documentation shall include for each project the name, address and reference telephone numbers of the owner of the pipe line system that was CIPP lined; date of owner acceptance of the completed product installation; length of CIPP installed; diameter of host pipe; and installer name, address and reference telephone numbers. In addition, the Contractor shall
 HDR Project No. 10026963

submit documentation in the form of a notarized letter(s) from the manufacturer(s) verifying that the proposed resin and tube materials have been manufactured for a minimum of three (3) years or the project's linear footage does not exceed three percent (3%) of the total footage of the product (at time of bid) that has been successfully installed in the United States.

- 2. The above documentation of product qualification and notarized Manufacturer's letter(s) shall be mailed or faxed to the Owner within fourteen (14) calendar days after the Notice to Proceed date.
- G. Product Manufacturing
 - 1. The Contractor shall submit documentation in the form of a notarized letter(s) from the manufacturer(s) verifying that the proposed resin and tube materials have been manufactured for a minimum of three years or the project's linear footage does not exceed three percent (3%) of the total footage of the product (at time of bid) that has been successfully installed in the U.S.
- H. Product Compatibility
 - 1. The Contractor shall submit documentation certifying that the resin, tube, and outside layer of tube are compatible.
- I. Installation Procedures
 - 1. List of Installation Procedures
 - a. An itemized list detailing the installation procedures to be used shall be submitted. This shall include estimated times for each task, the number of required excavations, resin curing method, and any other items unique to each process.
 - 2. Cure Schedule
 - a. A cure schedule shall be included that provides the resin manufacturer's recommended cure and cool down times and cure temperature for each diameter and thickness.
 - 3. Wrinkle Reducing or Removing Methods
 - a. Procedures to be submitted shall include proposed methods of removing or reducing the height of protruding wrinkles in the liner.
 - 4. Required Standards
 - a. All related ASTM standards or any nationally recognized standards for installation of the product shall be submitted.
 - 5. Product Repair
 - a. Detailed procedures shall be submitted for repairing the product in the event of failure or future damage. These procedures should not require specialized training and/or equipment for the Owner's maintenance crews.
 - 6. Future Tapping of Service Connections
 - a. Where applicable, detailed procedures shall be submitted for future tapping of service connections into the product. The procedures should not require specialized training and/or equipment for the Owner's maintenance crews.
 - 7. Installation Lubricant
 - a. Detailed description and physical properties of the lubricant to be used during installation shall be submitted for the Owner's approval.
 - 8. Construction of Manhole Transition Sections
 - a. Detailed procedures for the construction of manhole transition sections along with description and physical properties of the concrete bonding agent to be used shall be submitted for the Owner's approval.
 - 9. Forms and Quality Control Records
 - a. Examples of forms and quality control records to be used throughout the installation and curing process to demonstrate effective application and verification checks shall be provided. These forms and quality control records are subject to approval by the Owner.
- J. Product Test Data
 - 1. General Requirements:

- a. No product shall be allowed to be installed without submittal of test data supporting the product performance requirements listed below.
- b. Materials tested in order to provide the required test data shall be similar to those proposed for use in the Project.
- c. Unless test data is required below to be obtained from field samples, all test samples shall be prepared so as to simulate the conditions and procedures the product will experience during the Project.
- d. All testing shall have been performed by an independent third party qualified to perform such testing.
- 2. Chemical Resistance:
 - a. Tests shall be conducted for standard domestic sewage application in accordance with ASTM F1216, Appendix X2, or F1743, Section 7.2, and meet the minimum requirements listed therein.
- 3. Hydraulic Capacity:
 - a. Calculations shall be submitted which support that the finished in-place flexible tube shall be able to provide a minimum of one-hundred percent (100%) of the existing sewer line's original design capacity. (Original design capacity of the existing sewer line shall be calculated using a roughness coefficient "n" of 0.015.).
 - a. The typical roughness coefficient "n" to be used in calculations for the proposed flexible tube shall be verified by independent third party (hired by the product Manufacturer) test data, but shall not be less than 0.011, unless otherwise approved by the Owner.
- 4. Flexural Modulus and Strength:
 - a. In order to verify the proposed product's past performance, the Contractor shall submit detailed test results from a minimum of ten (10) previous successful installations of the proposed CIPP liner.
 - a. The test results of field samples from each of the previous installations shall verify that the minimum requirements for short-term flexural modulus and flexural strength specified in this specification had been achieved.
- K. Wet-Out Product Data
 - 1. The following items pertaining to the resin shall be submitted prior to wet-out of the liner:
 - a. The proper quantity (volume or weight plus the specific gravity of the resin) needed to fill all of the felt voids plus the targeted additional resin quantity to compensate for polymerization shrinkage and migration, in a unit length of each diameter and thickness of installed and cured CIPP to be supplied on this project for each line installed.
 - a. Resin colorant type or brand name.
 - b. Colorant information.
 - c. Colorant level (proportion) to be used, based on the percent of resin weight.
 - d. A procedure for adding the colorant to the resin.
 - 2. At time of lining, a signed copy of the wet-out sheet (batch ticket) for each liner delivered to the site and installed.
 - a. The wet-out sheets shall certify that for each length of a diameter and thickness, the information is truthful and accurate.
 - a. The information on the wet-out sheet shall include, but shall not be limited to: liner number, liner diameter, liner thickness, wet out time (prep, mixing and filling, conveyer, clean up, total), resin identification, quantity of resin placed and retained in the felt, a nominal yield calculation, catalyst and promoters used and their proportions, fabric tube identifier, fabric tube length (measured, dry, wet out, total) and the roller gap dimension.

1.6 DELIVERY, STORAGE, AND HANDLING

1. CIPP and appurtenances shall be handled, stored, protected, transported, and installed as recommended by the manufacturer. CIPP shall be stored and handled such that the CIPP, including the CIPP tube layers and coatings, is protected from physical damage or other

deterioration. CIPP and appurtenances susceptible to sun and light deterioration (i.e., ultraviolet radiation) and heat damage shall be adequately protected.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Product Qualifications:
 - 1. In order for a CIPP product (combination of tube and resin) to qualify for use in the Project, a history of successful commercial viability shall be shown.
 - 2. Products not meeting the minimum requirements established by the Engineer for successful commercial viability shall be rejected.
 - 3. The Engineer shall be the sole judge as to whether the requirements have been met. For a proposed CIPP product to qualify as a commercially acceptable product for the Project, the following requirements must be met:
 - a. A minimum of 50,000 linear feet of successful wastewater collection system installations in the United States shall be documented. The proposed tube and resin shall have been used together as one product, to assure commercial viability of the materials and the process. In addition, the CIPP product shall have been in service within wastewater collection facilities in the United States for a minimum of three (3) years, unless otherwise approved by the Owner. Installations of the proposed resin and tube used independently from each other may not be used to qualify the product for the linear footage and years of service requirements.
 - a. The manufacturer(s) for both proposed resin and tube shall have successfully produced the material in the United States continuously for a minimum of three (3) years, unless otherwise approved by the Owner. If the manufacturer(s) does not have this minimum three years commercial experience in the United States, the number of linear feet of product proposed to be installed under this Project shall not exceed three percent (3%) of the total footage (at time of bid) of the product that has been successfully installed in the United States.
- B. Product Manufacturing
 - 1. The manufacturer(s) for both proposed resin and tube shall have successfully produced the material in the U.S. continuously for a minimum of three years, unless otherwise approved by the Owner. If the manufacturer(s) does not have this minimum three years commercial experience in the U.S., the number of linear feet of product proposed to be installed under this Project shall not exceed three percent (3%) of the total footage (at time of bid) of the product that has been successfully installed in the U.S.
- C. Product Requirements
 - 1. Bonding to Existing Pipe Wall
 - a. Pipeline rehabilitation products that require bonding to the existing pipe wall for structural strength will not be allowed since the present structural conditions of the existing pipe walls are unknown and may vary considerably.
 - 2. Resin Impregnation
 - a. No CIPP lining product shall be accepted unless vacuum resin impregnation techniques are used.
 - 3. CIPP Wall
 - a. The finished CIPP wall shall be homogenous throughout, except for the exterior coating (i.e., no intermediate impermeable layers).

2.2 DESIGN REQUIREMENTS

- A. General Requirements:
 - 1. All materials and components, including resin, tube, and outside layer of tube, shall be compatible and suitable for providing a finished CIPP product which meets the requirements of the Contract Documents.

- B. Design Parameters:
 - 1. The design thickness of the CIPP wall is a function of multiple factors including, but not limited to, product materials and the condition of the existing sewer line. The materials used shall have the capability to vary wall thicknesses in order to address variations in existing pipe conditions (i.e., circumferences, deterioration, and alignment due to pipe bends) and design considerations for a fully deteriorated host pipe.
 - 2. The installed CIPP liner design parameters shall meet or exceed the following minimum CIPP Resin Requirements:
 - a. Flexural Modulus (short term): 300,000 psi
 - a. Flexural Modulus (long term): 150,000 psi (The long term flexural modulus is defined as fifty years as determined by ASTM D2990 Test Method)
 - a. Flexural Strength: 4,500 psi
 - 3. The installed CIPP liner design parameters shall meet or exceed the following Minimum Finished (cured) CIPP Wall Thickness Requirement (regardless of calculated thicknesses based on ASTM standards identified in this Specification):
 - a. 14-inch Diameter Host Pipe: 0.26-inch (6.6 mm)
 - a. 16-inch Diameter Host Pipe: 0.30-inch (7.6 mm)
 - b. 18-inch Diameter Host Pipe: 0.37-inch (9.4 mm)
 - c. 20-inch Diameter Host Pipe: 0.41-inch (10.4 mm)
 - d. 24-inch Diameter Host Pipe: 0.43-inch (10.9 mm)
 - e. 27-inch Diameter Host Pipe: 0.48-inch (12.2 mm)
 - 4. Other Design Parameters to be used in determining minimum finished liner thickness:
 - a. Fully deteriorated host pipe.
 - a. H-20 truck live load: 16,000 lbs
 - b. Groundwater depth above the bottom of the pipe = depth to ground surface (to reflect saturated soil conditions after a heavy rain).
 - c. Pipe ovality: 3 percent
 - d. Soil density: 120 lbs/cu. ft.
 - e. Soil modulus without live load: 700 psi
 - f. Safety factor: 2.0
- C. Structural Requirements:
 - 1. The flexible tube for full-length liners shall be designed as per ASTM F1216, Appendix X1, with the following additional requirements:
 - a. The tube design shall assume no bonding to the existing pipe wall.
 - b. With regards to external buckling and because the structural conditions of the existing sewer pipe walls are unknown, the flexible tube shall be designed to act as a standalone pipe within the existing pipe.
 - c. Acceptable third party testing and verification of the design analysis techniques (ASTM F1216, Appendix X1.2.2 for all installation methods) shall be submitted for the Owner review prior to installation of the liner.
 - d. The bond between the flexible tube layers shall be strong and uniform. All layers shall form one homogeneous structural pipe wall with no part of the flexible tube left unsaturated by the resin after curing.
- D. Tube:
 - 1. The material shall meet the requirements of ASTM F1216, Section 5.1, or F1743, Section 5.2.1. The tube shall be compatible with the resin system used. The tube shall be fabricated to a size that, when installed, will fit the internal circumference and the length of the existing pipe. Allowance shall be made for circumferential and longitudinal stretch during installation. The tube shall be capable of conforming to offset joints, bells and disfigured pipe sections. The minimum length of each section shall be the distance from the manhole to the next manhole.
 - 2. The Contractor shall verify the section lengths and inside dimensions of the existing sewer section before tube fabrication. Sewing or connecting tubes in order to attain the required length is prohibited.

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Guam Waterworks Authority

Asan-Adelup-Hagatna - Route 1 Sewer Rehabilitation and Replacement - Phase II WATER AND STEAM CURED-IN-PLACE PIPE LINING

- 3. The outside layer of the flexible tube (before inversion) shall be plastic coated with a transparent flexible material that is compatible with the resin system used. The plastic coating shall not delaminate after the flexible tube has cured.
- 4. The flexible tube shall contain no intermediate or encapsulated elastomeric layers. No material shall be included in the tube that can be subject to delamination in the cured flexible tube.
- E. Resin:
 - 1. The resin system shall meet the requirements of ASTM F1216, Section 5.2, F1743, Section 5.2.3, or these specifications, whichever is more stringent.
 - 2. The resin shall be of suitable, visible color to show that the felt liner is completely and uniformly impregnated. The color used shall not interfere with visual and/ or closed circuit television (CCTV) inspection of the liner or its required properties.
 - 3. The resin shall be a chemically resistant water cured isophtalic polyester or vinyl ester thermoset resin. When cured the CIPP shall meet the structural and chemical resistance requirements of ASTM F1216 and ASTM F1743.

PART 3 - EXECUTION

3.1 PRELIMINARY INVESTIGATION OF HOST SEWER PIPE

- A. Prior to ordering rehabilitation materials, the Contractor shall be responsible for inspecting and confirming the inside diameter, pipe material, and alignment of the host sewer pipe, and determining the condition of each segment to be lined.
- B. The Contractor shall use the data and information collected from this inspection to finalize the liner size, refine the liner design, and refine the installation techniques.
- C. If unknown physical conditions in the work area are encountered during the investigation that materially differ from those ordinarily encountered, the Contractor shall notify the Owner.

3.2 **PROCEDURE**

- A. General Requirements
 - 1. Basic procedure for the sewer rehabilitation shall include an access shaft which may involve the temporary removal of the upper portion of a manhole, sewer flow control and bypass pumping (see Specification Section 33 37 23) where necessary, cleaning (see Specification Section 30 01 30.41), pre-rehabilitation television inspection (see Specification Section 33 01 30.11), liner installation, testing, post-rehabilitation television inspection (see Specification Section 33 01 30.11), and any required manhole reconstruction and surface restoration (see Specification Section 33 01 30.81). After completion of the rehabilitation, the CIPP liner shall provide a continuous, watertight, corrosion resistant conduit within the existing sewer line.
 - 2. The Contractor shall be responsible for performing all CIPP and related work, including video inspection, excavations, and cleaning in accordance with applicable Federal and local safety regulations, including current OSHA safety standards.
 - 3. Prior to entering manholes and other confined spaces to perform sewer rehabilitation work, the Contractor shall evaluate the atmosphere in and near the sewer to determine the presence of toxic or flammable vapors and shall ventilate the rehabilitation work area as necessary to render it safe, in accordance with OSHA 1910.146, "Permit Required Confined Spaces."
 - 4. The Contractor shall be responsible for odor and noise mitigation on this Project in accordance with applicable Federal and local regulations. The Contractor shall monitor the surrounding area and minimize any odors and noise that may occur due to his work activities.

3.3 INSTALLATION OF LINER

A. Liner installation shall be in accordance with ASTM F1216, Section 7, or F1743, Section 6, and with the following requirements:

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- 1. Cleaning and Inspection
 - a. The sewer line shall be cleaned and video inspected per Section 33 01 30.41, "Cleaning of Sewers and Manholes," and Section 33 01 30.11, "Television Inspection of Sewers" prior to CIPP installation. Cleaning and video inspection shall be approved by the Owner before beginning the CIPP installation work.
- 2. Protruding Laterals
 - a. Protruding laterals shall be grinded down to the pipe wall surface or as necessary to prevent any damage to the liner and ensure proper installation of the CIPP liner. The Contractor shall CCTV the pipe after the lateral has been grinded down and obtain approval by the Owner before beginning the CIPP installation work.
- 3. Access
 - a. The Contractor shall locate and designate all manhole access points that will be used for liner installation and sewer bypassing. The Contractor shall verify that all access points are open and accessible for work and identify any obstacles that may prevent proper installation of the CIPP liner.
- 4. Resin Impregnation
 - a. The tube shall be free of any tears and frayed sections. The tube shall be impregnated with resin (wet-out) in accordance with ASTM F1216, Section 7.2, or F1743, Section 6.2. A vacuum impregnation process shall be used. A roller system shall be used to uniformly distribute the resin throughout the tube. All air in the tube shall be removed by vacuum allowing the resin to thoroughly impregnate the tube. All resin shall be contained to ensure no public property or persons are exposed to the liquid resin.
 - a. The Owner or his representative shall be present during the wet out operation.
 - b. The installer shall arrange for a location where the liner will be vacuum-impregnated prior to installation. The installer shall allow the Owner to inspect the materials and procedures used to vacuum-impregnate the tube.
 - c. Should the liner material (felt layers and interior plastic coating) be cut to pump/vacuum resin into the liner, all cut layers of the felt shall be sewn closed and the plastic coating sealed watertight, per manufacturer's recommended procedures.
- 5. Bypassing
 - a. If bypassing of sewage flows is required around the sections of pipe designated for rehabilitation, the bypass shall be constructed in accordance with Section 33 37 23, "Sewer Flow Control."
 - a. Public advisory services shall be required to notify all parties whose service laterals will be affected and all connected residents to advise minimum water usage.
 - b. The Contractor shall provide written notification of work activities to all local users fourteen (14) calendar days before interruption of service and provide interim sewer service. This notification shall include a description of the project, the method of construction, and the approximate date and duration that disruption of sewer service will occur. The notification shall also note the potential inconvenience from resin odor, noise, and lights. The Contractor shall maintain a notification log which will include the date and time of the notification, the contact person's name, and if no contact was made, a notation that the information was left at the person's door. The notification shall be submitted to the Owner for approval at least fourteen (14) calendar days prior to being mailed to affected parties.
 - c. If authorized by the Owner, in-person verbal notification shall be acceptable in lieu of the above written notifications.
- B. Insertion of Liner
 - 1. Before the insertion begins, the tube manufacturer shall provide values for the minimum pressure required to hold the tube tight against the existing conduit and the maximum allowable pressure so as not to damage the tube. Once the insertion has started, the pressure shall be maintained between the minimum and maximum pressures until cool down has been completed. Should the pressure deviate from the required, the installed tube shall be removed from the host conduit at the Contractor's expense. The Contractor shall provide the Owner with a continuous log of pressure during cure.

- 2. Prior to installation, remote temperature gauges (typically thermocouple probes) shall be placed inside the host pipe at the invert level of each end to monitor the temperatures during the cure cycle.
- 3. Insertion shall be in accordance with ASTM F1216, Section 7.4, or F1743, Section 6.4. If the tube is being pulled into the pipe, no resin shall be lost by contact with manhole walls or the pipe. The resin should not be contaminated or diluted by exposure to dirt, debris, or water during the pull. The resin that provides a structural seal shall not contact the pipe until positioned at the point of repair.
- 4. The Owner or his representative shall be present during the entire liner insertion procedure. The Contractor shall provide a written notice to the Owner a minimum of 24 hours prior to insertion of the liner.
- 5. Tube insertion forces or pressures shall be limited so as not to stretch the tube longitudinally by more than five (5%) of the original length.
- 6. Segments of liner that have been resin impregnated and placed in the host conduit and then are found to be too short, shall be removed without curing and properly discarded at the Contractor's expense. Removal of the uncured, resin impregnated liner shall be accomplished in such a way as to minimize the amount of resin allowed to escape. The Contractor shall be responsible for cleanup of all escaped resin and any odors that may result. The Contractor shall submit a plan to remove any odors and resin impregnated, uncured liner from the host conduit including protection of the host system from escaping resin to the Owner for approval a minimum of three (3) weeks prior to the first installation process.
- 7. The use of a lubricant during inversion is recommended to reduce friction. This lubricant should be poured into the water in the downtube or applied directly to the tube. Lubricant shall not be used in processes where impregnated coatings are performed prior to tube installation. The lubricant used shall be a non-toxic, oil-based product that has no detrimental effects on the tube or roller and pump system, and will not support bacterial growth or adversely affect sewage treatment processes.
- 8. The tube shall not be exposed to ultraviolet light.
- 9. The tube shall not experience excessive bubbling or wrinkling during insertion.
- C. Curing
 - 1. Heat Source for Circulation of Water
 - a. After insertion of the wetted out tube is complete, the Contractor shall use a suitable heat source and distribution equipment to circulate heated water uniformly throughout the section for a consistent cure of the resin. The curing temperatures shall comply with submittals and manufacturer's recommendations.
 - b. The heat source shall be fitted with suitable monitors to gauge the temperature of the incoming and outgoing water supply. Another such gauge shall be placed between the impregnated liner tube and the invert of the host pipe at the termination manhole, and any intermediate manholes, to determine the temperatures during the resin cure process. Temperatures at all gauges shall be monitored and logged during curing and cool down. The Contractor shall provide the Owner with a continuous log of temperatures at all gauges during curing.
 - c. Contractor shall provide a temperature measuring sensor throughout the entire length of rehabilitated CIPP to ensure uniform and complete curing. The thermocouple sensors and cable shall allow for temperature to be measured at least every three (3) inches along liner during the curing process. Contractor shall submit documentation that records the continuously monitored temperature during the curing process.
 - 2. CIPP Curing Requirements
 - a. Curing shall be in accordance with ASTM F1216, Section 7.6, or F1743, Section 6.6.
 - a. Initial cure may be considered completed when the exposed portions of the felt tube appear to be hard and the termination manhole temperature sensor indicates the temperature to be adequate to realize an exotherm or cure in the resin as recommended by the resin manufacturer and approved by the Owner. Curing temperatures and duration shall comply with previously submitted data and information.

- b. Any hot water used during the curing process shall be free of any pollutants and shall be properly disposed of at ambient temperatures in an environmentally safe manner in accordance with applicable Federal and local rules and regulations. Contractor shall be responsible for obtaining the applicable permits.
- D. Cool-Down
 - 1. Cool-down shall be in accordance with ASTM F1216, Section 7.7, or F1743, Section 6.7.
 - 2. The Contractor shall cool the hardened pipe to a temperature below 100 degrees F before relieving the water column (pressure) or 113 degrees F before relieving the internal pressure.
 - 3. Cool-down may be accomplished by the introduction of cool water into the inversion standpipe to replace water or mixture of air being drained from a small hole made at the downstream end.
 - 4. Care shall be taken in the release of the water column or air pressure so that a vacuum will not be developed that could damage the newly installed CIPP.
 - 5. Coupon samples shall be obtained for testing.
- E. Workmanship
 - 1. The finished CIPP shall be continuous over the entire length of each installation run and be free of such defects not limited to holidays, foreign inclusions, dry spots, lifts, delamination, buckling, creases, and seepage of groundwater through the liner material.
- Location of Wrinkle Height of Wrinkle **Repair Method and** Tolerance Grind to 2 percent of Below springline or depth of flow, Greater than 2 percent whichever is higher of the pipe diameter the pipe diameter or or 1/4", whichever is 1/4", whichever is greater greater Above springline or depth of flow, Greater than 4 percent Grind to 4 percent of whichever is higher of the pipe diameter the pipe diameter or or 1/2", whichever is 1/2", whichever is greater greater
- 2. Wrinkles in the finished CIPP liner shall be repaired as indicated in the following table.

- 3. The Owner shall determine if repairing the wrinkle is necessary.
- 4. Should the liner be inadvertently perforated during the grinding procedure, the Contractor shall repair or replace the liner by a method approved by the Owner.
- 5. If other critical defects are present, the Contractor shall remove and replace the liner in these areas, using a method approved by the Owner, at the Contractor's sole expense.

3.4 REINSTATEMENT OF LATERAL CONNECTIONS

- A. Lateral Connection Verification
 - 1. The Contractor shall verify the location and number of lateral connections shown on the Plans during his pre-rehabilitation television inspection (see Section 33 01 30.11) or from other methods approved by the Owner. The verification methods utilized by the Contractor shall not require any excavation or removal of existing pipe.
- B. Lateral Connection Reinstatement
 - After the CIPP has been cured in place, the existing lateral connections shall be reinstated as required. This shall be done without excavation, from the interior of the pipeline by means of a television camera and remote-control cutting device. The reinstated opening shall be neat, and its edges smooth and without any hanging fibers, or loose or abraded materials. The invert of the reinstated opening shall match the invert of the original connection. Additionally, the opening shall be reinstated to a minimum of 90% and a maximum of 95%

of the original connection opening. The Contractor shall be responsible for restoring/correcting without delay all missed or faulty reconnections as well as for any damages, which may have resulted. A minimum of one (1) standby remote-control cutting device shall be on site during lateral reinstatement operations.

- 2. All lateral connections shall be reinstated within 10 hours after the completion of the curing process to minimize disturbance to private residents. If connections cannot be reinstated within this period of time, the Contractor shall obtain approval from the Owner prior to any extension to allow additional bypass/diversion pumping. Added bypass/diversion pumping services shall be incidental to the project and at the Contractor's expense.
- 3. The Contractor shall be responsible for maintaining an emergency crew capable of cutting taps and readily available to respond to sewer service customer problems after normal working hours unless otherwise determined by the Owner. Contractor's emergency crew shall be qualified and fully equipped to perform lateral connection reinstatement operations and provide temporary bypassing if required to maintain sewer service. Costs related to the emergency response will be incidental to the Contract and not measured for payment.
- C. Lateral Connection Seals
 - 1. After the CIPP has been cured in place and the existing lateral connections have been reinstated, those locations as shown on the plans shall have lateral seals installed in accordance with Section 33 01 30.76.

3.5 TRANSITION SECTIONS

- A. Design
 - 1. Transition sections shall be constructed to channel sewage flow and minimize entrance and exit losses as the flow passes through the existing manhole structures affected by CIPP work. Construction of the transition grout within the channel shall be determined as follows. For situations where:
 - a. A CIPP liner terminates at both upstream and downstream manhole pipe openings, and the cured liner I.D. is 18" nominal or greater, the transition grout within the channel shall have a uniform thickness equal to the liner thickness throughout the length of the channel.
 - b. A CIPP liner terminates one manhole pipe opening, and the cured liner I.D. is greater than 18" nominal, the transition grout shall be equal to the liner thickness at the manhole wall and taper towards the center of the manhole at a ratio of 1:10 (V:H).
 - c. A cured liner I.D. is equal to or less than 18" nominal, the transition grout shall be equal to the liner thickness at the manhole wall and taper towards the center of the manhole at a ratio of 1:10 (V:H).

Transition Grout Construction			
	Nominal Diameter <u>></u> 18"	Nominal Diameter < 18"	
Liner Terminates at Both Manhole Openings	Uniform thickness equal to liner thickness throughout channel length.	Equal to liner thickness at the manhole wall and taper towards channel center at 1:10 (V:H) ratio.	
Liner Terminates at One Manhole Opening	Equal to liner thickness at the manhole wall and taper towards channel center at 1:10 (V:H) ratio.	Equal to liner thickness at the manhole wall and taper towards channel center at 1:10 (V:H) ratio.	

- d. When the pipe liner is placed through manholes, the Contractor shall cut away the top of the pipe liner to conform to the existing manhole walls.
- e. Existing benches and channels shall be built up with grout as needed to match the CIPP liner elevations. Smooth transitions shall be formed between the existing surfaces and the CIPP.
- 2. Surface Preparation
 - a. Prior to applying new concrete, the existing surfaces shall be adequately cleaned, scraped of loose concrete, and roughened. An approved concrete bonding agent shall be applied prior to the construction of any new channels, benches and/or transition sections. The bonding agent shall meet ASTM C881 requirements for Type 1, Grade 3, epoxy resin adhesive. The bonding agent shall be Sikadur 31 Hi-Mod Gel or an approved equal.
- 3. Material Requirements
 - Any new channels, benches, and transition sections shall be formed using a quick setting, high strength Portland cement based repair mortar. The mortar shall be SikaTop 122 Plus, Sauereisen Substrate Resurfacer No. F-121, or an approved equal. The mortar shall have the following minimum properties:

	Sika Top 122 Plus	Sauereisen Substrate Resurfacer No. F-121
Flexural Strength	1,500 psi 28 days	1,500 psi 7 days
	(ASTM C293)	(ASTM C580)
Tensile Strength	500 psi 28 days	822 psi 7 days
C C	(ASTM C496)	(ASTM C307)
Bond Strength	2,000 psi 28 days	2,200 psi 7 days
	(ASTM C882)	(ASTM C882)
Compressive Strength	7,000 psi 28 days	7,000 psi 28 days
	(ASTM C109)	(ASTM C109)

- 4. Sealing of Annular Space
 - a. At all manholes apply Sikadur 31 Hi-Mod Gel or an approved equal between the CIPP liner and the existing pipe. The material shall be applied around the entire circumference of the pipe to fully seal the annular space to prevent infiltration of groundwater and exfiltration of sewage and sewer gases.
 - a. Where CIPP liner is placed through the manholes, the material shall be applied where the top of the liner has been cut away.
 - b. Install continuous or properly trimmed hydrophilic waterstop end seals at each manhole opening in accordance with the waterstop end seal manufacturer's recommendations. The seals shall be bands that are 20 mm wide and 5 mm high. The hydrophilic water stop end seal shall be Hydrotite Model RS-0520-3.51, or an approved equal, and shall be compatible with the CIPP liner.
- 5. Liner Termination at Manhole
 - a. The liner section above the bench shall extend approximately two inches into the manhole to mechanically lock the liner in place.

3.6 GENERAL TESTING

- A. General CIPP Liner Testing Requirements
 - 1. For each inversion length of CIPP full-length liner installed, the Contractor shall perform the tests identified in Section 3.7 CIPP Tests.

- 2. Where testing is performed on CIPP samples, the Contractor shall be responsible for providing the necessary samples and for hiring a qualified, independent third party to perform the required tests. The report shall outline test procedures, present data, provide diagrams as required, and summarize test results for each length of CIPP installed. The report shall provide all information labeled on the samples. Sample labeling requirements are provided in the following paragraph. Copies of the report shall be sent from the laboratory simultaneously to both the Contractor and the Owner immediately upon completion of the sample testing. Two (2) copies of the detailed report on the testing shall be sent to the Owner.
- 3. The Owner shall be responsible for filling out and maintaining a Cured Sample Testing Record for all samples which the Owner takes possession of. The Contractor shall not destroy any Cured Sample Testing Records and will transfer all Cured Sample Testing Records to the Owner immediately after final acceptance of the project.
- 4. Lengths of CIPP which fail any of the required tests may be required by the Owner to be removed and replaced at the Contractor's cost.
- B. CIPP Samples
 - 1. General Procedures
 - a. Cured CIPP samples shall be taken and labeled in the presence of the Owner. The labeling on the sample shall consist of the sample number, Project Name, the Owner Job Number, Contractor company name, name(s) of Contractor's personnel that extracted the sample, the date/time that the sample was taken and the name of the Owner personnel present during sampling. The labeling shall be made with a permanent marking device that will not smudge or fade on the sample.
 - b. In addition, the Contractor shall maintain a Cured Sample Testing Record. The Cured Sample Testing Record shall be current and shall be available for immediate review by the Owner upon the Owner's request. A copy of the Cured Sample Testing Record is provided at the end of this Specification. The Contractor may obtain a copy of the Cured Sample Testing Record from the Owner.
 - c. The Owner may take possession of a sample or samples at any time prior to the samples being shipped to the third party testing laboratory. The number of samples taken are at the discretion of the Owner. If samples are taken, the Contractor is relieved of responsibility of testing the samples. The samples taken by the Owner may be tested by a laboratory selected by the Owner. In this situation, costs for testing and shipping these samples will be paid for by the Owner. Two copies of the test reports from the laboratory selected by the Owner will be sent to the Contractor.
 - 2. Pipes of 18-Inch Diameter or Less
 - a. The sample shall be cut from a section of cured CIPP at the termination point that has been inverted through a pipe with the same inside diameter as the existing pipe and has been held in place by a suitable heat sink, such as sandbags. The sample shall be large enough to provide for all of the tests indicated below.
 - a. If a length of CIPP is installed through intermediate manholes, samples shall be taken at each intermediate manhole as well as at the termination point.
 - 3. Pipes Greater Than 18-Inch Diameter
 - a. The sample shall be fabricated from material taken from the tube and the resin/catalyst system used and cured in a clamped mold placed in the downtube when circulating the heated water. The sample shall be large enough to provide for all tests indicated below.
 - a. Prior to obtaining any sample, the Contractor shall mark the limits of the sample on the CIPP and obtain the approval of the Owner. The Owner has the discretion to adjust the sample location.

3.7 CIPP TESTS

- A. CIPP Wall Thickness Test
 - 1. Pipes of 18-Inch Diameter or Less
 - a. For host pipes with a nominal diameter 18-inches or less, testing shall be in accordance with ASTM F1743, Section 8.1.6.

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- b. The Contractor shall read and follow ASTM F1743 in its entirety.
- c. As a summary, Section 8.1.6 indicated a minimum of eight measurements at evenly spaced intervals around the circumference of the sample shall be taken to ensure that minimum and maximum thicknesses are determined. Deduct from the measured values the thickness of any plastic coatings of CIPP layers not included in the structural design of the CIPP. The average thickness shall be calculated using the measured values and shall meet or exceed the minimum finished thickness indicated in Section 2.2.B, Design Parameters. The minimum wall thickness at any point shall not be less than 87.5% of the minimum finished thickness indicated in Section 2.2.B, Design Parameters.
- Ultrasonic testing of wall thickness is not allowed. d.
- 2. Pipes Greater than 18-Inch Diameter
 - For host pipes with a nominal diameter greater than 18-inches, a 1-inch diameter cored a. sample shall be taken at the crown of the CIPP, approximately two feet into the pipe at the upstream and downstream manholes of the inversion section.
 - An epoxy resin filler approved by the Owner shall be used to fill the cored areas. a.
- B. Short-Term Flexural Test
 - CIPP samples shall be tested for short-term flexural (bending) properties. Testing shall be 1 in accordance with ASTM F1216, Section 8.1.3.1, or F1743, Section 8.1.4. Five specimens shall be tested.
- C. Delamination Test
 - Testing shall be in accordance with ASTM F1216, Section 8.4, or ASTM F1743, Section 1. 8.4. Five specimens shall be tested.
- D. Peel or Stripping Strength Test
 - Testing shall be in accordance with ASTM F1216, Section 8.5. The peel or stripping 1. strength between any nonhomogeneous layers of CIPP laminate shall be a minimum of 10 lb/in. of width.

3.8 PIPE LEAKAGE TEST

- A. Testing shall be in accordance with ASTM F1216 as summarized below. The Contractor shall review and follow ASTM F1216 in its entirety.
- B. The cured liner material shall be impervious and not allow for any infiltration or exfiltration. Unless otherwise directed by the Owner, the Contractor shall conduct either an exfiltration, infiltration, or air test for each CIPP inversion for pipes with a nominal diameter of 36-inches or less.
- C. Laterals shall be reinstated after the leakage test is completed.
- D. The Contractor shall notify the Owner as to the type of testing to be conducted prior to the testing.
- E. It shall be noted that the allowable leakage amounts indicated in the following paragraphs are to allow for imperfections that may be associated with the leakage test setup (Ex. slight leakage at the plugs, seepage through the downtube material, volumetric changes in the water or air inside the liner due to temperature changes, etc.). Leakage as a result of a pervious finished liner will not be accepted and will be considered defective requiring repair or replacement.
 - 1. Exfiltration Test
 - An exfiltration test may be conducted after the CIPP has cooled to ambient temperature. a. The Contractor shall submit testing procedures for approval.
 - b. The maximum amount of leakage for any section of CIPP being tested shall not exceed 50 gallons per day per inch of internal diameter per mile of pipe. During the exfiltration testing, the maximum internal pipe pressure at the lowest end shall not exceed 10 feet of water and the water level inside the inversion standpipe shall be two feet higher than the top of the pipe or two feet higher than the groundwater level, whichever is greater. The test should be conducted for a minimum of one hour and may be performed during the liner cool down period.

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- c. The exfiltration test shall be conducted at the completion of the curing process while the CIPP is under hydrostatic pressure.
- d. Laterals shall be reinstated after the leakage test is completed.
- 2. Infiltration Test
 - a. An infiltration test may be conducted if the groundwater is more than 2 feet above top of pipe for the entire section of sewer line. The Contractor shall submit testing procedures for approval.
 - a. The maximum amount of infiltration for any CIPP section being tested shall not exceed the rate of 50 gallons per day per inch of internal diameter per mile of pipe at a minimum test head of 2 feet above the existing groundwater level, whichever is greater.
- 3. Air Test
 - a. Testing shall be conducted after the CIPP has cooled to ambient temperature and prior to reinstating any laterals. Low pressure air test shall be in accordance with ASTM F1417-11a, except for testing times, which shall follow the minimum testing times as listed in the table below. The Time-Pressure Drop Method, using 1.0 psig pressure drop, shall be used.

Pipe Diameter	Minimum Time	Length for Minimum Time	Time for Longer Length
Inches	Seconds	Feet	Seconds/Ft
12	680	199	3.419
15	850	159	5.342
18	1,020	133	7.693
21	1,190	114	10.471
24	1,360	100	13.676
27	1,530	88	17.309

- b. The low pressure air test may be dangerous to personnel. It is extremely important that the various plugs be properly installed to prevent sudden expulsion of a poorly installed or partially inflated plug. The Contractor shall be responsible for providing all safety measures necessary to protect personnel from injury. No one shall be allowed in the manholes during testing.
- c. For products in which the pipe wall is cured while not in direct contact with the pressurizing fluid (e.g. a removable inflation bladder is used), the pipe shall be leakage tested after the cure process is completed and the pressurizing fluid and apparatus have been removed.

3.9 INSPECTION AND ACCEPTANCE

- A. The finished installation shall be inspected by the Contractor by closed-circuit television camera as specified in Section 33 01 30.11, "Television Inspection of Sewers," in the presence of the Owner, unless otherwise directed by the Owner.
- B. Variations from true line and grade will only be acceptable if proven by the Contractor that the variations existed under the original conditions of the existing sewer lines.
- C. The CIPP work will be deemed unacceptable if infiltration of groundwater is detected. All lateral connections and entrances must be accounted for and shall be unobstructed.

3.10 CLEANING

A. Upon acceptance of the CIPP installation, the Contractor shall restore the Project area to its original conditions or better.

PART 4 - MEASUREMENT AND PAYMENT

4.1 CIPP LINING

- A. The quantity for which payment will be made for sewer line rehabilitation shall be the actual length of CIPP liner installed, measured in linear feet.
- B. Payment for sewer line CIPP rehabilitation work shall be based on the unit price bid per linear foot for CIPP lining as scheduled in the Bid Schedule. This payment shall include full compensation for all labor, materials, supplies, equipment, tools, and incidentals for the complete installation of the liner, transition sections, removal and restoration of sewer manhole cones (if required for access), removal of protruding laterals, sealing at manholes, reworking manhole inverts and benches, patching, grout work, testing of installed liner, and for all other related work covered by this specification. CIPP samples submitted to the testing lab by the Owner shall be paid for by the Owner.
- C. Payment for CIPP lining will not be made until all testing and post-construction CCTV work have been approved by the Owner.

4.2 LATERAL REINSTATEMENT

- A. Measurement for payment for sewer lateral connection reinstatements upon completion of CIPP lining installation shall be per each sewer lateral connection reinstated.
- B. Payment for sewer lateral opening reinstatement shall be based on the unit price per each as scheduled in the Bid Schedule and shall include full compensation for all labor, materials, supplies, equipment, tools and incidentals for the complete reinstatement of sewer lateral connections openings.

END OF SECTION



1. Each field cured sample taken for testing shall be marked and identified by a sample number, Project Name, City Job Number, Contractor company name, name(s) of person(s) that extracted the sample, the date/time when the sample was taken, and name of Office-in-Charge or designated representative present during sampling.

Samples from flat plate shall be not be used for determining installed thickness of CIPP.

SECTION 33 01 30.73

ULTRAVIOLET (UV) LIGHT CURED-IN-PLACE PIPE LINING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - The rehabilitation of existing sewer line by the installation of ultraviolet (UV) light cured-1. in-place pipe (CIPP).
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. GWA Bid Submission Requirements
 - 2. GWA Standard General Conditions of the Construction Contract
 - 3. GWA Supplementary Conditions
 - 4. Division 01 General Requirements.
 - 5. Section 33 01 30.11 Television Inspection of Sewers.
 - 6. Section 33 01 30.41 Cleaning of Sewers.
 - 7. Section 33 01 30.76 Cured-In-Place (CIPP) Lateral Seals.

OUALITY ASSURANCE 1.2

- A. Referenced Standards:
 - 1. American Society for Testing and Materials (ASTM):
 - ASTM C109, Standard Test Method for Compressive Strength of Hydraulic Cement a. Mortars (Using 2-in. Cube Specimens).
 - b. ASTM C293, Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Center-Point Loading).
 - c. ASTM C307, Standard Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacings.
 - d. ASTM C496, Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens.
 - ASTM C580, Standard Test Method for Flexural Strength and Modulus of Elasticity of e. Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
 - ASTM C881, Standard Specification for Epoxy-Resin-Base Bonding Systems for f. Concrete.
 - g. ASTM C882, Standard Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete by Slant Shear.
 - h. ASTM D2990, Standard Test Methods for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics.
 - ASTM F1216, Standard Practice for Rehabilitation of Existing Pipelines and Conduits i. by the Inversion and Curing of a Resin Impregnated Tube.
 - ASTM F1417-11a, Standard Practice for Installation Acceptance of Plastic Nonį. pressure Sewer Lines Using Low-Pressure Air.
 - ASTM F1743, Standard Practice for Rehabilitation of Existing Pipelines and Conduits k. by Pulled-in-Place Installation of Cured-in-Place Thermosetting resin Pipe (CIPP)
 - ASTM F2019-20, Standard Practice for Rehabilitation of Existing Pipelines and 1. Conduits by the Pulled in Place Installation of Glass Reinforced Plastic (GRP) Curedin-Place Thermosetting Resin Pipe (CIPP)
 - 2. National Association of Sewer Service Companies (NASSCO):
 - a. NASSCO standards, latest edition and revision thereof.

SYSTEM DESCRIPTION 1.3

A. The CIPP shall be formed by inserting a resin-impregnated flexible felt tube into an existing sewer line, expanding the tube to fit against the existing sewer line walls, and then curing the resin as required using ultraviolet (UV) light. The finished product within the lined pipe section

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shall be a continuous, jointless structural pipe that is formed to the existing sewer line and, unless otherwise indicated, shall provide a minimum of 100% of the existing sewer line's original design capacity.

1.4 CLOSED-CIRCUIT TELEVISION INSPECTIONS OF PIPE

- A. The Contractor is advised that closed-circuit television (CCTV) inspections were performed on the sewer segments to be rehabilitated from May 2015 to June 2015 and from February 2016 to May 2016. Additional limited amounts of CCTV inspections were performed in 2018 on line segments from SMH 329Haga to the Hagatna Pump Station. Viewing of the video recordings is mandatory.
- B. Some of the sewer lines have incomplete CCTV inspections because the camera was not able to traverse the entire pipe segment from manhole to manhole. As shown on the Contract drawings, for those sewer lines that has incomplete CCTV inspections, the resulting rehabilitation or replacement for the sewer pipe will be determined after the Contractor's initial CCTV work is completed.
- C. Conditions in the sewer are likely to have changed since the date when CCTV information was collected and conditions as depicted therein is not guaranteed to be current.
- D. Bidders shall provide a portable hard drive for the downloading of the files. Obtaining a copy of the video recording files shall be coordinated with Ms. Gloria Bensan of the Guam Waterworks Authority (GWA) at telephone number (671) 300-6042. The portable hard drive shall be dropped off at GWA's office, located at:

Gloria B. Nelson Public Service Building 688 Rt. 15 Mangilao, Guam 96913

A transmittal letter and label on the hard drive indicating the Bidder's name and phone number shall be included. The portable hard drive shall have a minimum capacity of 500 GB. The Bidder shall allow for a minimum of five days for copying of the files.

1.5 SUBMITTALS

- A. Contractor Qualifications:
 - 1. The Contractor shall submit documentation that the Contractor is qualified to properly install the proposed product. The following minimum experience requirements shall be met and provided on the documentation:
 - a. CIPP Contractor work force is to have at least one (1) qualified CIPP work supervisor, one (1) CIPP work crew member, and one (1) lateral reinstatement remote cutter operator. Qualified work crew members must directly provide the specific work for which they have been qualified until such work has been completed and accepted by the Owner.
 - b. Successfully completed projects completed by the Contractor shall have involved the successful installation of a cumulative total of 100,000 linear feet and/or 300 line segments of CIPP liner into sewer main host pipes of 18-inch or larger diameter.
- B. Contractor Personnel Qualifications:
 - 1. The Contractor shall submit documentation that the Contractor's personnel are qualified to properly install the proposed product. The following minimum experience requirements shall be met and provided on the documentation:
 - a. All phases of the CIPP work shall be performed under the direct supervision of an experienced supervisor who has field experience on at least three (3) successfully completed projects performed in the United States or its Territories and in which he had direct supervision over CIPP lining installation work.
 - b. Successfully completed projects completed by the CIPP supervisor shall each have involved the successful installation of a minimum of 30,000 linear feet and/or 100 line segments of CIPP liner into host pipes of 18-inch or larger diameter.

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- c. Besides the CIPP work supervisor, at least one other CIPP work crew member shall have direct experience installing CIPP liner. The work crew member shall have field experience on a minimum of two (2) successfully completed CIPP liner projects performed in the United States or its Territories. The two (2) successfully completed projects shall each have involved the successful installation of a minimum of 10,000 linear feet of CIPP liner into host pipes of 18-inch or larger diameter. The work crew member shall have directly participated in liner insertion on the two (2) qualifying projects.
- d. The remote cutter operator shall have directly performed a minimum of 50 successful lateral connection reinstatement by remote cutter on CIPP liner projects performed in the United States or its Territories.
- 2. If the Contractor desires to reassign or replace personnel who have been qualified by the Owner, a written request to the Owner naming the replacement personnel shall be made The request shall include documentation of replacement personnel work qualification and experiences which demonstrates that the minimum qualification of this section are met. Written favorable review from the Owner of the replacement personnel's qualifications shall be obtained prior to employing such personnel on the Project.
- 3. If qualified personnel leave the Contractor's or Specialty Subcontractor's employment during the Contract, the Contractor shall provide replacement personnel that meet the minimum qualifications established by the Owner.
- C. Design Analysis:
 - 1. Provide sufficient detail to allow the Owner to judge whether or not the proposed materials, equipment, forms, and procedures will meet the Contract requirements.
 - 2. All design calculations and shop drawings shall be prepared and stamped by a Civil Engineer licensed in Guam, unless otherwise approved by the Owner.
 - 3. No materials shall be manufactured prior to approval of the submittals by the Owner.
 - 4. The CIPP shall be designed per ASTM F2019. The design used for the product shall be submitted in a report for review and approval. The report shall document the design criteria and assumptions for a fully deteriorated pipe section. Physical properties used in design equations shall be validated by independent testing.
- D. Manufacturing and Quality Control:
 - 1. Engineering design guides and detailed quality control procedures for rehabilitation materials, manufacturing, shipping, handling and storage, and installation shall be submitted for review. This shall include inspection requirements, product sampling procedures, testing procedures, material safety data sheets (MSDS) for materials and allowable manufacturing tolerance levels.
 - 2. The Contractor shall submit certification provided by the product Manufacturer as to the country of manufacture of all major components to be used to produce the final installed work.
- E. Installation Qualification
 - 1. The Contractor shall submit documentation provided by the Manufacturer that the Contractor is qualified to properly install the proposed product. The documentation shall consist of evidence of Contractor training, testing and/or certification of being trained to install the Manufacturer's product.
 - 2. The above documentation of Contractor's training shall be delivered to the Owner within fourteen (14) calendar days after the Notice to Proceed date.
- F. Product Qualification
 - The Contractor shall submit documentation that the proposed product meets the minimum linear footage and years of service requirements indicated in Paragraph 2.1 Materials. The documentation shall include for each project the name, address and reference telephone numbers of the owner of the pipe line system that was CIPP lined; date of owner acceptance of the completed product installation; length of CIPP installed; diameter of host pipe; and installer name, address and reference telephone numbers. In addition, the Contractor shall submit documentation in the form of a notarized letter(s) from the manufacturer(s) verifying 7/31/2020

100% Design

that the proposed resin and tube materials have been manufactured for a minimum of three (3) years or the project's linear footage does not exceed three percent (3%) of the total footage of the product (at time of bid) that has been successfully installed in the United States.

- 2. The above documentation of product qualification and notarized Manufacturer's letter(s) shall be delivered to the Owner within fourteen (14) calendar days after the Notice to Proceed date.
- G. Product Manufacturing
 - 1. The Contractor shall submit documentation in the form of a notarized letter(s) from the manufacturer(s) verifying that the proposed resin and tube materials have been manufactured for a minimum of three years or the project's linear footage does not exceed three percent (3%) of the total footage of the product (at time of bid) that has been successfully installed in the U.S.
- H. Product Compatibility
 - 1. The Contractor shall submit documentation certifying that the resin, tube, and outside layer of tube are compatible.
- I. Installation Procedures
 - 1. List of Installation Procedures
 - a. An itemized list detailing the installation procedures to be used shall be submitted. This shall include estimated times for each task, the number of required excavations, resin curing method, and any other items unique to each process.
 - 2. Cure Schedule
 - a. A cure schedule shall be included that provides the resin manufacturer's recommended cure and cool down times and cure temperature for each diameter and thickness.
 - 3. Wrinkle Reducing or Removing Methods
 - a. Procedures to be submitted shall include proposed methods of removing or reducing the height of protruding wrinkles in the liner.
 - 4. Required Standards
 - a. All related ASTM standards or any nationally recognized standards for installation of the product shall be submitted.
 - 5. Product Repair
 - a. Detailed procedures shall be submitted for repairing the product in the event of failure or future damage. These procedures should not require specialized training and/or equipment for the Owner's maintenance crews.
 - 6. Future Tapping of Service Connections
 - a. Where applicable, detailed procedures shall be submitted for future tapping of service connections into the product. The procedures should not require specialized training and/or equipment for the Owner's maintenance crews.
 - 7. Installation Lubricant
 - a. Detailed description and physical properties of the lubricant to be used during installation shall be submitted for the Owner's approval.
 - 8. Construction of Manhole Transition Sections
 - a. Detailed procedures for the construction of manhole transition sections along with description and physical properties of the concrete bonding agent to be used shall be submitted for the Owner's approval.
 - 9. Forms and Quality Control Records
 - a. Examples of forms and quality control records to be used throughout the installation and curing process to demonstrate effective application and verification checks shall be provided. These forms and quality control records are subject to approval by the Owner.
- J. Product Test Data
 - 1. General Requirements:
 - a. No product shall be allowed to be installed without submittal of test data supporting the product performance requirements listed below.

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- b. Materials tested in order to provide the required test data shall be similar to those proposed for use in the Project.
- c. Unless test data is required below to be obtained from field samples, all test samples shall be prepared so as to simulate the conditions and procedures the product will experience during the Project.
- d. All testing shall have been performed by an independent third party qualified to perform such testing.
- 2. Chemical Resistance:
 - a. Test results shall meet the chemical resistance requirements of ASTM F2019. The chemical resistance tests shall be conducted in accordance with ASTM D543.
- 3. Hydraulic Capacity:
 - a. Calculations shall be submitted which support that the finished in-place flexible tube shall be able to provide a minimum of one-hundred percent (100%) of the existing sewer line's original design capacity. (Original design capacity of the existing sewer line shall be calculated using a roughness coefficient "n" of 0.015.).
 - b. The typical roughness coefficient "n" to be used in calculations for the proposed flexible tube shall be verified by independent third party (hired by the product Manufacturer) test data, but shall not be less than 0.011, unless otherwise approved by the Owner.
- 4. Flexural Modulus and Strength:
 - a. In order to verify the proposed product's past performance, the Contractor shall submit detailed test results from a minimum of ten (10) previous successful installations of the proposed CIPP liner.
 - b. The test results of field samples from each of the previous installations shall verify that the minimum requirements for short-term flexural modulus and flexural strength specified in this specification had been achieved.
- K. Wet-Out Product Data
 - 1. The following items pertaining to the resin shall be submitted prior to wet-out of the liner:
 - a. The proper quantity (volume or weight plus the specific gravity of the resin) needed to fill all of the felt voids plus the targeted additional resin quantity to compensate for polymerization shrinkage and migration, in a unit length of each diameter and thickness of installed and cured CIPP to be supplied on this project for each line installed.
 - b. Resin colorant type or brand name.
 - c. Colorant information.
 - d. Colorant level (proportion) to be used, based on the percent of resin weight.
 - e. A procedure for adding the colorant to the resin.
 - 2. At time of lining, a signed copy of the wet-out sheet (batch ticket) for each liner delivered to the site and installed.
 - a. The wet-out sheets shall certify that for each length of a diameter and thickness, the information is truthful and accurate.
 - b. The information on the wet-out sheet shall include, but shall not be limited to: liner number, liner diameter, liner thickness, wet out time (prep, mixing and filling, conveyer, clean up, total), resin identification, quantity of resin placed and retained in the felt, a nominal yield calculation, catalyst and promoters used and their proportions, fabric tube identifier, fabric tube length (measured, dry, wet out, total) and the roller gap dimension.

1.6 DELIVERY, STORAGE, AND HANDLING

A. CIPP and appurtenances shall be handled, stored, protected, transported, and installed as recommended by the manufacturer. CIPP shall be stored and handled such that the CIPP, including the CIPP tube layers and coatings, is protected from physical damage or other deterioration. CIPP and appurtenances susceptible to sun and light deterioration (i.e., ultraviolet radiation) and heat damage shall be adequately protected.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Product Qualifications:

- In order for a CIPP product (combination of tube and resin) to qualify for use in the Project, 1. a history of successful commercial viability shall be shown.
- 2. Products not meeting the minimum requirements established by the Engineer for successful commercial viability shall be rejected.
- The Engineer shall be the sole judge as to whether the requirements have been met. For a 3. proposed CIPP product to qualify as a commercially acceptable product for the Project, the following requirements must be met:
 - A minimum of 50,000 linear feet of successful wastewater collection system installations in the United States shall be documented. The proposed tube and resin shall have been used together as one product, to assure commercial viability of the materials and the process. In addition, the CIPP product shall have been in service within wastewater collection facilities in the United States for a minimum of three (3) years, unless otherwise approved by the Owner. Installations of the proposed resin and tube used independently from each other may not be used to qualify the product for the linear footage and years of service requirements.

The manufacturer(s) for both proposed resin and tube shall have successfully produced the material in the United States continuously for a minimum of three (3) years, unless otherwise approved by the Owner. If the manufacturer(s) does not have this minimum three years commercial experience in the United States, the number of linear feet of product proposed to be installed under this Project shall not exceed three percent (3%) of the total footage (at time of bid) of the product that has been successfully installed in the United States.

- B. Product Manufacturing
 - The manufacturer(s) for both proposed resin and tube shall have successfully produced the 1. material in the U.S. continuously for a minimum of three years, unless otherwise approved by the Owner. If the manufacturer(s) does not have this minimum three years commercial experience in the U.S., the number of linear feet of product proposed to be installed under this Project shall not exceed three percent (3%) of the total footage (at time of bid) of the product that has been successfully installed in the U.S.
- C. Product Requirements
 - 1 Bonding to Existing Pipe Wall
 - Pipeline rehabilitation products that require bonding to the existing pipe wall for a. structural strength will not be allowed since the present structural conditions of the existing pipe walls are unknown and may vary considerably.
 - 2. Resin Impregnation
 - a. No CIPP lining product shall be accepted unless vacuum resin impregnation techniques are used.
 - 3. CIPP Wall
 - The finished CIPP wall shall be homogenous throughout, except for the exterior coating a. (i.e., no intermediate impermeable layers).

2.2 **DESIGN REQUIREMENTS**

- A. General Requirements:
 - All materials and components, including resin, tube, and outside layer of tube, shall be 1. compatible and suitable for providing a finished CIPP product which meets the requirements of the Contract Documents.
- B. Design Parameters:
 - 1. The design thickness of the CIPP wall is a function of multiple factors including, but not limited to, product materials and the condition of the existing sewer line. The materials used shall have the capability to vary wall thicknesses in order to address variations in

7/31/2020 100% Design existing pipe conditions (i.e., circumferences, deterioration, and alignment due to pipe bends) and design considerations for a fully deteriorated host pipe.

- 2. The installed CIPP liner design parameters shall meet or exceed the following minimum CIPP Resin Requirements:
 - a. Flexural Modulus (short term): 725,000 psi
 - Flexural Modulus (long term): 362,500 psi (The long term flexural modulus is defined as fifty years as determined by ASTM D2990 Test Method)
 - c. Flexural Strength: 4,500 psi
- 3. The installed CIPP liner design parameters shall meet or exceed the following Minimum Finished (cured) CIPP Wall Thickness Requirement (regardless of calculated thicknesses based on ASTM standards identified in this Specification):
 - a. 14-inch Diameter Host Pipe: 0.17-inch (4.3 mm)
 - b. 16-inch Diameter Host Pipe: 0.23-inch (5.8 mm)
 - c. 18-inch Diameter Host Pipe: 0.28-inch (7.1 mm)
 - d. 20-inch Diameter Host Pipe: 0.31-inch (7.9 mm)
 - e. 24-inch Diameter Host Pipe: 0.33-inch (8.4 mm)
 - f. 27-inch Diameter Host Pipe: 0.38-inch (9.7 mm)
- 4. Other Design Parameters to be used in determining minimum finished liner thickness:
 - a. Fully deteriorated host pipe.
 - b. H-20 truck live load: 16,000 lbs
 - c. Groundwater depth above the bottom of the pipe = depth to ground surface (to reflect saturated soil conditions after a heavy rain).
 - d. Pipe ovality: 3 percent
 - e. Soil density: 120 lbs/cu. ft.
 - f. Soil modulus without live load: 700 psi
 - g. Safety factor: 2.0
- C. Structural Requirements:
 - . The flexible tube for full-length liners shall be designed as per ASTM F2019, Appendix X1, with the following additional requirements:
 - a. The tube design shall assume no bonding to the existing pipe wall.
 - b. With regards to external buckling and because the structural conditions of the existing sewer pipe walls are unknown, the flexible tube shall be designed to act as a standalone pipe within the existing pipe.
 - c. Acceptable third party testing and verification of the design analysis techniques (ASTM F1216, Appendix X1.2.2 for all installation methods) shall be submitted for the Owner review prior to installation of the liner.
 - d. The bond between the flexible tube layers shall be strong and uniform. All layers shall form one homogeneous structural pipe wall with no part of the flexible tube left unsaturated by the resin after curing.
- D. Tube:
 - 1. The material shall meet the requirements of ASTM F2019, Section 5.2.1. The tube shall be compatible with the resin system used. The tube shall be fabricated to a size that, when installed, will fit the internal circumference and the length of the existing pipe. Allowance shall be made for circumferential and longitudinal stretch during installation. The tube shall be capable of conforming to offset joints, bells and disfigured pipe sections. The minimum length of each section shall be the distance from the manhole to the next manhole.
 - 2. The Contractor shall verify the section lengths and inside dimensions of the existing sewer section before tube fabrication. Sewing or connecting tubes in order to attain the required length is prohibited.
 - 3. The outside layer of the flexible tube (before inversion) shall be plastic coated with a transparent flexible material that is compatible with the resin system used. The plastic coating shall not delaminate after the flexible tube has cured.

- 4. The flexible tube shall contain no intermediate or encapsulated elastomeric layers. No material shall be included in the tube that can be subject to delamination in the cured flexible tube.
- E. Resin:
 - 1. The resin system shall meet the requirements of ASTM F2019, Section 5.2.4, or these specifications, whichever is more stringent.
 - 2. The resin shall be a chemically resistant UV cured isophtalic polyester or vinyl ester thermoset resin. When cured the CIPP shall meet the structural and chemical resistance requirements of ASTM F2019.
 - 3. The resin shall only be a chemically resistant UV cured vinyl ester thermoset resin for use in the sewer line from manhole 20AAsan to manhole 1368Asan and shall meet the structural and chemical resistance requirements of ASTM F2019.

PART 3 - EXECUTION

3.1 PRELIMINARY INVESTIGATION OF HOST SEWER PIPE

- A. Prior to ordering rehabilitation materials, the Contractor shall be responsible for inspecting and confirming the inside diameter, pipe material, and alignment of the host sewer pipe, and determining the condition of each segment to be lined.
- B. The Contractor shall use the data and information collected from this inspection to finalize the liner size, refine the liner design, and refine the installation techniques.
- C. If unknown physical conditions in the work area are encountered during the investigation that materially differ from those ordinarily encountered, the Contractor shall notify the Owner.

3.2 PROCEDURE

- A. General Requirements
 - Basic procedure for the sewer rehabilitation shall include an access shaft which may involve the temporary removal of the upper portion of a manhole, sewer flow control and bypass pumping (see Specification Section 33 37 23) where necessary, cleaning (see Specification Section 30 01 30.41), pre-rehabilitation television inspection (see Specification Section 33 01 30.11), liner installation, testing, post-rehabilitation television inspection (see Specification Section 33 01 30.11), and any required manhole reconstruction and surface restoration (see Specification Section 33 01 30.81). After completion of the rehabilitation, the CIPP liner shall provide a continuous, watertight, corrosion resistant conduit within the existing sewer line.
 - 2. The Contractor shall be responsible for performing all CIPP and related work, including video inspection, excavations and cleaning in accordance with applicable Federal and local safety regulations, including current OSHA safety standards.
 - 3. Prior to entering manholes and other confined spaces to perform sewer rehabilitation work, the Contractor shall evaluate the atmosphere in and near the sewer to determine the presence of toxic or flammable vapors and shall ventilate the rehabilitation work area as necessary to render it safe, in accordance with OSHA 1910.146, "Permit Required Confined Spaces."
 - 4. The Contractor shall be responsible for odor and noise mitigation on this Project in accordance with applicable Federal and local regulations. The Contractor shall monitor the surrounding area and minimize any odors and noise that may occur due to his work activities.

3.3 INSTALLATION OF LINER

- A. Liner installation shall be in accordance with ASTM F2019, Section 6, and with the following requirements:
 - 1. Cleaning and Inspection
 - a. The sewer line shall be cleaned and video inspected per Section 33 01 30.41, "Cleaning of Sewers and Manholes," and Section 33 01 30.11, "Television Inspection" prior to

CIPP installation. Cleaning and video inspection shall be approved by the Owner before beginning the CIPP installation work.

- 2. Protruding Laterals
 - a. Protruding laterals shall be grinded down to the pipe wall surface or as necessary to prevent any damage to the liner and ensure proper installation of the CIPP liner. The Contractor shall CCTV the pipe after the lateral has been grinded down and obtain approval by the Owner before beginning the CIPP installation work.
- 3. Access
 - a. The Contractor shall locate and designate all manhole access points that will be used for liner installation and sewer bypassing. The Contractor shall verify that all access points are open and accessible for work and identify any obstacles that may prevent proper installation of the CIPP liner.
- 4. Resin Impregnation
 - a. The tube shall be free of any tears and frayed sections. The tube shall be impregnated with resin (wet-out) in accordance with ASTM F2019, Section 6.3. The impregnation equipment shall contain devices to secure proper distribution of the resin.
 - b. The Owner or his representative shall be present during the wet out operation, if wet out is conducted on Guam. The installer shall allow the Owner or Owner's Representative to inspect the materials and procedures used to impregnate the tube.
 - c. All wet out or impregnation of the liner shall be done in a facility permitted by applicable regulatory permits. Documentation must be submitted to the Owner.
 - d. The manufacturing process shall be done ensuring that the glass fiber composite liner is carefuly impregnated with resin at the factory. No "over the hole" or "on-site" wet-out is allowed. All liners shall be packaged in special UV protection material and put into shipping containers that ensure the liner can be stored for up to 6 months with no need for refrigeration. This does not waive any requirement of the Contractor to provide necessary refrigeration as recommended by the product manufacturer.
- 5. Bypassing
 - a. If bypassing of sewage flows is required around the sections of pipe designated for rehabilitation, the bypass shall be constructed in accordance with Section 33 37 23, "Sewer Flow Control."
 - b. Public advisory services shall be required to notify all parties whose service laterals will be affected and all connected residents to advise minimum water usage.
 - c. The Contractor shall provide written notification of work activities to all local users fourteen (14) calendar days before interruption of service and provide interim sewer service. This notification shall include a description of the project, the method of construction, and the approximate date and duration that disruption of sewer service will occur. The notification shall also note the potential inconvenience from resin odor, noise, and lights. The Contractor shall maintain a notification log which will include the date and time of the notification, the contact person's name, and if no contact was made, a notation that the information was left at the person's door. The notification shall be submitted to the Owner for approval at least fourteen (14) calendar days prior to being mailed to affected parties.
 - d. If authorized by the Owner, in-person verbal notification shall be acceptable in lieu of the above written notifications.
- B. Insertion of Liner
 - 1. Insertion shall be in accordance with ASTM F2019, Sections 6.2 and 6.4.
 - 2. If significant groundwater infiltration is present in the existing sewer line, the Contractor may install a preliner tube or chemical seal defective pipe joints, holes, or other sources of the infiltration to control resin loss, preserve liner thickness, and prevent reduction in physical properties and contamination of the resin by water and other contaminants. The Contractor may also perform open trench point repair(s) to replace defective piping. The Contractor shall obtain approval from the Owner prior to installing the preliner tube or chemical grout to seal sources of infiltration.

- 3. Prior to installing the tube, a 10 mil thick plastic sheet shall be pulled into the host pipe to protect the tube from damage as the tube is pulled in, unless otherwise approved by the Owner.
- 4. The tube shall be pulled into place through an existing manhole or approved access point. The pulling speed shall not exceed 15 feet per minute. Care shall be exercised not to damage the tube during the pulling phase.
- 5. The Owner or his representative shall be present during the entire liner insertion procedure. The Contractor shall provide a written notice to the Owner a minimum of 24 hours prior to insertion of the liner.
- 6. Segments of liner that have been resin impregnated and placed in the host conduit and then are found to be too short, shall be removed without curing and properly discarded at the Contractor's expense. Removal of the uncured, resin impregnated liner shall be accomplished in such a way as to minimize the amount of resin allowed to escape. The Contractor shall be responsible for cleanup of all escaped resin and any odors that may result. The Contractor shall submit a plan to remove any odors and resin impregnated, uncured liner from the host conduit including protection of the host system from escaping resin to the Owner for approval a minimum of three (3) weeks prior to the first installation process.
- 7. Measure the overall elongation of the tube after the pull-in completion. The longitudinal elongation shall be less than 2 percent of the overall length.
- C. Curing
 - 1. Curing shall be in accordance with ASTM F2019, Section 6.6 and 6.7.
 - 2. A camera shall be located on the ultraviolet curing assembly to enable video inspection of the fabric and ensure the fabric tube has been properly inflated and any problems can be identified before curing process begins.
 - 3. A multi-lamp ultraviolet curing assembly shall be drawn through the pipe. The ultraviolet curing lights shall operate in the 200 to 400-nm range. The ultraviolet curing assembly shall travel through the pipe at a predetermined speed which allows cross-linking /polymerization and curing of the CIPP resin.
 - 4. The Contractor shall submit a documented record of time, rate of travel of the ultraviolet curing assembly, and internal temperatures and pressures during the curing process for each sewer segment to the Owner.

D. Workmanship

- 1. The finished CIPP shall be continuous over the entire length of each installation run and be free of such defects not limited to holidays, foreign inclusions, dry spots, lifts, delamination, buckling, creases, and seepage of groundwater through the liner material.
- 2. Wrinkles in the finished CIPP liner shall be repaired as indicated in the following table.

Location of Wrinkle	Height of Wrinkle	Repair Method and Tolerance
Below springline or depth of flow, whichever is higher	Greater than 2 percent of the pipe diameter or 1/4", whichever is greater	Grind to 2 percent of the pipe diameter or 1/4", whichever is greater
Above springline or depth of flow, whichever is higher	Greater than 4 percent of the pipe diameter or 1/2", whichever is greater	Grind to 4 percent of the pipe diameter or 1/2", whichever is greater

- 3. The Owner shall determine if repairing the wrinkle is necessary.
- 4. Should the liner be inadvertently perforated during the grinding procedure, the Contractor shall repair or replace the liner by a method approved by the Owner.

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5. If other critical defects are present, the Contractor shall remove and replace the liner in these areas, using a method approved by the Owner, at the Contractor's sole expense.

3.4 REINSTATEMENT OF LATERAL CONNECTIONS

- A. Lateral Connection Verification
 - 1. The Contractor shall verify the location and number of lateral connections shown on the Plans during his pre-rehabilitation television inspection (see Section 33 01 30.11) or from other methods approved by the Owner. The verification methods utilized by the Contractor shall not require any excavation or removal of existing pipe.
- B. Lateral Connection Reinstatement
 - 1. After the CIPP has been cured in place, the existing lateral connections shall be reinstated as required. This shall be done without excavation, from the interior of the pipeline by means of a television camera and remote-control cutting device. The reinstated opening shall be neat, and its edges smooth and without any hanging fibers, or loose or abraded materials. The invert of the reinstated opening shall match the invert of the original connection. Additionally, the opening shall be reinstated to a minimum of 90% and a maximum of 95% of the original connection opening. The Contractor shall be responsible for restoring/correcting without delay all missed or faulty reconnections as well as for any damages, which may have resulted. A minimum of one (1) standby remote-control cutting device shall be on site during lateral reinstatement operations.
 - 2. All lateral connections shall be reinstated within 10 hours after the completion of the curing process to minimize disturbance to private residents. If connections cannot be reinstated within this period of time, the Contractor shall obtain approval from the Owner prior to any extension to allow additional bypass/diversion pumping. Added bypass/diversion pumping services shall be incidental to the project and at the Contractor's expense.
 - 3. The Contractor shall be responsible for maintaining an emergency crew capable of cutting taps and readily available to respond to sewer service customer problems after normal working hours unless otherwise determined by the Owner. Contractor's emergency crew shall be qualified and fully equipped to perform lateral connection reinstatement operations and provide temporary bypassing if required to maintain sewer service. Costs related to the emergency response will be incidental to the Contract and not measured for payment.
- C. Lateral Connection Seals
 - 1. After the CIPP has been cured in place and the existing lateral connections have been reinstated, those locations as shown on the plans shall have lateral seals installed in accordance with Section 33 01 30.76.

3.5 TRANSITION SECTIONS

A. Design

- 1. Transition sections shall be constructed to channel sewage flow and minimize entrance and exit losses as the flow passes through the existing manhole structures affected by CIPP work. Construction of the transition grout within the channel shall be determined as follows. For situations where:
 - a. A CIPP liner terminates at both upstream and downstream manhole pipe openings, and the cured liner I.D. is 18" nominal or greater, the transition grout within the channel shall have a uniform thickness equal to the liner thickness throughout the length of the channel.
 - b. A CIPP liner terminates one manhole pipe opening, and the cured liner I.D. is greater than 18" nominal, the transition grout shall be equal to the liner thickness at the manhole wall and taper towards the center of the manhole at a ratio of 1:10 (V:H).
 - c. A cured liner I.D. is equal to or less than 18" nominal, the transition grout shall be equal to the liner thickness at the manhole wall and taper towards the center of the manhole at a ratio of 1:10 (V:H).

Transition Grout Construction			
	Nominal Diameter <u>></u> 18"	Nominal Diameter < 18"	
Liner Terminates at Both Manhole Openings	Uniform thickness equal to liner thickness throughout channel length.	Equal to liner thickness at the manhole wall and taper towards channel center at 1:10 (V:H) ratio.	
Liner Terminates at One Manhole Opening	Equal to liner thickness at the manhole wall and taper towards channel center at 1:10 (V:H) ratio.	Equal to liner thickness at the manhole wall and taper towards channel center at 1:10 (V:H) ratio.	

- d. When the pipe liner is placed through manholes, the Contractor shall cut away the top of the pipe liner to conform to the existing manhole walls.
- e. Existing benches and channels shall be built up with grout as needed to match the CIPP liner elevations. Smooth transitions shall be formed between the existing surfaces and the CIPP.
- 2. Surface Preparation
 - a. Prior to applying new concrete, the existing surfaces shall be adequately cleaned, scraped of loose concrete, and roughened. An approved concrete bonding agent shall be applied prior to the construction of any new channels, benches and/or transition sections. The bonding agent shall meet ASTM C881 requirements for Type 1, Grade 3, epoxy resin adhesive. The bonding agent shall be Sikadur 31 Hi-Mod Gel or an approved equal.
- 3. Material Requirements
 - Any new channels, benches, and transition sections shall be formed using a quick setting, high strength Portland cement based repair mortar. The mortar shall be SikaTop 122 Plus, Sauereisen Substrate Resurfacer No. F-121, or an approved equal. The mortar shall have the following minimum properties:

	Sika Top 122 Plus	Sauereisen Substrate Resurfacer No. F-121
Flexural Strength	1,500 psi 28 days	1,500 psi 7 days
	(ASTM C293)	(ASTM C580)
Tensile Strength	500 psi 28 days	822 psi 7 days
	(ASTM C496)	(ASTM C307)
Bond Strength	2,000 psi 28 days	2,200 psi 7 days
	(ASTM C882)	(ASTM C882)
Compressive Strength	7,000 psi 28 days	7,000 psi 28 days
	(ASTM C109)	(ASTM C109)

- 4. Sealing of Annual Space
 - a. At all manholes apply Sikadur 31 Hi-Mod Gel or an approved equal between the CIPP liner and the existing pipe. The material shall be applied around the entire

circumference of the pipe to fully seal the annular space to prevent infiltration of groundwater and exfiltration of sewage and sewer gases.

- b. Where CIPP liner is placed through the manholes, the material shall be applied where the top of the liner has been cut away.
- c. Install continuous or properly trimmed hydrophilic waterstop end seals at each manhole opening in accordance with the waterstop end seal manufacturer's recommendations. The seals shall be bands that are 20 mm wide and 5 mm high. The hydrophilic water stop end seal shall be Hydrotite Model RS-0520-3.51, or an approved equal, and shall be compatible with the CIPP liner.
- 5. Liner Termination at Manhole
 - a. The liner section above the bench shall extend approximately two inches into the manhole to mechanically lock the liner in place.

3.6 GENERAL TESTING

- A. General Testing Requirements
 - 1. For each inversion length of CIPP full-length liner installed, the Contractor shall perform the tests identified in Section 3.7 CIPP Tests.
 - 2. Where testing is performed on CIPP samples, the Contractor shall be responsible for providing the necessary samples and for hiring a qualified, independent third party to perform the required tests. The report shall outline test procedures, present data, provide diagrams as required, and summarize test results for each length of CIPP installed. The report shall provide all information labeled on the samples. Sample labeling requirements are provided in the following paragraph. Copies of the report shall be sent from the laboratory simultaneously to both the Contractor and the Owner immediately upon completion of the sample testing. Two (2) copies of the detailed report on the testing shall be sent to the Owner.
 - 3. The Owner shall be responsible for filling out and maintaining a Cured Sample Testing Record for all samples which the Owner takes possession of. The Contractor shall not destroy any Cured Sample Testing Records and will transfer all Cured Sample Testing Records to the Owner immediately after final acceptance of the project.
 - 4. Lengths of CIPP which fail any of the required tests may be required by the Owner to be removed and replaced at the Contractor's cost.
- B. CIPP Samples
 - 1. General Procedures
 - a. Cured CIPP samples shall be taken and labeled in the presence of the Owner. The labeling on the sample shall consist of the sample number, Project Name, the Owner Job Number, Contractor company name, name(s) of Contractor's personnel that extracted the sample, the date/time that the sample was taken and the name of the Owner personnel present during sampling. The labeling shall be made with a permanent marking device that will not smudge or fade on the sample.
 - b. In addition, the Contractor shall maintain a Cured Sample Testing Record. The Cured Sample Testing Record shall be current and shall be available for immediate review by the Owner upon the Owner's request. A copy of the Cured Sample Testing Record is provided at the end of this Specification. The Contractor may obtain a copy of the Cured Sample Testing Record from the Owner.
 - c. The Owner may take possession of a sample or samples at any time prior to the samples being shipped to the third party testing laboratory. The number of samples taken are at the discretion of the Owner. If samples are taken, the Contractor is relieved of responsibility of testing the samples. The samples taken by the Owner may be tested by a laboratory selected by the Owner. In this situation, costs for testing and shipping these samples will be paid for by the Owner. Two copies of the test reports from the laboratory selected by the Owner will be sent to the Contractor.
 - 2. Obtaining Samples

- a. The sample shall be cut from a section of cured CIPP at the termination point that has been inverted through a pipe with the same inside diameter as the existing pipe and has been held in place by a suitable heat sink, such as sandbags. The sample shall be large enough to provide for all of the tests indicated below.
- b. If a length of CIPP is installed through intermediate manholes, samples shall be taken at each intermediate manhole as well as the termination point. Samples at the intermediate manholes shall be obtained similarly to the method used to obtain the sample at the termination point. The samples at the intermediate manholes shall be large enough to provide for all of the tests indicated below.

3.7 CIPP TESTS

- A. CIPP Wall Thickness Test
 - 1. Testing shall be in accordance with ASTM F2019-20, Section 7.1.3.
 - 2. The Contractor shall read, understand and follow ASTM F2019-20 in its entirety.
 - 3. As a summary, Section 7.1.3 indicates a minimum of eight measurements at evenly spaced intervals around the circumference of the restrained sample shall be taken, avoiding including any point(s) where the liner is obviously thicker due to an overlapping of the structural layers of the laminate, but making sure to pick up the obvious minimum thickness around the circumference of the liner. The average composite wall section thickness shall meet or exceed the stated minimum design thickness per the engineer's wall thickness calculation. The average thickness shall be calculated using the measured values and shall meet or exceed the minimum finished thickness indicated in Section 2.2.B, Design Parameters. The minimum finished thickness indicated in Section 2.2.B, Design Parameters.
 - 4. Ultrasonic testing of wall thickness is not allowed.
- B. Short-Term Flexural Test
 - 1. CIPP samples shall be tested for short-term flexural (bending) properties. Testing shall be in accordance with ASTM F2019-20, Section 7.1.2. Five specimens shall be tested.
- C. Delamination Test
 - 1. Testing shall be in accordance with ASTM F1216, Section 8.4, or ASTM F1743, Section 8.4. Five specimens shall be tested.
- D. Peel or Stripping Strength Test
 - 1. Testing shall be in accordance with ASTM F1216, Section 8.5. The peel or stripping strength between any nonhomogeneous layers of CIPP laminate shall be a minimum of 10 lb/in. of width.

3.8 GRAVITY PIPE LEAKAGE TEST

- A. The cured liner material shall be impervious and not allow for any infiltration or exfiltration. Unless otherwise directed by the Owner, the Contractor shall conduct either an exfiltration, infiltration, or air test for each CIPP inversion for pipes with a nominal diameter of 36-inches or less.
- B. Laterals shall be reinstated after the leakage test is completed.
- C. The Contractor shall notify the Owner as to the type of testing to be conducted prior to the testing.
- D. It shall be noted that the allowable leakage amounts indicated in the following paragraphs are to allow for imperfections that may be associated with the leakage test setup (Ex. slight leakage at the plugs, seepage through the downtube material, volumetric changes in the water or air inside the liner due to temperature changes, etc.). Leakage as a result of a pervious finished liner will not be accepted and will be considered defective requiring repair or replacement.
 - 1. Exfiltration Test
 - a. An exfiltration test may be conducted after the CIPP has cooled to ambient temperature. The Contractor shall submit testing procedures for approval.

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- b. The maximum amount of leakage for any section of CIPP being tested shall not exceed 50 gallons per day per inch of internal diameter per mile of pipe. During the exfiltration testing, the maximum internal pipe pressure at the lowest end shall not exceed 10 feet of water and the water level inside the inversion standpipe shall be two feet higher than the top of the pipe or two feet higher than the groundwater level, whichever is greater. The test should be conducted for a minimum of one hour and may be performed during the liner cool down period.
- c. When water is used to cure the CIPP, the exfiltration test shall be conducted at the completion of the curing process while the CIPP is under hydrostatic pressure. If steam is used to cure the CIPP, water tight plugs shall be installed at both ends and the CIPP filled with water.
- d. Laterals shall be reinstated after the leakage test is completed.
- 2. Infiltration Test
 - a. An infiltration test may be conducted if the groundwater is more than 2 feet above top of pipe for the entire section of sewer line. The Contractor shall submit testing procedures for approval.
 - b. The maximum amount of infiltration for any CIPP section being tested shall not exceed the rate of 50 gallons per day per inch of internal diameter per mile of pipe at a minimum test head of 2 feet above the existing groundwater level, whichever is greater.
- 3. Air Test
 - a. Testing shall be conducted after the CIPP has cooled to ambient temperature and prior to reinstating any laterals. Low pressure air test shall be in accordance with ASTM F1417-11a, except for testing times, which shall follow the minimum testing times as listed in the table below. The Time-Pressure Drop Method, using 1.0 psig pressure drop, shall be used.

Pipe Diameter	Minimum	Length for	Time for Longer Length
	Time	Minimum Time	
Inches	Seconds	Feet	Seconds/Ft
12	680	199	3.419
15	850	159	5.342
18	1,020	133	7.693
21	1,190	114	10.471
24	1,360	100	13.676
27	1,530	88	17.309

- b. The low pressure air test may be dangerous to personnel. It is extremely important that the various plugs be properly installed to prevent sudden expulsion of a poorly installed or partially inflated plug. The Contractor shall be responsible for providing all safety measures necessary to protect personnel from injury. No one shall be allowed in the manholes during testing.
- c. For products in which the pipe wall is cured while not in direct contact with the pressurizing fluid (e.g. a removable inflation bladder is used), the pipe shall be leakage tested after the cure process is completed and the pressurizing fluid and apparatus have been removed.

3.9 INSPECTION AND ACCEPTANCE

- A. The finished installation shall be inspected by the Contractor by closed-circuit television camera as specified in Section 33 01 30.11, "Television Inspection," in the presence of the Owner, unless otherwise directed by the Owner.
- B. Variations from true line and grade will only be acceptable if proven by the Contractor that the variations existed under the original conditions of the existing sewer lines.

C. The CIPP work will be deemed unacceptable if infiltration of groundwater is detected. All lateral connections and entrances must be accounted for and shall be unobstructed.

3.10 CLEANING

A. Upon acceptance of the CIPP installation, the Contractor shall restore the Project area to its original conditions or better.

PART 4 - MEASUREMENT AND PAYMENT

4.1 CIPP LINING

- A. The quantity for which payment will be made for sewer line rehabilitation shall be the actual length of CIPP liner installed, measured in linear feet.
- B. Payment for sewer line CIPP rehabilitation work shall be based on the unit price bid per linear foot for CIPP lining as scheduled in the Bid Schedule. This payment shall include full compensation for all labor, materials, supplies, equipment, tools, and incidentals for the complete installation of the liner, transition sections, removal and restoration of sewer manhole cones (if required for access), removal of protruding laterals, sealing at manholes, reworking manhole inverts and benches, patching, grout work, testing of installed liner, and for all other related work covered by this specification. CIPP samples submitted to the testing lab by the Owner shall be paid for by the Owner.
- C. Payment for CIPP lining will not be made until all testing and post-construction CCTV work have been approved by the Owner.

4.2 LATERAL REINSTATEMENT

- A. Measurement for payment for sewer lateral connection reinstatements upon completion of CIPP lining installation shall be per each sewer lateral connection reinstated.
- B. Payment for sewer lateral opening reinstatement shall be based on the unit price per each as scheduled in the Bid Schedule and shall include full compensation for all labor, materials, supplies, equipment, tools and incidentals for the complete reinstatement of sewer lateral connections openings.

C. Lateral Reinstatement

- 1. Measurement for payment for sewer lateral connection reinstatements upon completion of CIPP lining installation shall be per each sewer lateral connection reinstated.
- 2. Payment for sewer lateral opening reinstatement shall be based on the unit price per each as scheduled in the Bid Schedule and shall include full compensation for all labor, materials, supplies, equipment, tools and incidentals for the complete reinstatement of sewer lateral connections openings.

END OF SECTION



Samples from flat plate shall be not be used for determining installed thickness of CIPP.
SECTION 33 01 30.76 CURED-IN-PLACE (CIPP) LATERAL SEALS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - These specifications include the minimum requirements for the rehabilitation of lateral 1. connections and their interface with the main-line pipes via Cured-In-Place-Pipe (CIPP) as shown on the plans and included as part of the Contract Documents. The lateral seal will include 2 ft of lateral pipeline that will also be rehabilitated in conjunction with the lateral/mainline connection, as a one piece integrated system.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. GWA Bid Submission Requirements
 - 2. GWA Standard General Conditions of the Construction Contract
 - 3. GWA Supplementary Conditions
 - 4. Division 01 General Requirements.
 - 5. Section 33 01 30.11 Television Inspection of Sewers.
 - 6. Section 33 01 30.41 Cleaning of Sewers.
 - 7. Section 33 01 30.72 Water and Steam Cured-In-Place Pipe Lining.
 - 8. Section 33 01 30.73 Ultraviolet (UV) Light Cured-In-Place Pipe Lining.
 - 9. Section 33 37 23 Sewer Flow Control

1.2 OUALITY ASSURANCE

- A. Referenced Standards:
 - 1. American Society for Testing and Materials (ASTM):
 - ASTM F1216, Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin Impregnated Tube.

1.3 SUBMITTALS

- A. Contractor Personnel Oualifications:
 - The Contractor shall submit documentation that the Contractor's personnel are qualified to 1. properly install the proposed product. The following minimum experience requirements shall be met and provided on the documentation:
 - All phases of the lateral seals shall be performed under the direct supervision of an a. experienced supervisor who has field experience on at least three (3) successfully completed projects performed in the United States or its Territories and in which the supervisor had direct supervision over lateral sealing installation work.
 - Successfully completed projects completed by the supervisor shall have involved the b. successful installation of a cumulative total of 50 lateral sealing work for sewer host pipes of 18-inch or larger diameter.
 - Besides the work supervisor, at least one other work crew member shall have direct c. experience installing CIPP lateral seals for sewer mains. The work crew member shall have field experience on a minimum of two (2) successfully completed lateral sealing projects performed in the United States or its Territories. The two (2) successfully completed projects shall each have involved the successful installation of a minimum of five (5) lateral sealing projects for sewer host pipes of 18-inch or larger diameter. The work crew member shall have directly participated in liner wet-out and insertion on the two (2) qualifying projects.
 - 2. If the Contractor desires to reassign or replace personnel who have been qualified by the the Owner, a written request to the the Owner naming the replacement personnel shall be made

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The request shall include documentation of replacement personnel work qualification and experiences which demonstrates that the minimum qualification of this section are met. Written favorable review from the Owner of the replacement personnel's qualifications shall be obtained prior to employing such personnel on the Project.

- 3. If qualified personnel leave the Contractor's or Specialty Subcontractor's employment during the Contract, the Contractor shall provide replacement personnel that meet the minimum qualifications established by the Owner.
- B. Quality Control Plan
 - 1. A detailed quality assurance plan (QCP) shall be submitted that fully represents and conforms to the quality control requirements of these specifications. At a minimum the QCP shall include the following:
 - a. How the system is prepared for installation.
 - b. How the system is installed.
 - c. How the completed system is confirmed to be in compliance with the requirements of the Contract.
 - d. Training/Qualifications of personnel preparing and installing the system.
 - e. Proposed methods for product performance controls, including method of and frequency of product sampling and testing as applicable.
 - 2. Proposed procedures for quality control, product sampling and testing shall be defined.
 - 3. Proposed methods for product performance controls, including method of and frequency of product sampling and testing as applicable.
 - 4. Proposed methods and procedures for system repair or replacement, (as defined in Section 1.6) in the event of product defects or failure.
- C. Product data submittals required for all rehabilitation lateral lining systems proposed for installation under this contract shall include:
 - 1. System material type and manufacturer to be used including: catalog data sheets, ASTM references, material composition, manufacturers recommended specifications, component physical properties and chemical resistance.
 - 2. Manufacturer's detailed description of the recommended procedures for handling and storing materials
 - 3. Manufacturers detailed description of the recommended system installation process
 - 4. Copies of independent testing performed on the CIPP liner composite verifying the product meets the requirements as specified in these contract documents and the manufacturers design.
 - 5. By-Pass Pumping Plan, if applicable to the system being installed.
 - 6. Traffic Control plan, if applicable for the system being installed.
 - 7. Certified statement, from the manufacturer, that the contractor/installer is an approved installer of the system with certificates of completed training for each crew member involved. This requirement shall comply with the specific system requirements specified in the contract documents
 - 8. Submittal of all quality assurance documentation and test reports for system installed. (After Rehabilitation Completion)
 - 9. CIPP wall thickness design calculations based upon ASTM F1216 assuming either Fully Deteriorated conditions, as specified by the Owner. The designs will be stamped by a Professional Engineer licensed in Guam, unless otherwise approved by the Owner.
 - 10. Wetout/cure logs per liner providing details pertaining to the resin type and quantity, catalyst type and quantity, tube type, installation pressures, temperature and times (as applicable to the curing lateral lining system utilized), and pertinent the Owner/User project specific data.
 - 11. Third party testing of the physical properties, corrosion resistance and sealing method.
 - 12. Health and Safety plan detailing the site specific safety requirements.
 - 13. Qualifications of the Contractor to install the system.
 - 14. Qualifications of the proposed system to meet the requirements of the Contract.

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- D. Lateral lining system repair / replacement documentation:
 - 1. Due to defects in preparation and/or installation, systems will occasionally need to be repaired or partially replaced. The Manufacturer shall outline specific repair or replacement procedures for potential issues that may occur during the installation of the system. Repair/replacement procedures shall be as recommended by the system manufacturer and shall be submitted as part of the PWS.
 - Issues, that may not affect the operation and long term life of the product, shall be identified 2. and defined by the Manufacturer.
 - 3. Repairable issues that may occur in the system shall be specifically based on Manufacturer's recommendations, including a detailed step-by-step repair procedure, resulting in a finished product meeting the estimated life cycle of the component and requirements of these contract specifications.
 - 4. Un-repairable issues that may occur in the system shall be clearly defined based on the Manufacturer's recommendations. The Contractor, together with the manufacturer, shall define the best recommended procedure for the total removal and replacement of the system.
 - 5. The Contractor shall receive no additional compensation for the repair or replacement of system deemed non-conforming to the requirements of these contract documents and unacceptable by the the Owner.

PART 2 - PRODUCTS

2.1 LATERAL SEALS

- A. General
 - 1. The system seals the point of connection from a main-line pipe to a connecting lateral pipeline and is normally installed without excavation by the install of a resin- impregnated, flexible laminate installed into the existing service lateral, lapping over the main-line pipe, sealing the connection.
 - 2. The system can be specified one of the following:
 - b. Tee/full wrap section with a full circumferential CIPP liner inside the main pipe and a tube which shall extend continuously from the sewer main into the lateral for an the Owner specified distance
 - c. Flange/brim CIPP connection seal and tube which shall extend continuously from the sewer main into the lateral for 2 ft or as specified by the Owner.
 - d. A system that is similar to those listed above and acceptable to the Owner.
 - 3. The Contractor will determine the need for a clean out on the lateral(s) specified for rehabilitation.
 - 4. The system shall be capable of sealing a combination of "tees" and "wyes" of varying angles. The resin shall be cured to form the tube into a hard impermeable pipe-within-apipe.
 - 5. When cured, the system shall seal the connection of the lateral to the mainline in a continuous tight-fitting, watertight pipe-within-a-pipe to eliminate any visible leakage between the lateral and mainline and shall provide a leak-proof seal to prevent root intrusion, infiltration, and ex-filtration between the liner and host pipe.
 - 6. Systems that use polyester and vinylester resins shall include a method of sealing the connection and the end of the laterals liner as recommended by the manufacturer of the system. The product used in the sealing method shall be installed in accordance with manufacturer's recommendations. The sealing method shall be tested by simulating groundwater pressure using a third party and stamped by an engineer.
 - 7. Systems that use silicate or epoxy shall prepare the host pipe in accordance with manufacturer's recommendations. Third party testing shall be provided to prove the bond strength between the resin and surface it is to bond to.
 - The installation of the system will require the product to be capable of installing without 8. access to the upstream side of the lateral pipe and capable of navigating bends or other transitions in alignment as identified by the the Owner in the contract bid documents.

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B. Materials

- 1. Non-woven fabric tube
 - a. The fabric tube shall consist of one or more layers of absorbent non-woven felt fabric, felt/fiberglass or fiberglass and meet the requirements of ASTM F 1216, ASTM F 1743, ASTM D 5813 & ASTM F2019. The fabric tube shall be capable of absorbing and carrying resins, constructed to withstand installation pressures and curing temperatures and have sufficient strength to bridge missing pipe segments, and stretch to fit irregular pipe sections.
 - b. The wet-out fabric tube shall have a uniform thickness and excess resin distribution that when compressed at installation pressures will meet or exceed the design thickness after cure.
 - c. The fabric tube shall be manufactured to a size that when installed will tightly fit the internal circumference, meeting applicable ASTM standards or better, of the original pipe or the existing lined pipe. Allowance shall be made for circumferential stretching during installation. The tube shall be properly sized to the diameter of the existing pipe and the length to be rehabilitated and be able to stretch to fit irregular pipe sections and negotiate bends. The Contractor shall determine the minimum tube length necessary to effectively span the designated run. The Contractor shall verify the lengths in the field prior to ordering and prior to impregnation of the tube with resin, to ensure that the tube will have sufficient length to extend the entire length of the run. The Contractor shall also measure the inside diameter of the existing pipelines in the field prior to ordering liner so that the liner can be installed in a tight-fitted condition.
 - d. The outside and/or inside layer of the fabric tube (before installation) shall be coated with an impermeable, flexible membrane that will contain the resin and facilitate vacuum impregnation and monitoring of the resin saturation during the resin impregnation (wetout) procedure.
 - e. No material shall be included in the fabric tube that may cause de-lamination in the cured CIPP. No dry or unsaturated layers shall be acceptable upon visual inspection as evident by color contrast between the tube fabric and the activated resin containing a colorant.
 - f. The wall color of the interior pipe surface of CIPP after installation shall be a light reflective color so that a clear detailed examination with closed circuit television inspection equipment may be made. The hue of the color shall be dark enough to distinguish a contrast between the fully resin saturated felt fabric and dry or resin lean areas.
 - g. Seams in the fabric tube, if applicable, shall meet the requirements of ASTM D5813. H.
 - h. The outside of the fabric tube shall be marked with the name of the manufacturer of the CIPP lateral lining system, manufacturing lot and/or production footage, as applicable. The print must be visible during final CCTV inspection.
 - i. The minimum length of the fabric tube shall be that deemed necessary by the installer to effectively span the distance specified by the Owner.
 - j. The nominal fabric tube wall thickness shall be constructed, as a minimum, to the nearest 0.5 mm increment, Wall thickness transitions, in 0.5 mm increments or greater as appropriate, may be fabricated into the fabric tube between installation entrance and exit access points. The quantity of resin used in the impregnation shall be sufficient to fill all of the felt voids for the nominal felt thickness.
 - k. The liner shall be constructed with transitions where applicable.
- C. Resin
 - 1. The resin shall be a corrosion resistant polyester, vinyl ester, silicate or epoxy resin and catalyst system and hardener system that, when properly cured within the tube composite, meets the requirements of ASTM F1216, ASTM F1743 or F2019, the physical properties herein, and those, which are to be utilized in the design of the CIPP for this project. The resin shall produce CIPP, which will comply with or exceed the structural and chemical resistance requirements of this specification.

- 2. The method of cure may either be from a manufacturer recommended heat source, light cure or by ambient temperature. Method of cure instructions along with a cure log shall be on-site at all times.
- 3. The resin to tube ratio, by volume, shall be furnished as recommended by the manufacturer.
- D. Structural Requirements
 - 1. The physical properties and characteristics of the finished liner will vary considerably, depending on the types of resin and tube used. It shall be the responsibility of the Contractor to provide a CIPP lateral lining system which meets or exceeds the minimum properties specified herein.
 - 2. The CIPP shall be designed per ASTM F1216. The CIPP design shall assume no bonding to the original pipe wall.
 - 3. The lateral CIPP shall be designed assuming the following minimum design data, unless otherwise modified by the Owner:
 - (i) Factor of Safety = 2
 - (ii) Soil Modulus = 1,000 psi
 - (iii) Soil Density = 120 pcf
 - (iv) Live Load = H20
 - (V) Depth of Cover = as specified
 - (vi) Groundwater = $\frac{1}{2}$ depth of cover
 - (vii) Ovality = 2%
 - 4. The design engineer shall set the long term (50 year extrapolated) Creep Retention Factor at 50% of the initial design flexural modulus as determined by ASTM D-790 test method. This value shall be used unless the Contractor submits long term test data (ASTM D2990) to substantiate a different retention factor.
 - 5. The cured pipe material (CIPP) shall, at a minimum, meet or exceed the structural properties, as listed below.

(i)	Flexural modulus of elasticity:	250,000 psi
(ji)	Flexural strength:	4,500 psi

6. The structural performance of the finished pipe shall be adequate to accommodate all anticipated loads throughout its design life. No cured-in-place pipe rehabilitation technology will be allowed that requires bonding to the existing pipe for any part of its structural strength.

2.2 WARRANTY

A. The materials used for the project shall be certified by the manufacturer for the specified purpose. The manufacturer shall warrant the SYSTEM materials to be free from defects in raw materials for one (1) year after installation or from the date of acceptance by the the Owner, whichever is later. The Contractor shall warrant the system for a period of one (1) year.

PART 3 - EXECUTION

- A. General
 - 1. The rehabilitation of lateral connections and a portion of the lateral pipeline shall be accomplished by the installation of a Cured-In-Place-Pipe (CIPP) system installed from the main-line pipeline extending up the specified length of the lateral. The system may or may not require the use of cleanouts on the lateral pipeline. The installed system shall be free of all defects that will affect the design, service life and operation of the lateral interface with the main-line and the specified length of the lateral pipe.
 - 2. The liner may be inverted or pulled into place from the mainline sewer.
 - 3. The installed system shall eliminate water leakage into the sewer system over the entire rehabilitated length of sewer.
 - 4. The prices submitted by the Contractor, shall include all costs for the various bid items necessary for furnishing and installing, complete and in place, the system in accordance with these specifications, except for those specified otherwise by the Owner.

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- 5. The furnished and installed system shall include all materials, manufacturer's recommended equipment and manufacturer's installation procedures.
- 6. The installed system shall be free of all defects that will affect the design, service life and operation of the lateral and applicable portion of the main-line.
- 7. The installed system shall eliminate infiltration and ex-filtration over the entire length of the system.
- 8. The system shall be designed against corrosion and typical chemicals found in domestic sewage. The manufacturer of the system shall provide testing data that supports the chemical resistance in accordance with ASTM F1216.
- 9. The mainline and lateral portion of the system shall be designed for Fully Deteriorated design conditions per ASTM F1216 as specified by the Owner. Fully deteriorated design conditions assume the CIPP liner is designed to structurally replace the host pipe completely. Wall thickness design calculations stamped by a registered professional engineer shall be submitted. All design must be supported by third party testing and documentation for the exact product that is being submitted.
- 10. Flow entering the lateral or main-line shall be bypassed if necessary for the installation of the system.
- 11. All materials furnished as part of this contract shall be marked with detailed product information, stored in a manner specified by the manufacturer and tested to the requirements of this contract.
- 12. Testing shall be executed by the contractor.
- 13. Warranty inspections shall be executed by the the Owner or its representative. Any defects found shall be repaired or replaced by the Contractor according to manufacturer's recommendations.

3.1 LATERAL SEALS

- A. General
 - 1. Lateral seals are typically installed from the lined main-line with a lateral CIPP portion that extends up the lateral at a minimum distance of 2 feet.
 - Clean-outs are recommended but <u>not</u> always required to successfully install a lateral seal. Clean-outs shall be installed at the Owner's discretion. If the Owner decides clean outs are preferred, the Owner shall specify the type of cleanout.
- B. Preparation
 - 1. Preparation, cleaning, inspection, sewage by-passing and public notification are the responsibility of the Contractor, with the assistance of the Owner. The Contractor shall clean the interior of the existing host pipe prior to installation of the system. All debris and obstructions, that will affect the installation and the final product shall be removed and disposed of. All preparation shall be inaccordance with the manufacturer's written installation procedures.
 - 2. The system shall be constructed of materials and methods, that when installed, shall provide a jointless and continuous structurally sound CIPP able to withstand all imposed static and dynamic loads on a long-term basis, as specified by the Owner.
 - 3. The Contractor may, under the direction of the Owner, utilize any of the existing manholes in the project area as installation access points or excavate access points at predetermined locations.
 - 4. Pre-Cleaning CCTV The Contractor shall request utility locating (as required by the Owner or local Government) to identify potential cross-bore utilities within the proximity of the service lateral to be cleaned for rehabilitation, if applicable. Prior to cleaning, the Contractor shall to all extents possible, televise the service lateral to confirm that cleaning the lateral will not damage or breach a conflicting utility bored through the sewer lateral (such as natural gas or power) when the utility locate indicates a potential conflict.
 - 5. The Contractor shall remove all internal debris from the pipe line that will interfere with the installation and the final product delivery of the system as required in these specifications. The Contractor shall make use of commercially available industry standard cleaning equipment to prepare the pipe for system installation. Solid debris and deposits shall be

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removed from the pipeline, if possible, and disposed of properly by the Contractor. Precaution shall be taken, by the Contractor in the use of cleaning equipment to avoid damage to the existing pipe. If the pipe cannot be cleaned sufficiently using industry standard cleaning equipment then additional cleaning will be considered changed conditions.

- 6. Post-Cleaning CCTV Upon completion of the cleaning, the Contractor shall then perform a Post-Cleaning CCTV Inspection, which typically acts as the Pre- rehabilitation CCTV Inspection. Make all necessary provisions to ensure service conditions and structural conditions of the host pipe are suitable for installation and warranty of the service connection. The Contractor shall be responsible for inspecting and confirming the inside diameter, pipe material, and alignment of the host sewer pipe, and determining the condition of each segment to be lined.
- Existing Sewage Flows The Contractor shall provide flow diversion or stoppage requirements to the Owner to assist in developing plan including notifying upstream users to temporary stop using their water/wastewater during the system installation.
- 8. Bypass Existing Sewage Flows When circumstances require continuous service, for the flow of the service connection (such as medical facilities or laboratories), the Contractor will install a temporary sewage by-pass system, if required by the Owner. Once the rehabilitation process has begun, existing sewage flows shall be maintained, until the system is fully installed. The Contractor shall coordinate sewer bypass and flow interruptions with the Owner at least 7 days in advance and with the property owners and businesses at least 1 business day in advance. The pump and bypass lines shall be of adequate capacity and size to handle typical flows.
- 9. Contractor shall perform post-cleaning video inspections of the pipelines. Only PACP certified personnel trained in locating breaks, obstacles and service connections by closed circuit television shall perform the inspection. The Contractor shall provide the Owner a copy of the pre-cleaning and post-cleaning video and suitable log, and/or in digital format for review prior to installation of the CIPP and for later reference by the Owner, if specifically required by the Owner.
- 10. Line Obstructions It shall be the responsibility of the Contractor to clear the line of obstructions that will interfere with the installation and long-term performance of the system. If pre-installation inspection reveals an obstruction, misalignment, broken or collapsed section or sag that was not identified as part of the original scope of work and will prohibit proper installation of the system, the Contractor may be directed by the Owner to correct the problem(s) prior to installing the system by utilizing open cut repair methods. This work will be considered changed conditions, or if there is an existing bid item for this work, the Contractor shall be compensated under the particular pay item designated for open cut point repairs.
- 11. The Contractor shall be responsible for confirming the locations of all branch service connections prior to installing and curing the CIPP. If required in the contract documents, each connection will be dye tested to determine whether or not the connection is live or abandoned. The cost for dye testing of existing service connections shall be compensated at the unit price bid. In the event the status of a service connection cannot be adequately defined, the Owner will make the final decision, prior to installation and curing of the liner, as to the status. Typically only service connections deemed "active" shall be reopened by the Contractor. Reinstatement in small diameter pipes typically requires a cleanout for external reinstatement.
- 12. The Contractor shall be allowed use water from an owner-approved fire hydrant in the project vicinity. Use of an approved double check backflow assembly shall be required, unless an open gap exists in the Contractor's equipment. Contractor shall provide his own approved assembly. Contractor shall pay current market price for all water usage, unless otherwise specified by the Owner.

3.2 INSTALLATION

A. The entire liner shall be wet-out using vacuum impregnation including the lateral and mainline portions.

- B. The system shall be loaded inside and/or on a pressure apparatus. The pressure apparatus, attached to a robotic device, shall be positioned in the mainline pipe at the service connection. The robotic device, together with a CCTV camera, shall be used to align the lateral portion of the system with the service connection opening. Air pressure, supplied to the pressure apparatus through an air hose, shall be used to invert or expand the resin impregnated CIPP into the lateral pipe, and push the main-line portion of the system against the main-line pipe (typically lined pipe). The pressure shall be adjusted to the manufacturer's recommended installation pressure to fully install the CIPP into the lateral pipe and hold the system tight to the pipe walls. Care shall be taken during the curing process not to over-stress the tube.
- C. After lateral CIPP installation is completed, manufacturer's recommended pressure is maintained on the impregnated CIPP for the duration of the curing process. Curing method shall be compatible with the resin selected and shall be in accordance with manufacturer's recommendations. The initial cure shall be deemed to complete when the CIPP has been exposed to the UV light, heat source or held in place for the time period specified by the manufacturer.
- D. The Contractor shall cool (if heat cured) the hardened CIPP before relieving the pressure in the apparatus. Cool-down may be accomplished by the introduction of cool air into the pressure apparatus. Care shall be taken to maintain proper pressure throughout the cure and cool-down period.
- E. If cured by ambient-cure process, the Contractor shall maintain bladder pressure until CIPP has completely cured per manufacturer's recommendations before relieving the pressure in the pressure apparatus.
- F. The finished CIPP shall be free of dry spots, lifts and de-lamination. The system shall not inhibit the closed circuit television post video inspection of the mainline or service lateral pipes. Frayed ends of the system shall be removed prior to acceptance.
- G. Contractor shall maintain a visible, written log of all activities in accordance with manufacturers' recommendations and shall include time/location of wet out, time of insertion, time/location of lateral insertion, bladder pressure requirements, required cure time, actual cure time, and cool down duration.
- H. During the warranty period, any defects which will affect the integrity of strength of the system and allow leaks shall be repaired at the Contractor's expense in a manner mutually agreed upon by the Owner.
- I. After the work is completed, the Contractor will provide the the Owner with a CCTV video verifying the completed work including the restored conditions.

3.3 FINISH

- 1. The installed system shall be continuous over the specified length of the sewer line section (including main-line and lateral) and be free from visual defects such as foreign inclusions, dry spots, pinholes, major wrinkles and de-lamination. The system shall be impervious and free of any leakage from the pipe to the surrounding ground or from the ground to inside the lined pipe.
- 2. Any defect, which will or could affect the structural integrity or strength of the system or allow leaks, shall be repaired at the Contractor's expense.
- The system shall provide a watertight seal at the connection to the main-line pipe and for the 3. length of the lateral CIPP lined. The following methods/materials are recommended for ensuring a water tight seal:
 - 100% Solids Epoxy providing an adhesive bond between the system and the host pipe, a. installed/applied per the manufacturer's recommendations.
 - Hydrophilic materials installed/applied per the manufacturer's recommendations. h
- Branch lateral connections or any other pre-existing connection to the service lateral shall be 4. reinstated by a remote controlled robotic cutting device, either from within the pipeline or externally through a cleanout. The reinstated connection shall be brushed to allow for a smooth edge.

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5. Cured samples of the CIPP may be required for testing physical properties in accordance with the requirements specified herein. The test shall be performed by an independent 3rd party laboratory, if required by the Owner and as recommended by the system manufacturer.

3.4 SAFETY

- 1. The Contractor shall conform to all work safety requirements of pertinent regulatory agencies, and shall secure the site for working conditions in compliance with the same. The Contractor shall erect such signs and other devices as are necessary for the safety of the work site.
- 2. The Contractor shall perform all of the Work in accordance with applicable OSHA safety standards. Emphasis shall be placed upon the requirements for entering confined spaces.
- 3. The Contractor shall have on the job site at all times at a minimum the following safety equipment:
 - a) Gas monitor capable of testing and detecting for combustible gas, oxygen deficiency and hydrogen sulfide.
 - b) Confined space access and retrieval winch system.
 - c) Ventilating fans with large diameter ventilating hose.
 - d) Safety harness and life lines.
 - e) Other equipment as may be required for a specific project
 - f) All equipment to be available for use, in sufficient quantity, by the Contractor, Engineer and the Owner for the duration of the project.
- All entries into or work within confined spaces shall be conducted in accordance with the U.S. Department of Health and Human Services/National Institute for Occupational Safety and Health [DHHS (NIOSH)] Publication No. 87-113, A Guide to Safety in Confined Spaces.

PART 4 - MEASUREMENT AND PAYMENT

- A. Measurement and Payment for cleaning and CCTV necessary for the completion of the work will not be paid for directly, but shall be considered incidental to the unit bid price for each sewer lateral liner installed.
- B. Measurement and Payment for the installation of the CIPP lateral liner shall be based on the unit price per each as scheduled in the Bid Schedule.

END OF SECTION

SECTION 33 01 30.77 CHEMICAL GROUTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Providing all labor, tools, materials and equipment necessary to install chemical sealing at defective pipe joints, cracks, the annular space between the rehabilitation material and host pipe at reinstated lateral openings, and other small defects to reduce or eliminate groundwater infiltration. This work shall be in accordance with American Society for Testing and Materials (ASTM) F 2304-03 "Standard Practice for Rehabilitation of Sewers Using Chemical Grout."

B. Related Specification Sections include but are not necessarily limited to:

- 1. GWA Bid Submission Requirements
- 2. GWA Standards General Conditions of the Construction Contract
- 3. GWA Supplementary Conditions
- 4. Division 01 General Requirements
- 5. Section 33 01 30.11 Television Inspection of Sewers
- 6. Section 33 01 30.41 Cleaning of Sewers and Manholes
- 7. Section 33 01 30.72 Water and Steam Cured-in-Place Pipe Lining
- 8. Section 33 01 30.73 Ultraviolet (UV) Light Cured-in-Place Pipe Lining
- 9. Section 33 37 23 Sewer Flow Control

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. ASTM International (ASTM):
 - a. F2304-10, Standard Practice for Sealing of Sewers Using Chemical Grouting

1.3 SUBMITTALS

- A. General
 - 1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
- B. Product Qualification
 - 1.

1.4 SUBMITTALS

A. In addition to equipment and material submittals required elsewhere in this Special Provision, the Contractor shall submit pump calibration information, field sealing records, certification of pressure sensing/monitoring equipment, current documentation of Contractor's compliance with product manufacturer's Safe Operating Practices Procedures (SOPP) as approved by EPA and/or OSHA and/or HIOSH. Further, upon request, the Contractor must submit proof of chemical supplier's product liability insurance.

1.5 DELIVERY, STORAGE AND HANDLING

A. Contractor shall deliver materials to the job site in undamaged, unopened containers bearing manufacturer's original labels. Materials used as chemical sealant shall be transported, stored, and placed in manner prescribed by manufacturer of those materials, as detailed in published data provided by manufacturer.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Product Qualifications:

- 1. Chemical sealant shall have a documented service of successful performance in similar usage, with a minimum of 2,000 joints sealed. Contractor shall submit a notarized letter from the chemical sealant manufacturer indicating that this requirement has been met.
- 2. Chemical Sealant
 - a. Chemical Grout

Grout used shall be Avanti AV-118 acrylic resin or De Neef Construction Chemicals AC 400. Contractor shall provide all components of the solution which make up the completed resin. After final reaction, it shall be a stiff, impermeable, yet flexible gel. Grout shall make true solution at concentrations as high as three pounds per gallon of water. Solutions shall have ability to accept dilution by groundwater of at least 50% by volume, without significantly changing sealing ability of the gel when at rest or in motion. Solutions shall gel in a predetermined time when exposed to normal groundwater pH ranges, and be capable of formula adjustments to compensate for changing conditions. Final reaction shall produce a continuous, irreversible, impermeable stiff gel at chemical concentrations low as 0.4 lbs per gallon of water that is able to break away from the joint sealing packer when the packer is deflated. Gel shall not be rigid or brittle. Gel shall have negligible corrosion rate on mild steel plates.

3. Non-Chemical Grout

Any request to substitute a non-chemical grout shall be subject to review and approval by the Owner.

4. Insoluble (Particulate) Additives

Inactive solids such as diatomaceous earth may be mixed with sealant by Contractor as filler only upon written approval of the Owner.

5. Water shall be potable.

PART 3 - EXECUTION

3.1 EQUIPMENT

- A. The Contractor shall provide equipment consisting of closed-circuit television (CCTV) systems, necessary chemical sealant containers/tanks, pumps, regulators, valves, hoses, etc. and joint sealing packers for appropriate sizes of pipe designated to receive chemical grouting. The packer shall be cylindrical and have a diameter less than the pipe size. The packer shall be constructed in a manner to allow restricted amounts of sewage to flow and shall be pneumatically operated. Hydraulically or mechanically expanded devices shall not be permitted.
- B. To test the accuracy, integrity, and performance capabilities of sealing equipment units, the Contractor shall perform a demonstration test in a test cylinder constructed so that a minimum of two known leak sizes can be simulated. Contractor shall provide test cylinders and pressure gauges. Contractor shall perform the demonstration test for each chemical sealing unit prior to beginning work. This technique will establish test equipment performance capability in relationship to test criteria and ensure that there is no leakage of the test medium from the system or other equipment defects.

3.2 CLEANING

- A. Prior to the application of chemical sealing materials, the Contractor shall thoroughly clean the sewer segment designated for chemical sealing work. Cleaning shall include the removal of all debris, solids, and other deposits in the sewer line; particularly at the pipe joints, cracks or other areas designated for the grouting work.
- B. The sewer segment shall be clear of obstructions such as dropped joints, protruding lateral connections, and broken/crushed pipe which will prevent the use of the grouting equipment.

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3.3 SEWER FLOW CONTROL

A. Any sewer flow control and bypassing pumping around the segment designated for sealing work shall be reviewed by GWA.

3.4 CHEMICAL SEALANT APPLICATION FOR SEALING JOINTS

- A. Repairs shall be conducted at joints, cracks, and other areas where groundwater infiltration is identified. The repair will be such that the original cross-sectional area and shape of the interior of the sewer pipe shall not be permanently reduced orchanged.
 - 1. Placement of Chemical Sealant
 - a. Contractor shall position the sealing packer over the area of infiltration by means of a metering device at the surface and closed circuit television camera in the line. Accurate measurement of the location of the defect to be sealed shall be made using the portion of the sealing packer as "Datum" or measurement point or target. Such measurement to the target shall also be used to obtain necessary measurement for positioning the injection area of sealing packer over area to be sealed.
 - b. Contractor shall expand the sealing packer sleeves using controlled pressures. Expanded sleeve shall seal against the inside periphery of pipe to form a void area at the point of infiltration, completely isolated from the remainder of the line. Contractor shall pump sealant materials into this isolated area through hose systems at controlled pressures which are in excess of groundwater pressures. Contractor shall pump as much sealant material as is field-required to seal any leaks and fill the voids. Sealant material shall break away from the packer and stay in place when the packer is deflated and moved from the point of infiltration.
 - c. Upon completion of all grouting required along a sewer segment, CCTV shall be used to verify that the infiltration at the sealed locations have been eliminated or adequately reduced as determined by the Owner. Should it be determined by GWA that the sealing work does not meet the requirements of the Contract Documents, the Contractor shall reseal the defective locations at no additional cost to the Owner. Additional video inspection shall be conducted at no additional cost to the Owner, and shall be conducted as many times as it is necessary until it has been documented that the sealing work has been satisfactorily completed.
 - d. After sealing the entire sewer section, Contractor shall remove surplus sealant material from section at the immediate downstream manhole. If surplus sealant materials left in the sewer section by Contractor results in sewer surcharging and subsequent damage to public or private property, Contractor shall beresponsible for repairing all of the damage at his own expense.
 - 2. Gel Checks
 - a. Contractor shall make gel checks daily for each sealing vehicle to monitor both induction period and gel characteristics. Contractor shall also make checks for everymixed batch or at least twice per day if only one batch is used. The Owner reserves the right to request adjustment of gel times or reject entire batch if acceptable gel characteristics do not exist. Periodic gel checks shall also be made in the pipe (at request of the Owner) by seating the sealing packer on the pipe barrel and filling the packer void with sealant solutions. Pressure will then be monitored until a rise in pressure is observed, indicating that sealant has gelled in the packer void. Contractor shall certify, for each of the sealing vehicles, results of required gel check.
 - 3. Field Records
 - a. Contractor shall keep field records for each sewer section prior to, during, and after completion of chemical sealing operation. Records shallinclude information such as accurate locations, gel times, sealant volumes, pressures, air temperatures, and joints not sealed due to close proximity to building service connections and sewer manholes.

3.5 WARRANTY

A. The Contractor shall guarantee the sealing of the pipe joint by the sealant for one full year from the date of acceptance to the extent that he will repair and/or re-seal any defects including, but not limited to, root penetration, signs of infiltration, and cracks in the pipe or sealing material, which may appear in the structure because of faulty design, workmanship, or material.

3.6 SAFETY

A. Contractor shall be solely responsible for safety during the performance of all work. Contractor shall take satisfactory precautions to protect the sewer segments and appurtenances from damage that might be inflicted upon them by the use of grouting equipment. Any damage inflicted upon a sewer segment or other public or private property as a result of the Contractor's sealing operations, regardless of the sealing method used and regardless of any other circumstances which may contribute to damage, shall be repaired by the Contractor is his sole expense.

PART 4 - MEASUREMENT AND PAYMENT

4.1 CHEMICAL SEALANT

- A. Measurement and Payment for the installation of the chemical grouting shall be based on the unit price per each individual installation for up to 1 gallon of successfully installed grout as scheduled in the Bid Schedule. Payment shall include full compensation for all labor, materials, supplies, equipment, tools, and all incidentals for the complete installation of the chemical sealant. Mobilization/demobilization costs related to chemical sealing work shall also be included into the unit price as scheduled in the Bid Schedule.
- B. Measurement and Payment for the installation of the chemical grouting over 1 gallon, shall be based upon the unit price for each gallon of successfully installed grout as scheduled in the Bid Schedule. Payment shall include full compensation for all labor, materials, supplies, equipment, tools, and all incidentals for the complete installation of the chemical sealant.

4.2 CCTV, CLEANING, SEWER FLOW CONTROL

A. Measurement and Payment for any required closed circuit television (CCTV), sewer line cleaning and/or sewer flow control required will not be measured and paid for directly, but shall be considered incidental to the unit bid prices for the installation of chemical grout.

END OF SECTION

SECTION 33 37 23 SEWER FLOW CONTROL

PART 1 - GENERAL

- A. Section Includes: Providing all labor, tools, materials and equipment necessary to control and bypass sewage flows in manholes, sewers, and laterals in order to perform the rehabilitation and reconstruction work required under the Contract. This section also specifies trailer mounted bypass pumping equipment and road ramps for use by the contractor that will be turned over to GWA at the end of the project.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. GWA Bid Submission Requirements
 - 2. GWA Standard General Conditions of the Construction Contract
 - 3. GWA Supplementary Conditions
 - 4. Division 01 General Requirements

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. ASTM International (ASTM):
 - a. D2657, Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings
 - b. F714, Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter
- B. Contractor Qualifications
 - 1. The pumping and bypassing contractor/subcontractor shall have successfully performed a minimum of two projects requiring pumping and bypassing of sewer lines in commercial and industrial areas.
 - 2. The pumping and bypassing contractor/subcontractor shall have all personnel performing the operation to be certified by the Guam Environmental Protection Agency (GEPA) as either an Operator in Training or a Wastewater Collection Operator Level I and have the operation supervised by a GEPA certified Wastewater Collection Operator Level II.

1.3 SUBMITTALS

- A. General
 - 1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
- B. Contractor Qualifications
 - 1. The Contractor shall submit documentation of his meeting the minimum requirement described in Paragraph 1.2.B within fifteen (15) calendar days of the Notice to Proceed date.
 - a. The documentation shall include name of project, name and address of owner, owner contact person and phone number, description of project and pumping/bypass work, and letters of confirmation and project completion from owner.
 - 2. The Contractor shall submit documentation of his meeting the minimum requirement described in Paragraph 1.2.B.2 within thirty (30) calendar days of the Notice to Proceed date to both the Owner and GEPA.
 - a. The documentation shall include the name of the individual, level of certification and certification number. The Contractor may coordinate with GEPA's Chief Engineer to authorize a special examination to certify any individuals meeting the requirements as described by GEPA for any of the Operator in Training, Wastewater Collection Operator Level I or II certifications.

- C. Sewage Diversion and Bypass and Pumping Plan
 - 1. At least thirty (30) calendar days prior to the planned start of actual construction activities, the Contractor shall prepare and submit for approval to the Owner a proposed sewage diversion and bypass pumping plan. The Contractor's proposed sewage diversion and bypass pumping plan shall include, but not be limited to, a sewer system map showing all sewer inverts, temporary and permanent trench restoration details, the anticipated sewage water level and rim elevations at manholes (record drawing information may be used, however, the Contractor shall adjust the elevations to reflect a common survey datum) in the areas affected by any diversion, anticipated peak sewage flows, and locations of plugs, pumps, piping, and monitoring sites for each stage of construction.
 - 2. All sewer pumper trucks or tanker trucks used to bypass any wastewater flow, whether it is part of the bypassing plan or as a backup in case of a bypass emergency, shall be licensed by GEPA. A listing of all pumper trucks or tankers, including name and a copy of the license shall be included in this plan.
 - 3. The Contractor shall submit a contingency plan that outlines the actions to be taken in the event that any sewage spills should occur.
 - 4. Pumping equipment, piping, and any other appurtenant equipment and tools to be used shall be listed in this plan.
 - 5. The Contractor's sewage diversion and bypass pumping plan shall be approved by GEPA and the Owner before any diversion of sewage flows will be allowed.
- D. Traffic Control Plan
 - 1. Modifications made to the traffic control plans in the Contract drawings for Department of Public Works Highway Encroachment Office permit.
- E. Bypass Pumps and Traffic Ramps
 - 1. Contractor shall submit complete details for the two trailer mounted bypass pumps and road ramps that will be turned over to GWA. Details for the pumps shall include manufacturer catalog cut sheets, pump specifications, pump curves, engine specifications, materials of construction design capacity, dimensions and other information necessary to describe the equipment to be provided.
 - 2. Road Ramps shall include manufacturer cut sheets, dimension drawings and materials of construction

1.4 GENERAL REQUIREMENTS

- A. Traffic Control Plan
 - 1. Traffic control plans have been provided in the Contract drawings and conform to the applicable provisions of the "Manual on Uniform Traffic Control Devices for Streets and Highways" (MUTCD), as amended, published by the Federal Highway Administration and are provided as examples. Actual traffic control plans required by the Department of Public Works Highway Encroachment Office may require modifications for permit approval and are the responsibility of the Contractor and shall be paid for by the Contractor.
 - 2. Obtaining approvals and permits from the Department of Public Works Highway Encroachment Office, shall be the responsibility of the Contractor. All permit fees will be the responsibility of the Contractor.
 - 3. The Sewage Diversion and Bypass and Pumping Plan, if required by the Department of Public Works Highway Encroachment Office, shall be submitted with the Highway Encroachment Permit Application.
- B. Existing Cleanouts
 - 1. Existing cleanouts have not been located for any lateral connections being serviced by the sewer line.
- C. Safety
 - 1. Sanitary sewers convey sanitary sewage and certain substances which may be considered hazardous. These substances may include hydrogen sulfide, a natural gaseous byproduct of sanitary sewage.

- 2. The Contractor shall exercise extreme caution and comply with all applicable Federal and local regulations and all applicable OSHA requirements when performing the required sewer work or when in the vicinity of any hazardous substances.
- D. Notification

The Contractor shall notify the general public, property owners, government agencies, mayor's office, etc., of the sewage bypass piping and/or diversion pumping. General public notification can be coordinated with the Owner's Public Information Officer (PIO) as specified in Section 01 13 00. In addition, the Contractor shall notify the Owner at least fourteen (14) calendar days prior to the start of sewage bypass piping and/or diversion pumping to schedule the disconnect of the existing sewage bypass system.

PART 2 - PRODUCTS

2.1 SEWER BYPASS PIPING

- A. All bypass discharge piping shall be (HDPE) and conform to the following requirements:
 - 1. All high density polyethylene (HDPE) pipes shall meet the requirements of ASTM F714 DR rating of the pipe shall be sufficient to withstand the pressure and leakage test outlined below.
 - 2. HDPE pipe shall be furnished in standard laying lengths not exceeding 50 feet.
 - 3. Assembled and joined at site using couplings, flanges or butt-fusion method to provide leak proof joint. All joints shall be made in strict compliance with the manufacturer's recommendations and ASTM 2657.
 - a. Threaded, solvent joints or quick connect joints and connections will not be permitted on HDPE bypass piping.
 - 4. HDPE fittings shall be fully pressure rated to match the pipe DR pressure rating.
- B. The Contractor shall perform leakage and pressure tests of the bypass pumping discharge piping using clean water prior to the actual operation. The pressure and leakage test shall be conducted at one and a half times the maximum pressure the system will experience based on the approved Bypass Pumping Plan for a period of two hours. No leakage is permitted during the test. The Construction Inspector will be given 24 hours' notice prior to testing. In addition, the Contractor shall demonstrate that the pumping system is in good working order and is sufficiently sized to successfully handle flows by performing a test run for a period of 24 hours prior to beginning the Work.
- C. All other pipe materials to be considered shall be approved for use by the Owner prior to Contract Award.

2.2 SEWER BYPASS EQUIPMENT

- A. Sewer Bypass Pump(s)
 - 1. Contractor shall provide a minimum of two (2) new bypass pumps that ownership and any remaining warranty shall be transferred to the Guam Waterworks Authority at the project completion.
 - 2. Each bypass pump shall be capable of pumping a minimum of 800 GPM.
 - 3. Bypass pump shall be a Waste Trash Flow Dry Prime Pumps TFV or approved equal and shall be trailer mounted.
- B. Sewer Bypass Ramp(s)
 - 1. Contractor shall provide a minimum of two (2) new bypass pump ramps that ownership and any remaining warranty shall be transferred to the Guam Waterworks Authority at the project completion.
 - 2. Bypass Ramps shall be a minimum of 20 feet in length.
 - 3. Bypass Ramps shall be sized to allow a minimum of 800 GPM to be pumped through the ramp.
- C. Other Sewer Equipment

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Asan-Adelup-Hagatna - Route 1 Sewer Rehabilitation and Replacement - Phase II SEWER FLOW CONTROL 1. Other sewer bypass pump, ramps and/or other devices necessary to successfully complete the work, will not be transferred to the Guam Waterworks Authority and shall remain with the Contractor.

PART 3 - EXECUTION

3.1 SEWAGE DIVERSION AND BYPASS PUMPING DESIGN REQUIREMENTS

- A. Plugging and Blocking
 - 1. Temporary sewer line plugs may be inserted into the line at an upstream manhole location. The plug shall be designed so that a portion of the sewage flow can be released as may be required. During the work, flows shall be controlled and shall be either completely shut off or reduced sufficiently to allow proper performance of the Contract work.
- B. Pumping and Bypassing
 - 1. Pumping equipment, piping, and any other appurtenant equipment and tools shall be furnished and placed by the Contractor to bypass the sewer segment(s) where the work is being performed.
 - a. Standby pumps of equal size shall be on-site during pumping operations.
 - b. All pumps must be capable of pumping the wet weather peak flows. Calculated and monitored dry weather peak flow values have been provided on the construction plans. The Contractor is responsible for bypassing the complete dry and wet weather flow.
 - c. A standby pump equal in size to the largest primary pump shall be on-site during bypass pumping operations.
 - 2. Bypassing shall completely isolate and restrict flow within the segment or segments being repaired or rehabilitated. Therefore, in cases of CIPP rehabilitation or some repairs, both the upstream and downstream segments of the rehabilitated segment(s) shall *also* be bypassed to perform the rehabilitation and reconstruction work required under the Contract.
 - 3. While the bypass pumps may use electrical power (arranged by the Contractor) to keep the noise level within permitted limits, standby bypass pumps shall be engine-driven and will be permitted to be used at all locations during emergency operating conditions when there are power outages or normal duty pump malfunctions.
 - a. No standby bypass pumps shall be connected to an electrical power source.
 - 4. All pumped sewage shall be enclosed in piping that is adequately protected from the public and traffic and shall be redirected into the sanitary sewer system.
 - a. Temporary bypass piping may be laid on the ground surface where it is not an obstruction to vehicles and pedestrians, but shall be pinned firmly in place to prevent movement and/or breakage during usage.
 - b. Where the temporary bypass piping poses an obstruction to vehicles and/or pedestrians, the piping shall be buried or a ramp shall be provided to allow vehicles to cross over.c. Bypass
 - 5. For piping crossing over walls and over or around other obstacles, the Contractor shall consider reaction and water hammer forces at bends, and piping shall be properly supported and anchored to prevent movement, injury to personnel, and pipe stresses that can lead to pipe failure.
 - a. The Contractor shall note the condition of walls and other structures prior to beginning his work, and shall be responsible for repairing any damage caused by his operations.
 - b. Laying of bypass lines in easements shall be coordinated with property owners.
- C. Pumping and Bypassing at Cleanouts
 - 1. Pumping, bypassing and collecting of sewage shall be performed by inserting a suction line into the building sewer cleanout located in private property.
 - 2. The Contractor shall make a "good faith effort" to locate all buried cleanouts.
 - 3. If a building sewer cleanout is buried, the Contractor shall perform the necessary work to locate and expose the cleanout to complete the sewage flow bypass or collection work.

- 4. The cost for locating and exposing buried or lost cleanouts for bypassing, collecting and disposing sewage from residences and surface restoration shall be considered incidental to sewer flow control work.
- 5. Should a cleanout be deemed missing and needed for bypassing operation, the Contractor shall notify the Owner immediately.
- 6. Where sewer flow controls are used, precautions shall be taken to ensure that water levels do not create backups nor cause damage or flooding to any public or private properties. Any such damage, claims or fines due to the Contractor's operations shall be repaired, cleaned or compensated at the sole expense of the Contractor. In the event of a spill, the Contractor shall notify the Owner immediately and supply upon request, by the Owner's Public Information Officer, any pertinent data required for public notification.
- D. Vehicular and Pedestrian Traffic Requirements
 - 1. Safe passage of pedestrian and vehicular traffic must be ensured through and around all bypassing equipment and materials through the use of barriers, warning signs, etc. All temporary bypass piping joints and connections shall be positively sealed with no leaks occurring.

3.2 PRE AND POST BYPASS INSTALLATION REQUIREMENTS

- A. Pre-Installation Testing
 - 1. A trial diversion shall be performed one day before beginning rehabilitation work unless otherwise directed by the Owner.
 - 2. Trial diversion shall continue for two (2) consecutive hours in the presence of the Owner.
 - 3. Pumping equipment and piping shall be leak tested with potable water prior to pumping sewage.
- B. Operational Requirements
 - 1. Where sewer flow controls are used, precautions shall be taken to ensure that sewer water levels do not create backups, damages, or flooding of public or private properties.
 - 2. Damages caused by the Contractor's operations shall be repaired and cleaned by the Contractor at no cost to the Owner.
 - 3. The Contractor shall also be responsible for the settlement of all claims for damages resulting from his work or actions.
 - 4. Sewage flowing by gravity shall not be allowed to flow higher than the top of the crown of the flowing sewer pipe at any manhole as a result of construction or diversion activities, unless approved by the Owner. No diversion shall be implemented or left in place once the sewage level reaches aforementioned limits.
- C. Monitoring Requirements
 - When the sewage bypass system is in operation, the Contractor shall ensure that the system is continuously manned, operated, monitored and maintained by a GEPA certified Operator in Training or Wastewater Collection Operator Level I, specifically trained and experienced in all aspects of such systems and the operation is supervised by a GEPA certified Wastewater Collection Operator Level II. Standby pumps shall be checked, maintained, and started up periodically to ascertain their operational status.
 - 2. The Contractor shall inspect pumping equipment and piping for leaks at all times. Leak detection shall be performed any time the bypass pumping system is disassembled, reassembled or modified. No leaks in the diversion piping shall be permitted. Any fines resulting from sewage spills due to the Contractor's work shall be the total responsibility of the Contractor.
 - 3. The Contractor shall continuously monitor the sewage water level elevations in cleanouts or manholes upstream and downstream of the Project area and at any discharge manhole where flow is being diverted or pumped to. The Contractor shall obtain approval from the Owner of all monitoring locations prior to commencing the bypassing or diversion of any sewage flows.
 - 4. The Contractor shall be responsible for monitoring for high sewage flow conditions and for temporarily suspending his sewage flow control activities if conditions warrant it. The

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Contractor shall also temporarily suspend his sewage flow control activities if so directed by the Owner. On-going Project work that requires sewage flow control shall be suspended until the conditions and the Owner allow for the resumption of the sewage flow control activities.

- 5. In the event of an emergency, the Contractor shall be capable of immediately removing all diversion plates, bypass pumps, bypass piping, or any portions of diversion and bypass pumping equipment and materials as may be required.
- D. Restoration Requirements
 - 1. Following the completion of each section of sewer line replacement or rehabilitation work, the Contractor shall remove all diversion and bypass pumping equipment and piping and the area shall be restored to its original or better condition.

3.3 CLEANING REQUIREMENTS

A. When bypass pumping operations are complete, the Contractor shall drain the temporary bypass piping into the sewer prior to removal. The Contractor shall also provide drip pans or containers as needed to capture the drips and spills of wastewater that can occur when the temporary bypass piping is dismantled.

3.4 REQUIREMENTS FOR BYPASS EQUIPMENT TO BE TURNED OVER TO GWA

A. When bypass pumping operations are complete, the Contractor shall clean the bypass pump equipment and road ramps for turnover to GWA. The Contractor shall operate each pump in the presence of the Owner or Owners representative to demonstrate that the pumps are in working condition prior to turnover to GWA. If any pumps are not operational, the Contractor shall complete the necessary repairs and demonstrate operability before turnover.

3.5 MEASUREMENT AND PAYMENT

- A. Lump sum payment for sewer flow control work shall be as specified in the Bid Schedule and shall be full compensation for furnishing all materials, tools, equipment, labor and incidentals necessary to complete plugging, diversion, and pumping of sewage flows required to complete CIPP installation and pipe replacement, including, but not limited to, preparing and obtaining approvals for a sewage diversion and bypass pumping plan, temporary bypass and standby pumps, inserting and removing pipe plugs, constructing bulkheads, pumping, monitoring water surface levels, installing and removing bypass and diversion piping, bypassing at sewer laterals, manhole modifications, trenching, pavement demolition, excavation, trench cover, plating, backfilling, compacting, temporary and permanent repaving, trench and site restoration, and design, approval, and implementation of traffic control for bypass operation, and dewatering as needed.
- B. The cost for bypassing, collecting and disposing sewage from residences shall be considered incidental to sewer flow control work.

END OF SECTION

Part D

Reference Documents



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Asan-Adelup-Hagatna, Route 1 Sewerline Rehabilitation and Replacement – Phase II GWA Project No. S15-002-EPA IFB-06-ENG-2020 RFI Response No. 2 to Contractor Inquiries

This Addendum and/or Response to Request for Information (RFI) is issued to modify the previously issued bid documents and/or given for informational purposes and to the extent the responses below modify the bid documents, please treat them as an amendment to the Bid. The following responses are in response to RFIs received.

	REFERENCE	QUESTION/INQUIRY AS SUBMITTED:	GWA RESPONSE:
Questions f	rom July 17, 2	020	
1		Unit Price Bid Form has a pay item for different kinds of cleaning requirements. If heavy cleaning is required based on the field conditions, Will GWA use the contractor daily reports in computing the time impact?	Contractor shall reference Specification 33 01 30.41 for the definitions, requirements of each pay item, required documentation, and the measurement and payment clauses for each bid pay item.
2		GTA is requiring the contractor to get the clearance from them every 10 days. This is unreasonable for a contract that is for a period of 425 days. Will GWA get a waiver of this requirement?	GTA has established their own clearance requirements, which the Contractor shall be expected to follow. This contract is primarily going to consist of Cured-In-Place-Piping, therefore it is not expected that all 425 days of the base bid will require GTA clearance markings to be conducted every 10 days.
3		In case bypass pump operations extend beyond the contractual requirements, will Contractor be paid for the bypass pump, materials and labor used for bypass operations?	Contractor shall reference Article 11 of the General Conditions and as amended by the Supplementary Conditions.
4		Item No. 6 in the Unit Price Bid Form has a quantity of 1,096 Lin. Ft. But, we came up with 410 Lin. Ft. Please clarify.	Please see revised unit price bid form.

	REFERENCE	QUESTION/INQUIRY AS SUBMITTED:	GWA RESPONSE:			
Questions f	Questions from July 23, 2020					
5		Sections 33 01 30.72, 3.3, D & 33 01 30.73, 3.3, D limit the height of wrinkles in the finished CIPP to 2% or 0.25" below the springline and 4% or 0.5" above the springline. Will the Owner revise these sections to allow for wrinkles of 5% below the springline and above?	No changes to these requirements will be made.			
6		33 01 30.73, 1.5, B - Will the Owner please revise the CIPP contractor experience requirements for UV cure CIPP to 30,000 LF and/or 100 segments installed in pipes of 18" and larger.	The qualification requirements for the Contractor will not be revised. Note that experience requirements are not specific to UV Cured CIPP.			
7		33 01 30.73, 1.5, B - Will the Owner please revise the CIPP supervisor experience requirements for UV cure CIPP to 10,000 LF and/or 30 segments installed in pipes of 18" and larger.	The qualification requirements for the CIPP Supervisor will not be revised. Note that experience requirements are not specific to UV Cured CIPP.			
8		33 01 30.73, 2.2, E - Will the Owner please remove the requirement for vacuum resin impregnation techniques for UV cure CIPP. Vacuum resin impregnation techniques are not typically used in UV cure CIPP manufacturing.	See revised specification 33 01 30.73 attached to this addendum.			
9		Please allow for a mainline grouting bid item as a mechanism for payment for mainline grouting, if required to address infiltration prior to lining.	Please see added specification 33 01 30.77 and revised bid schedule attached to this addendum.			
10		When are the additive bids to be awarded?	GWA will award additive bids in any number and combination as they determine along with the base bid that fits within the budget of the project.			

Bidders are also notified to visit GWA website: <u>www.guamwaterworks.org</u> to ensure that addenda to the bid, answers to questions, and reminders are communicated to all bidders throughout the solicitation process.

maril

MIGUEL C. BORDALL, P.E. General Manager

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