

GENERAL CONDITIONS

IT IS INTENT OF THIS CONTRACT TO PROVIDE ALL LABOR, MATERIAL AND EQUIPMENT TO DIGITALLY SCAN, INSPECT, CLEAN, SURVEY AND REPAIR IF REQUIRED, BY THE USE OF PNEUMATIC INJECTION, GROUT OR PVC LINING ACTUAL UNDERGROUND SANITARY SEWERS RANGING FROM 2” THROUGH 108” AND STRUCTURES, WITHIN SUFFOLK COUNTY, UNDER THE DIRECTION OF THE SUFFOLK COUNTY DEPARTMENT OF PUBLIC WORKS, DIVISION OF SANITATION. THE CONTRACTOR SHALL BE PREPARED TO PERFORM THE NECESSARY WORK AT THE SITE WITHIN FOUR (4) HOURS NOTICE FOR ALL EMERGENCIES. ANY OTHER REQUESTED WORK THE CONTRACTOR MUST START NO LATER THAN FIVE (5) DAYS AFTER REQUEST. (THE ONLY EXCEPTION WILL BE IF MATERIALS MUST BE ORDERED AND A COUNTY REPRESENTATIVE MUST APPROVE AUTHORIZATION FOR DELAY). THE CONTRACTOR FOR SUCH NOTIFICATION SHALL PROVIDE A TWENTY-FOUR (24) HOUR TELEPHONE NUMBER. UPON NOTIFICATION, THE CONTRACTOR WILL BE INFORMED OF THE SPECIFICS OF WORK TO BE PERFORMED.

WORK INCLUDED

THE CONTRACTOR SHALL FURNISH ALL LABOR, MATERIALS, PLANS, POWER, LIGHT, HEAT, WATER, TOOLS, APPLIANCES, EQUIPMENT, SUPPLIES AND OTHER MEANS NECESSARY FOR PROPERLY PERFORMING AND COMPLETING THE WORK IN STRICT ACCORDANCE WITH THE SPECIFICATIONS AND TO THE SATISFACTION OF THE OWNER IN THE MANNER BEST CALCULATED TO PROMOTE RAPID COMPLETION OF THE WORK, CONSISTENT WITH THE PROTECTION OF LIFE AND PROPERTY. THE CONTRACTOR SHALL COMPLY WITH ALL FEDERAL STATE, COUNTY AND MUNICIPAL LAWS, ORDINANCES AND REGULATIONS PERTAINING TO THE PERFORMANCE AND CONDUCT OF THE WORK. THE OWNER WILL PROVIDE WHEN NECESSARY, CLEANING, PUMPING AND BYPASSING.

QUALIFICATIONS

THE CONTRACTOR SHALL FURNISH PERSONNEL WITH A MINIMUM OF THREE (3) YEARS EXPERIENCE IN THE FIELD OF PIPELINE AND STRUCTURE REPAIR BY THE MEANS OF PNEUMATIC INJECTION GROUTING AND DSET INSPECTION. ALL PERSONNEL SHALL HOLD PACP CERTIFICATION FOR DIGITAL PIPE EVALUATIONS. ALL PERSONNEL WHO ARE EXPECTED TO COME IN CONTACT WITH CHEMICAL GROUT SHALL HAVE PROOF OF CERTIFICATION BY THE MANUFACTURER CERTIFYING THAT THEY HAVE ATTENDED TRAINING CLASSES AND HAVE RECEIVED A CERTIFICATE FOR ACRYLAMIDE EXPOSURE.

SECTION 1 – GENERAL DESCRIPTION**SECTION 2 – DIGITAL SCAN/SIDE SCAN EVALUATION TECHNOLOGY IN SEWERS****SECTION 3 – PNEUMATIC INJECTION GROUTING****SECTION 4 – EMERGENCY SEWER REHABILITATION PVC DEFORMED PIPE LINER****SECTION 5 – MANHOLE REHABILITATION****SECTION 6 – BYPASS PUMPING****SECTION 7 – PRICING**

SECTION 1 – GENERAL DESCRIPTIONS**1.1 WORK INCLUDED**

- A. THE CONTRACTOR SHALL TAKE PRECAUTIONS TO PREVENT THE BACKUP OF SEWAGE INTO HOUSES OR STREETS AND SHALL BE RESPONSIBLE FOR ANY DAMAGE TO SAME.
- B. THE CONTRACTOR’S ATTENTION IS DIRECTED TO THE FACT THAT ALL WORK IS BEING PERFORMED IN ACTIVE SEWERS, AND IT IS NECESSARY TO MAINTAIN UNINTERRUPTED SEWAGE FLOW THROUGHOUT THE ENTIRE CONTRACT PERIOD. **CLEANING OF STRUCTURES AND PIPELINES SHOULD BE SCHEDULED WITH COUNTY PERSONNEL AND EQUIPMENT, IF COUNTY PERSONNEL AND EQUIPMENT ARE NOT AVAILABLE, VENDOR WILL SUPPLY CLEANING EQUIPMENT AND DISPOSAL OF MATERIALS. CLEANING NEEDS MUST BE DOCUMENTED BY DIGITAL PHOTOGRAPH AND SURVEYED BY COUNTY PERSONNEL.** THE CONTRACTOR SHALL FURNISH ALL EQUIPMENT, MATERIALS AND LABOR AS NECESSARY TO PERMIT DIGITAL SCANNING OR SIDE SCANNING OF PIPELINES AS REQUIRED HEREIN.

1.2 SAFETY REQUIREMENTS

- A. THE CONTRACTOR’S ATTENTION IS DIRECTED TO THE FACT THAT HARMFUL AND TOXIC VAPORS MAY EXIST WITHIN THE MANHOLES AND SEWERS AND THEY ARE, THEREFORE, CONSIDERED A CONFINED SPACE. THESE VAPORS WILL POSE A HAZARD TO WORKMEN WITHIN THE MANHOLE AS WELL AS THOSE IN PROXIMITY TO THE MANHOLE AT GRADE. THE CONTRACTOR SHALL BE REQUIRED TO ADHERE TO ALL OSHA, NIOSH, ETC., REGULATIONS AS WELL AS APPLICABLE HEALTH AND LABOR CODES THROUGHOUT THE ENTIRE DURATION OF WORK AT EACH MANHOLE.
- B. THE CONTRACTOR SHALL FURNISH ALL REQUIRED SAFETY APPARATUS INCLUDING FANS, DUCTS, BREATHING APPARATUS, SAFETY HARNESSSES, GAS DETECTION EQUIPMENT, TRIPODS AND ALL OTHER EQUIPMENT REQUIRED TO INSURE ABSOLUTELY SAFE CONDITIONS.
- C. MAINTENANCE OF TRAFFIC: THE CONTRACTOR SHALL MAINTAIN BOTH VEHICULAR AND PEDESTRIAN TRAFFIC; PROTECT THE PUBLIC FROM ALL DAMAGE TO PERSON AND PROPERTY. THE CONTRACTOR SHALL LEAVE THE WORK AREA FREE OF ALL EXCESS MATERIAL USED IN HIS OPERATIONS. COMPENSATION FOR ALL MATERIAL AND LABOR NECESSARY UNDER THIS SECTION SHALL BE INCLUDED IN THE PRICE PER CREW SHIFT.

SECTION 2 – DIGITAL SCAN/SIDE SCAN EVALUATION TECHNOLOGY IN SEWERS**2.1 DEFINITIONS**

THE SYSTEM “B” EQUIPMENT USED FOR PIPELINE INSPECTION SHALL INCLUDE, BUT NOT LIMITED TO, A COMPUTER SYSTEM CONTAINING DAI SOFTWARE, AN ENCODER FOR MEASURING DISTANCE AND A DIGITAL EVALUATION TECHNOLOGY PROBE. THE DSET PROBE SHALL BE CAPABLE OF CONTINUOUSLY RECORDING AN ELECTRONIC FORWARD VIEW OF THE PIPE WHILE SIMULTANEOUSLY DEVELOPING A 360° DEGREE SIDE SCAN IMAGE OF THE PIPE IN REAL TIME. AN INCLINOMETER SHALL BE UTILIZED FOR MEASURING THE INCLINATION OF EACH PIPELINE INSPECTED. THE PIPELINE SURFACE SHALL BE VIEWED AS AN UNFOLDED 360°DEGREE FLAT SIDE SCAN IMAGE. THE SIDE SCAN SHALL HAVE A POWERFUL ZOOM ABILITY THAT SHALL BE USED TO VIEW IN DETAIL, DEFECTS SUCH AS CRACKS,

VENDOR: NATIONAL WATER MAIN CLEANING

BREAKS, OFFSET JOINTS, CORROSION, ETC. THE ANALYST SHALL EVALUATE THE DIGITAL SCAN, BOTH SIDE AND FRONT VIEW, TO CAREFULLY RECORD AND CLASSIFY ALL PIPELINE DEFECTS AND CONNECTIONS. THE TRAVEL SPEED OF THE DIGITAL PROBE THROUGH THE PIPELINE SHALL BE UNIFORM AND NOT EXCEED FIFTEEN (15') FEET PER MINUTE.

TWO (2) HIGH-QUALITY FIFTEEN (15") INCH COLOR COMPUTER MONITORS SHALL BE UTILIZED DURING INSPECTIONS: ONE SHALL BE USED FOR THE 360° DEGREE UNFOLDED VIEW AND ONE FOR THE FRONTAL VIEW.

- A. MPEG (MOVING PICTURES EXPERT GROUP): IS THE NICKNAME GIVEN TO A FAMILY OF INTERNATIONAL STANDARDS USED FOR CODING AUDIO-VISUAL INFORMATION IN A DIGITAL COMPRESSED FORMAT. FOR THE PURPOSES OF THIS SPECIFICATION, MPEG SHALL BE DEFINED AS AN ISO-MPEG LEVEL 1 STANDARD (MPEG-1) DIGITAL AUDIO-VISUAL CODING HAVING A RESOLUTION OF 352 PIXELS (X) BY 240 PIXELS (Y) AND AN INTERLACED FRAME RATE OF THIRTY (30) FRAMES PER SECOND. ALL MPEG CODING'S SHALL BE NAMED USING .MPG AS THE FILE EXTENSION.
- B. CD-ROM (COMPACT DISK-READ ONLY MEMORY): FOR THE PURPOSE OF THIS SPECIFICATION, CD-ROM SHALL BE DEFINED AS A CD-R WRITTEN OR "BURNED" IN ACCORD WITH THE ISO-9660 LEVEL 2 SPECIFICATIONS.
- C. PACP (PIPE ASSESSMENT AND CERTIFICATION PROGRAM): A STANDARD DEVELOPED BY NASSCO IN CONJUNCTION WITH WRC FOR THE INSPECTION OF SEWER LINES.
- D. DSET DAI (DIGITAL SCANNING EVALUATION TECHNOLOGY DATA ANALYSIS & INTERPRETATION)

2.2 EQUIPMENT

GENERAL

- A. THE CONTRACTOR SHALL FURNISH A DIGITAL SCANNING STUDIO, EQUIPPED WITH TWO (2) SEPARATE SYSTEMS, EACH COMPLETE WITH AUDIO-VISUAL DIGITAL ENCODING EQUIPMENT/SOFTWARE AND OTHER NECESSARY EQUIPMENT, MATERIALS, ELECTRICITY, LABOR, TECHNICIANS, AS REQUIRED TO PERFORM THE INSPECTIONS. SYSTEMS SHALL BE LABELED SYSTEM "A": CONSISTING OF A DIGITAL SCAN CAPABLE OF 360° DEGREE ROTATION AT THE SCAN PROBE WITH PANNING AND REMOTE FOCUS CAPABILITY.
- B. THE SECOND SYSTEM SHALL BE LABELED SYSTEM "B": CONSISTING OF SIDE SCAN FLAT DIGITAL IMAGERY WITH REAL TIME CONTINUOUS READING AND RECORDING AS FEATURED BY THE DSET DAI SOFTWARE.
- C. THE DIGITAL SCANNING EQUIPMENT SHALL BE CAPABLE OF INSPECTING A MINIMUM OF ONE THOUSAND (1,000') FEET OF SEWER LINE, WHEN ENTRY INTO THE SEWER CAN BE ACCESSED FROM THE UPSTREAM AND DOWNSTREAM MANHOLE. WHEN ENTRY IS AT ONE (1) END ONLY, THE EQUIPMENT SHALL BE CAPABLE OF INSPECTING EIGHT HUNDRED (800') LINEAR FEET BY A SELF-PROPELLED UNIT. THE INSPECTION EQUIPMENT SHALL BE CAPABLE OF CLEARLY SCANNING THE INTERIOR OF A SIX (6") INCH DIAMETER SEWER AND ALL LARGER SIZES.
- D. THE SCANNING EQUIPMENT SHALL BE TRANSPORTED IN A STABLE CONDITION THROUGH THE SEWER LINE UNDER INSPECTION. THROUGHOUT THE INSPECTION THE SCANNING EQUIPMENT SHALL BE POSITIONED WITH THE UNIT DIRECTED ALONG THE LONGITUDINAL AXIS OF THE SEWER. WHEN THE SCANNING EQUIPMENT IS TOWED BY WINCH AND BOND THROUGH THE SEWER LINE, ALL WINCHES SHALL BE STABLE WITH EITHER LOCKING OR RATCHETING DRUMS. ALL WINCHES SHALL BE INHERENTLY STABLE UNDER LOADED CONDITIONS. THE BONDS SHALL BE STEEL OR OF AN EQUALLY NON-ELASTIC MATERIAL TO ENSURE THE SMOOTH AND STEADY PROGRESS OF THE EQUIPMENT. THE BONDS SHALL BE ORIENTED IN SUCH A MANNER AS TO ENABLE UNHINDERED

VENDOR: NATIONAL WATER MAIN CLEANING

EXTENSION OR RETRACTION THROUGH THE SEWER CONDUIT. ALL EFFORTS SHALL BE MADE TO PREVENT DAMAGE TO THE SEWER CONDUIT DURING THE INSPECTION.

- E. THE DIGITAL SCANNING STUDIO SHALL BE LARGE ENOUGH TO ACCOMMODATE FOUR (4) PEOPLE FOR THE PURPOSE OF VIEWING THE DIGITAL MONITORS WHILE THE INSPECTION IS IN PROGRESS. THE STUDIO SHALL BE INSULATED AGAINST NOISE AND EXTREMES IN TEMPERATURE AND SHALL BE PROVIDED WITH MEANS OF CONTROLLING EXTERNAL AND INTERNAL SOURCES OF LIGHT IN A MANNER CAPABLE OF ENSURING THAT THE MONITOR SCREEN DISPLAY IS IN ACCORDANCE WITH THE REQUIREMENTS OF THESE SPECIFICATIONS. THE OWNER OR HIS REPRESENTATIVE SHALL HAVE ACCESS TO VIEW THE DIGITAL MONITOR AT ALL TIMES. THE CENTRAL CONTROL PANEL AND CONTROL SHALL BE LOCATED IN THE MOBILE STUDIO. THE STUDIO SHALL BE MOUNTED ON A MOBILE VEHICLE (TRUCK), WHICH ALLOWS SAFE AND ORDERLY MOVEMENT OF THE INSPECTION EQUIPMENT THROUGHOUT THE WORK SITE.
- F. THE SYSTEM “A” EQUIPMENT USED FOR THE SEWER LINE INSPECTION SHALL BE SPECIFICALLY DESIGNED AND CONSTRUCTED FOR PIPELINE INSPECTION. THE UNIT SHALL BE WATERPROOF AND SHALL BE OPERATIVE IN ANY CONDITIONS THAT MAY BE ENCOUNTERED IN THE INSPECTION ENVIRONMENT. THE CONTRACTOR SHALL PROVIDE PAN AND TILT FUNCTIONS TO FACILITATE THE INSPECTION OF SERVICE LATERALS AND SEWER LINE DEFECTS. THE SCANNING EQUIPMENT SHALL BE CAPABLE OF A 360° DEGREE ROTATIONAL SCAN AND THE TILT ARC MUST NOT BE LESS THAN 225° DEGREES UNLESS OTHERWISE APPROVED BY THE OWNER. THE ADJUSTMENT OF FOCUS AND IRIS SHALL PROVIDE A MINIMUM FOCAL RANGE OF THREE (3”) INCHES IN FRONT OF THE SCANNING UNIT’S LENS. THE DISTANCE ALONG THE SEWER IN FOCUS FROM THE INITIAL POINT OF OBSERVATION SHALL BE A MINIMUM OF TWICE THE VERTICAL HEIGHT OF THE SEWER. THE ILLUMINATION MUST BE SUCH THAT IT WILL ALLOW AN EVEN DISTRIBUTION OF THE LIGHT AROUND THE SEWER PERIMETER WITHOUT THE LOSS OF CONTRAST, FLARE OUT OF PICTURE, OR SHADOWING. THE VIEW SHALL BE TRANSMITTED TO A MONITOR NOT LESS THAN THIRTEEN (13”) INCHES IN SIZE. THE EQUIPMENT SHALL BE CAPABLE OF RECEIVING AND TRANSMITTING A PICTURE OF NOT LESS THAN FOUR HUNDRED SIXTY (460) LINES OF HORIZONTAL RESOLUTION. THE TRAVEL SPEED OF THE INSPECTION UNIT (THROUGH THE SEWER) SHALL BE UNIFORM AND SHALL NOT EXCEED THE MAXIMUM SPEED OF THIRTY (30’) FEET PER MINUTE OR AS ORDERED BY THE OWNER.
- G. THE CONTACTOR SHALL TEST THE EQUIPMENT TO VERIFY THE PICTURE QUALITY. THE EQUIPMENT MANUFACTURER’S RECOMMENDATION SHALL BE USED TO CLEARLY DIFFERENTIATE BETWEEN THE FOLLOWING COLORS: WHITE, YELLOW, CYAN, GREEN, MAGENTA, RED, BLUE AND BLACK.
- H. THE DIGITAL INSPECTION EQUIPMENT SHALL BE OF SUCH QUALITY AS TO ENABLE THE FOLLOWING TO BE ACHIEVED:
- 1) COLOR: WITH THE MONITOR ADJUSTED FOR CORRECT SATURATION, THE SIX COLORS PLUS BLACK AND WHITE SHALL BE CLEARLY RESOLVED WITH THE PRIMARY AND COMPLEMENTARY COLORS IN ORDER OF DECREASING LUMINANCE.
 - 2) LINEARITY: THE BACKGROUND GRID SHALL SHOW SQUARES OF EQUAL SIZE, WITHOUT CONVERGENCE/DIVERGENCE OVER THE WHOLE OF PICTURE. THE CENTER CIRCLE SHALL APPEAR ROUND AND HAVE THE CORRECT HEIGHT/WIDTH RELATIONSHIP ($\pm 5\%$).
 - 3) RESOLUTION: THE LIVE PICTURE MUST BE DISPLAYED IN A DIGITAL MONITOR CAPABLE OF PROVIDING A CLEAR, STABLE IMAGE FREE OF ELECTRICAL INTERFERENCE WITH A MINIMUM HORIZONTAL RESOLUTION NOT LESS THAN FOUR HUNDRED SIXTY (460) LINES.
 - 4) COLOR CONSISTENCY: TO ENSURE THAT THE UNIT SHALL PROVIDE SIMILAR RESULTS WHEN USED WITH ITS OWN ILLUMINATION SOURCE, THE LIGHTING SHALL BE FIXED IN INTENSITY PRIOR TO COMMENCING THE SURVEY. IN ORDER TO ENSURE COLOR CONSISTENCY NO VARIATION IN ILLUMINATION SHALL TAKE PLACE DURING THE INSPECTION.
 - 5) THE INSPECTION MONITOR DISPLAY SHALL INCORPORATE AN AUTOMATICALLY UPDATED RECORD IN FEET AND TENTHS OF A FOOT OF THE DISTANCE ALONG THE LINE FROM THE CABLE

VENDOR: NATIONAL WATER MAIN CLEANING

CALIBRATION POINT TO THE LENS OF THE CAMERA. THE RELATIVE POSITIONS OF THE TWO (2) POINTS SHOULD ALSO BE NOTED. THE CONTRACTOR SHALL USE A SUITABLE METERING DEVICE THAT ENABLES THE CABLE LENGTH TO BE ACCURATELY MEASURED; THIS SHALL BE ACCURATE TO TWELVE (12) INCHES. THE CONTRACTOR SHALL DEMONSTRATE THAT THE TOLERANCE IS BEING ACHIEVED BY WHEEL MEASUREMENT BETWEEN MANHOLES ON THE SURFACE. THIS ACCURATE MEASUREMENT MUST BE INCLUDED ON EACH COMPUTER GENERATED DIGITAL ASSESSMENT REPORT.

- 6) ALL AUDIO-VISUAL DIGITAL RECORDINGS AND COLLECTED DATA MADE DURING THE INSPECTION SHALL BECOME THE PROPERTY OF THE OWNER AND SHALL BE SUBMITTED TO THE OWNER WITHIN FIVE (5) BUSINESS DAYS UPON COMPLETION OF THE INSPECTION.
- I. THE SYSTEM “B” EQUIPMENT USED FOR PIPELINE INSPECTION SHALL INCLUDE, BUT NOT LIMITED TO, A COMPUTER SYSTEM CONTAINING DAI SOFTWARE, ENCODER FOR MEASURING DISTANCE AND A DIGITAL EVALUATION TECHNOLOGY PROBE. THE DSET PROBE SHALL BE CAPABLE OF CONTINUOUSLY RECORDING AN ELECTRONIC FORWARD VIEW OF THE PIPE WHILE SIMULTANEOUSLY DEVELOPING A 360° DEGREE SIDE SCAN IMAGE OF THE PIPE IN REAL TIME. THE INCLINATION (SLOPE) OF THE PIPE SHALL BE CONTINUOUSLY TRACKED DURING THE SCANNING. THE PIPELINE SURFACE SHALL BE VIEWED AS AN UNFOLDED 360° DEGREE FLAT SIDE SCAN IMAGE. THE SIDE SCAN SHALL HAVE A POWERFUL ZOOM ABILITY THAT SHALL BE USED TO VIEW IN DETAIL, DEFECTS SUCH AS CRACKS, BREAKS, OFFSET JOINTS, CORROSION, ETC. THE ANALYST SHALL EVALUATE THE DIGITAL SCAN, BOTH SIDE AND FRONT VIEW, TO CAREFULLY RECORD AND CLASSIFY ALL PIPELINE DEFECTS AND CONNECTIONS. THE TRAVEL SPEED OF THE DIGITAL PROBE THROUGH THE PIPELINE SHALL BE UNIFORM AND NOT EXCEED FIFTEEN (15’) FEET PER MINUTE. TWO (2) HIGH-QUALITY THIRTEEN (13) INCH COLOR COMPUTER MONITORS SHALL BE UTILIZED DURING INSPECTIONS: ONE SHALL BE USED FOR THE 360° DEGREE UNFOLDED VIEW AND ONE FOR THE FRONTAL VIEW.

2.3 DIGITAL SCAN OR SIDE SCAN: AUDIO-VISUAL RECORDING PIPE INSPECTIONS

GENERAL

- A. DIGITALLY FORMATTED INSPECTIONS: THE CONTRACTOR SHALL INSPECT SEWER PIPELINES WITH PAN AND TILT IMAGERY AS SPECIFIED SO AS TO RECORD ALL RELEVANT FEATURES AND DEFECTS OF THE PIPELINE AS PERMANENT RECORD. INSPECTION OF PIPELINES SHALL BE CARRIED OUT IN A FORMAT APPROVED BY THE OWNER. THE OPERATION OF THE EQUIPMENT SHALL BE CONTROLLED BY A PACP CERTIFIED TECHNICIAN OR SUPERVISOR WHO SHALL BE LOCATED AT THE CONTROL PANEL IN THE MOBILE STUDIO. THE TECHNICIAN SHALL HAVE A MINIMUM OF THREE (3) YEARS’ EXPERIENCE IN PIPE EVALUATIONS.
- B. IF INSPECTION OF AN ENTIRE SECTION CANNOT BE SUCCESSFULLY PERFORMED FROM MANHOLE TO MANHOLE, AN ATTEMPT SHALL BE MADE TO PERFORM A REVERSE SET UP IN ORDER TO COMPLETE THE INSPECTION.
- C. WHENEVER CONDITIONS ALLOW, THE UNIT SHALL BE POSITIONED TO REDUCE THE RISK OF PICTURE DISTORTION. IN CIRCULAR SEWERS, THE LENS SHALL BE POSITIONED CENTRALLY AT THE SPRING-LINE (I.E. IN PRIME POSITION) WITHIN THE SEWER. IN NON-CIRCULAR SEWERS, UNIT ORIENTATION SHALL BE AT MID-HEIGHT, UNLESS OTHERWISE AGREED, AND CENTERED HORIZONTALLY. IN ALL INSTANCES THE LENS SHALL BE DIRECTED ALONG THE LONGITUDINAL AXIS OF THE SEWER WHEN IN PRIME POSITION. A POSITIONING TOLERANCE OF $\pm 10\%$ OF THE VERTICAL SEWER DIMENSION SHALL BE ALLOWED WHEN THE CAMERA IS IN PRIME POSITION.

2.4 INSPECTION REQUIREMENTS

- A. ANY OPERATOR RESPONSIBLE FOR DATA COLLECTION AND DEFECT CODING SHALL HOLD A CURRENT PACP CERTIFICATION. SUCH CERTIFICATIONS SHALL BE SUBMITTED TO OWNER PRIOR TO START OF ANY WORK.
- B. WHEN THE DIGITAL SCANNER IS BEING INSERTED INTO THE MANHOLE, THE VIDEO FILE WILL BE PAUSED AND WILL BE RESTARTED WHEN THE OPERATOR IS READY TO COMMENCE THE PIPE INSPECTION.
- C. THE INSPECTION WILL INCLUDE FROM THE STARTING POINT TO THE PRE-SET POSITION.
- D. AT THE START OF THE INSPECTION, THE OPERATOR WILL DISPLAY THE WORK ORDER LONG ENOUGH FOR THE WORK ORDER INFORMATION TO BE READ BY ANY PERSON REVIEWING THE VIDEO FILES.
- E. INSPECTION REPORT: THE CONTRACTOR SHALL COMPLETE AN EVALUATION REPORT COVERING THE INSPECTION AND THE INFORMATION ACQUIRED. A REPORT SHALL BE PREPARED FROM EACH OF THE TWO (2) INSPECTION SYSTEMS ON BOARD. PRIOR TO BEGINNING WORK, THE CONTRACTOR SHALL SUBMIT A HARDCOPY REPORT TO THE ENGINEER FOR APPROVAL. THE REPORTS FROM SYSTEM “B” SHALL INCLUDE A MAP SHOWING THE LOCATION OF WORK, PROJECT NARRATIVE EXPLAINING THE MEANS AND METHOD OF WORK WITH AN EXPLANATION OF CONTENTS IN REPORT, SUMMARY OF CONDITIONS FOUND, FRONTAL VIEW STILL IMAGES OF INSPECTED SEGMENTS OF PIPE, FULL 360° DEGREE UNFOLDED SCANNED COLOR IMAGE OF INSPECTED PIPE SEGMENTS, COMPUTER COLOR CODED PRINTOUT OF DEFECTS, VERTICAL PIPE DEFLECTION GRAPH REFERENCED TO DISTANCE IN FEET FROM START POINT AND MAGNIFIED SNAP SHOT VIEWS OF DEFECTS. THE REPORT FROM SYSTEM “A” SHALL INCLUDE AN OBSERVATION REPORT, CROSS SECTION REPORT AND A PLAN VIEW REPORT PROVIDED BY CIMS DATA MANAGEMENT SOFTWARE.

2.5 DIGITAL AUDIO-VISUAL RECORDING

- A. VISUAL RECORDING: CONTINUOUS DIGITAL RECORDINGS OF THE INSPECTION VIEW AS IT APPEARS ON THE MONITOR SHALL BE STORED. IT IS INTENDED THAT A DIGITAL RECORDING WILL BE MADE OF THE COMPLETE PIPE INSPECTION. THE RECORDING SHALL ALSO BE USED AS A PERMANENT RECORD OF DEFECTS. THE RECORDING SHALL BE MPEG-4 AND SHALL COMPLY WITH ISO/IEC 11172 MPEG-4 SPECIFICATIONS. THE DIGITAL ENCODING SHALL INCLUDE BOTH SOUND AND VISUAL INFORMATION THAT CAN BE REPRODUCED WITH AN IMAGE OF EQUAL TO THE QUALITY OF THE ORIGINAL PICTURE ON THE MONITOR. COMPRESSION RATE SHALL BE 1.5 MB/S. THE REPLAY OF THE COMPRESSED VIDEO INFORMATION, WHEN REVIEWED ON WINDOWS MEDIA PLAYER VERSION 6.4 OR HIGHER AND SHALL BE FREE OF ELECTRICAL INTERFERENCE AND SHALL PRODUCE A CLEAR, STABLE IMAGE. THE AUDIO PORTION OF THE COMPOSITE DIGITAL CODING SHALL BE SUFFICIENTLY FREE OF ELECTRICAL INTERFERENCE AND BACKGROUND NOISE TO PRODUCE AN ORAL REPORT THAT IS CLEAR AND COMPLETELY AND EASILY DISCERNIBLE. THE OPERATOR SHALL PAUSE THE DIGITAL RECORDING AT ANY TIME THAT THERE IS A DELAY IN THE INSPECTION, THE PAUSE SHALL IN NO WAY AFFECT, FREEZE OR INTERRUPT THE REPLAY OF THE VIDEO AND SHALL NOT CLOSE THE VIDEO FILE DURING THE INSPECTION. THE OPERATOR SHALL STORE A SINGLE VIDEO FILE FOR EACH INSPECTION. THE DATA SHALL BE TIME CODED USING THE ELAPSED TIME FROM THE VIDEO FILE. THE ELAPSED TIME SPECIFICATIONS SHALL COMPLY WITH PACP REQUIREMENTS. THE NAMING OF THE VIDEO FILE SHALL BE AUTOMATIC AND SHALL MATCH THE INSPECTION FILE NAME.
- B. THE AUDIO PORTION OF THE INSPECTION REPORT SHALL INCLUDE THE LOCATION OR IDENTIFICATION OF THE SECTION, THE MANHOLE-TO-MANHOLE DIRECTION OF TRAVEL AND THE DISTANCE TRAVELED ON THE SPECIFIC RUN ENCOUNTERED. THE DIGITAL SCANNING EQUIPMENT SHALL BE CONTINUOUSLY CONNECTED TO THE MONITORING EQUIPMENT. THE DIGITAL SCANNING

VENDOR: NATIONAL WATER MAIN CLEANING

UNIT AND MONITORING EQUIPMENT SHALL HAVE THE BUILT-IN CAPABILITY TO ALLOW THE ENGINEER TO INSTANTLY REVIEW BOTH THE AUDIO AND VISUAL QUALITY OF THE RECORDINGS AT ALL TIMES DURING THE ASSESSMENT SURVEY.

- C. SEPARATE MPEG FILES SHALL BE CREATED FOR EACH SEWER LINE SEGMENT. IN CASE OF A REVERSE SETUP, SUCH INSPECTION SHALL BE STORED IN A SEPARATE MPEG FILE. MPEG FILES AND THE DATA INSPECTION FILES SHALL BE WRITTEN TO CD-ROM MEDIA FOR DELIVERY TO THE ENGINEER. MULTIPLE MPEG'S MAY EXIST ON EACH CD-ROM. EACH CD-ROM SHALL BE LABELED, AT A MINIMUM, WITH THE FOLLOWING INFORMATION: OWNER, ENGINEERING FIRM, PROJECT NAME, DATE OF CD CREATION, CD ID AND CONTRACTORS FIRM.
- D. MPEG FILES SHALL BE NAMED ACCORDING TO THE FOLLOWING FILE SPECIFICATION:
 - 1. ***STREET NAME*** [UPSTREAM MANHOLE NUMBER] .MPG
 - 2. ***STREET NAME*** [UPSTREAM MANHOLE NUMBER_A] .MPG FOR A REVERSE INSPECTION
- E. DVD R'S IN MPEG-4 MAY BE SUBSTITUTED FOR CD-ROM'S WHEN APPLICABLE. **ALL RECORDS SHOULD BE BACKED-UP TO CD OR DVD AND LABELED BY ADDRESS AND MANHOLES ON DISC AND COVER CASE. A DATABASE INDEX OF BACKUP DISCS WILL BE KEPT RECORDING DATE, TIME DISTRICT AND STREET.**

2.6 INSPECTION REPORTS

- A. INSPECTION REPORT: THE CONTRACTOR SHALL COMPLETE AN EVALUATION REPORT COVERING THE INSPECTION AND THE INFORMATION ACQUIRED. A REPORT SHALL BE PREPARED FROM THE INSPECTION SYSTEM ON BOARD. THE MENTIONED REPORT MUST BE GIVEN TO COUNTY REPRESENTATIVE AT THE END OF EACH SHIFT.
- B. DATA SHALL BE DELIVERED IN ELECTRONIC FORM IN ACCORDANCE WITH PACP DATA STRUCTURE DEVELOPED BY NASSCO.
- C. IN ADDITION TO ANY PAPER DOCUMENTS, ALL INSPECTION REPORTS SHALL BE FURNISHED IN ELECTRONIC PACP DATA EXCHANGE FORMAT. DATA FILES AND DIGITAL VIDEO FILES SHALL BE LINKED ON SAME CD-ROM OR DVD.
- D. DIGITAL DATA DISPLAY: AT THE START OF EACH SEWER LENGTH BEING SURVEYED, THE LENGTH OF PIPELINE FROM ZERO UP TO THE CABLE CALIBRATION POINT SHALL BE RECORDED AND REPORTED IN ORDER TO OBTAIN A FULL RECORD OF THE SEWER LENGTH. THE LENGTH ENTERED ON THE DATA DISPLAY MUST ALLOW FOR THE DISTANCE FROM THE START OF THE SURVEY TO THE CABLE CALIBRATION POINT (PRE-SET POSITION) SUCH THAT THE FOOTAGE AT THE START OF THE SURVEY IS ZERO. IN THE CASE OF SURVEYING THROUGH A MANHOLE WHERE A NEW WORK ORDER IS REQUIRED, THE DISTANCE SHALL BE SET AT ZERO (0) WITH THE DIGITAL VIEW FOCUSED ON THE OUTGOING PIPE ENTRANCE FROM THE CENTER OF THE MANHOLE.
- E. INSPECTION RECORD: AT THE START OF EACH MANHOLE LENGTH A DATA GENERATOR SHALL ELECTRONICALLY GENERATE AND CLEARLY DISPLAY ON THE VIEWING MONITOR AND DIGITAL RECORDING, A RECORD OF DATA IN ALPHANUMERIC FORM CONTAINING THE INFORMATION ENTERED INTO THE WORK ORDER.
- F. ONCE THE SURVEY OF THE PIPELINE IS UNDER WAY, SPECIFIC DATA SHALL BE CONTINUOUSLY DISPLAYED ON THE VIEWING MONITOR AND THE MPEG-4 FILE. THE SIZE AND POSITION OF THE DATA DISPLAY SHALL BE SUCH AS NOT TO INTERFERE WITH THE MAIN SUBJECT OF THE PICTURE YET SHALL ALWAYS BE EASILY READABLE WHEN THE RECORDING IS REPLAYED. IT MUST BE POSSIBLE TO MOVE THE DATA ON THE VIDEO SCREEN TO ENSURE CONTINUAL ABILITY TO READ THE DATA ON THE SCREEN. AT MINIMUM THE FOLLOWING DATA SHALL BE DISPLAYED:
 - 1) AUTOMATIC UPDATE OF THE SCANNING UNIT'S POSITION SHOWN IN FEET.
 - 2) UPSTREAM MANHOLE AND DOWNSTREAM MANHOLE REFERENCE NUMBERS.
 - 3) OBSERVATIONS AND DEFECTS ENTERED BY THE TECHNICIAN DURING THE INSPECTION.

VENDOR: NATIONAL WATER MAIN CLEANING

- G. EACH SEWER LENGTH (I.E. THE LENGTH OF SEWER BETWEEN TWO CONSECUTIVE MANHOLES) SHALL BE ENTERED ON A SEPARATE WORK ORDER, HENCE, A SEPARATE FILE. WHERE A CONTRACTOR ELECTS TO “PASS THROUGH” A MANHOLE DURING AN INSPECTION SURVEY OR “WALK THROUGH” DURING A MAN ENTRY SURVEY HE SHALL START A NEW WORK ORDER AT THE MANHOLE “PASSED THROUGH” AND SHALL RESET THE DISTANCE TO ZERO.
- H. **FINAL INVOICE:** MUST BE GIVEN TO COUNTY REPRESENTATIVE NO LATER THAN THREE (3) WEEKS AFTER WORK COMPLETION.

2.7 DISLODGING OF CAMERA

IN THE EVENT THE DIGITAL SCAN PROBE BECOMES FIRMLY LODGED WITHIN A SECTION OF THE PIPE FOR REASONS BEYOND THE CONTRACTOR’S CONTROL AND CANNOT BE DISLODGED BY A REASONABLE EFFORT ON THE PART OF THE CONTRACTOR, THE OWNER’S FORCES WILL BE DISPATCHED TO EXCAVATE THE PIPELINE AND EXPOSE THE PIPE. THE ACTUAL BRAKING OF THE PIPE AND REMOVAL OF THE DIGITAL SCAN PROBE FROM THE PIPE SECTION SHALL BE DONE BY THE CONTRACTOR AT HIS OWN COST AND EXPENSE.

2.8 SEWER DATA SPECIFICATION

VIDEO INSPECTION SHOULD INCLUDE NAT83 COORDINATES AND FOOTAGE WITH GEOMETRIC DIRECTION AND THE DISTANCE FROM CENTER OF MANHOLE INVERT TO EACH HOUSE CONNECTION. ALL NON-CONFORMITIES OR PROBLEMS SHOULD BE MEASURED FROM MANHOLE AND NOTED SEPARATELY ON VIDEO. RECORDS SHOULD BE DOCUMENTED AND INTEGRATED INTO SUFFOLK COUNTY HANSEN TECHNOLOGY DATABASE VIA LAPTOP OR MICROSOFT EXCEL (OFFICE 2000 OR ABOVE). TECHNICAL ASSISTANCE WILL PROVIDE FOR ANY OTHER DATABASE EXPORT/IMPORT TO SUFFOLK COUNTY HANSEN TECHNOLOGY DATABASE WITH ADDITIONAL PRICE FOR SERVICE TO BE INCLUDED IN BID.

2.9 MANHOLE INSPECTION

ALL MANHOLES WILL BE INSPECTED AND WILL BE MARKED WITH A UNIQUE NUMBER IN PAINT ON THE INSIDE COVER AND OR SUPPORT RING. ANY AND ALL PROBLEMS DISCOVERED IN A MANHOLE SHOULD BE DOCUMENTED WITH DIGITAL PHOTOGRAPHS. ADDITIONALLY, ALL MANHOLE STRUCTURES WILL BE INSPECTED AND INFORMATION RECORDED FOR THE FOLLOWING DIMENSIONS AND CONDITIONS. THESE CONDITIONS ARE DEFINED BY THE HANSEN DATABASE AND WILL BE SUPPLIED TO THE SUCCESSFUL BIDDER. ADDITIONAL DIMENSIONS OR CONDITIONS MAY BE REQUESTED AS REQUIRED;

DIMENSIONS

- 1) MANHOLE COVER
- 2) MAN WAY ENTRY
- 3) CASTING DEPTH
- 4) ENTRY PIPE ID’S
- 5) MANHOLE INVERT LENGTH AND WIDTH

CONDITIONS

- 1) MANHOLE COVER
- 2) STEP CONDITION
- 3) COVER RISER RING
- 4) CONCRETE OR BRICK CONE RISER RING SUPPORT
- 5) MANHOLE CASTINGS AND MASONRY SEAMS
- 6) INVERT CONDITIONS
- 7) PIPE CONNECTION CONDITION AND NUMBER OF CONNECTIONS

8) SURCHARGE OR EVIDENCE OF SURCHARGE

SECTION 3 – PNEUMATIC INJECTION GROUTING**3.1 GENERAL**

WHERE DIRECT CHEMICAL GROUTING OF JOINTS AND DEFECTS SHALL BE ACCOMPLISHED BY FORCING SEALING MATERIALS INTO AND THROUGH THE JOINTS AND CRACKS OF THE SEWER PIPES, EQUIPMENT SHALL CONSIST OF A REMOTE CONTROLLED GROUT INJECTION RIG WHICH CAN BE POSITIONED TO COMPLETELY ISOLATE THE JOINT OR CRACK IN THE SEWER. THE DEVICE SHALL BE AN OPEN END, CYLINDRICAL CASING OF A SIZE LESS THAN THE INSIDE PIPE DIAMETER WITH CABLES CONNECTED TO BOTH ENDS TO PULL IT THROUGH OR POSITION IT IN THE LINE. THE CONTRACTOR WILL NOT BE REQUIRED TO GROUT PIPES LESS THAN SIX (6”) INCHES IN DIAMETER BY THIS METHOD.

CONTINUOUS, AIR-INFLATABLE SLEEVES (BLADDERS) SHALL BE MOUNTED AT EACH END OF THE CASING EXTERIOR WITH THE ENDS OF THE SLEEVES SEALED TO THE CASING. THE SLEEVES SHALL BE CONSTRUCTED IN SUCH A MANNER THAT THEY CAN BE PNEUMATICALLY EXPANDED FROM THE CENTER OF BOTH ENDS. EXPANSION SHALL BE REGULATED BY PRECISE PRESSURE GAUGES AND CONTROLS. UNDER NO CONDITIONS WILL HYDRAULICALLY OR MECHANICALLY EXPANDED DEVICES BE ALLOWED.

TWO (2) CONDUITS SHALL PASS THROUGH ONE END OF THE CASING AND SHALL BE ADAPTED TO SUPPLY A POLYMERIZING MATERIAL UNDER PRESSURE TO THE SPACE AT THE CENTER OF THE CASING. CHEMICAL GROUT MATERIAL SHALL BE PUMPED TO THE CASING THROUGH TWO (2) HOSES LEADING FROM THE SURFACE. CHEMICAL GROUT MATERIALS SHALL BE PLACED BY FLOW-CONTROLLED, PROPORTIONING PUMPS OR PRESSURE TANKS WITH PRESSURE IN EXCESS OF GROUNDWATER PRESSURE. EQUIPMENT SHALL BE SUCH THAT PROPORTIONS AND QUANTITIES OF THE MATERIAL BEING INJECTED CAN BE INSTANTLY REGULATED.

PRESSURES, PROPORTIONS AND QUANTITIES OF CHEMICAL GROUT MATERIAL TO BE USED SHALL BE DETERMINED ACCORDING TO THE SIZE OF THE JOINT OR CRACK, PERCENTAGE OF VOID BEING FILLED AND THE RATE OF FLOW OF SOLUTION IN RELATION TO THE BACKPRESSURE. IN THE EVENT THAT LARGE VOIDS ARE ENCOUNTERED ON THE OUTSIDE OF THE PIPE, INCLUDING THE POSSIBILITY OF FISSURES TO THE GROUND SURFACE, A CHANGE IN OPERATING PRESSURES AND PUMPING RATES SHALL BE MADE SO AS TO AVOID EXCESSIVE USE OF GROUT.

UPON COMPLETION OF THE INJECTION, THE GROUTING PACKER SHALL BE MOVED FORWARD, WIPING AWAY THE EXCESS GROUT AND ALLOWING THE TELEVISION CAMERA TO MOVE TO A SUITABLE POSITION FOR INSPECTING. THIS METHOD MAY BE UTILIZED IN PIPES FROM SIX (6”) INCHES TO THIRTY (30”) INCHES.

3.2 EXTERNAL APPLICATION

WHERE DIRECTED CHEMICAL GROUTING OF JOINTS OR CRACKS SHALL BE ACCOMPLISHED BY EXTERNAL INJECTION. INJECTION PIPES SHALL BE JETTED OR DRIVEN INTO THE GROUND BY MEANS OF A SUITABLE JET PUMP OR COMPRESSOR. ADEQUATE MEANS SHALL BE PROVIDED TO PREVENT THE INJECTED PIPE FROM PLUGGING. INJECTION PIPE SHALL BE INSTALLED ADJACENT TO THE LINE BEING GROUTED IN A POSITION THAT WILL ENSURE PROPER PLACEMENT OF GROUT. A GROUT MANIFOLD EQUIPPED WITH SUITABLE VALVES AND MIXING CHAMBER SHALL BE ATTACHED TO THE INJECTION PIPES. A SUITABLE MEANS OF OBSERVING THE INTERNAL DIAMETER OF THE LINE SHALL BE MAINTAINED DURING THE GROUTING OPERATION.

A. GROUTING LARGE DIAMETER PIPE AND STRUCTURES

VENDOR: NATIONAL WATER MAIN CLEANING

THE CONTRACTOR SHALL SUPPLY ALL LABOR, MATERIAL AND EQUIPMENT FOR THE CHEMICAL GROUTING OF LARGE DIAMETER PIPE AND STRUCTURES INCLUDING NECESSARY DRILLING EQUIPMENT, COMPRESSOR (125 CFM) AND GROUTING EQUIPMENT. THE GROUTING SHALL BE ACCOMPLISHED BY DRILLING HOLES INTO OR NEAR THE LEAK AND PUMPING THE CHEMICAL GROUT INTO THE SOIL SURROUNDING THE PIPE OR STRUCTURE THROUGH A GROUT POINT EQUIPPED WITH SUITABLE VALVES AND MIXING CHAMBER.

B. GROUTING EQUIPMENT

THE EQUIPMENT USED FOR MIXING AND PUMPING CHEMICAL SOLUTION SHALL MEET THE FOLLOWING SPECIFICATIONS:

- 1) THE GROUTING EQUIPMENT SHALL CONSIST OF TWO (2) PRESSURE TANKS OR PUMPS WITH COMBINED DISCHARGE NOT LESS THAN FIVE (5) GPM (GALLONS PER MINUTE) AT A PRESSURE OF SIXTY (60) PSI.
- 2) THE GROUTING EQUIPMENT SHALL BE EQUIPPED WITH ACCURATE FLOW METERS SO THAT CALIBRATION OF THE UNIT IS POSSIBLE.
- 3) THE GROUTING EQUIPMENT SHALL INCLUDE ACCURATE PRESSURE GAUGES AT THE PUMP OR TANK. ADDITIONAL PRESSURE GAUGES SHALL BE INSTALLED WHERE DIRECTED.
- 4) THE GROUTING EQUIPMENT SHALL BE EQUIPPED WITH FIVE HUNDRED (500') FOOT OF HOSES OF ADEQUATE CAPACITY TO CARRY THE GROUT AND CATALYST SOLUTION SEPARATELY TO THE PACKER OR INJECTION PIPES.

3.3 CHEMICAL GROUT MATERIALS**A. BASIC CHEMICAL GROUT**

THE CHEMICAL GROUT SHALL CONSIST OF AN INTIMATE MIXTURE OF DRY ACRYLAMIDE AND DRY N'METHYLENEBISACRYLAMIDE IN SUCH PROPORTIONS THAT DILUTE AQUEOUS SOLUTIONS, WHEN CATALYZED WILL FORM STILL GELS. THE GROUT SHALL MAKE A TRUE SOLUTION OF CONCENTRATIONS AS HIGH AS THREE (3) POUNDS PER GALLON OF WATER. THE CHEMICAL SOLUTION SHALL HAVE THE ABILITY TO TOLERATE GROUNDWATER DILUTION AND TO REACT IN MOVING WATER. IT SHALL HAVE A LOW VISCOSITY WHICH REMAINS CONTROLLABLE FROM TEN (10) SECONDS TO ONE (1) HOUR, AT TEMPERATURES FROM AMBIENT TO FREEZING AND UP TO THREE (3) HOURS AT TEMPERATURES FROM 140°F DEGREES. THE REACTION SHALL PRODUCE A CONTINUOUS AND IRREVERSIBLE GEL AT CHEMICAL CONCENTRATIONS AS LOW AS 0.4 POUNDS PER GALLON OF WATER. THE BASIC CHEMICAL GROUT SHALL BE Q-SEAL AS SUPPLIED BY CUES, INC. OF ORLANDO, FLORIDA, AV-100 AS SUPPLIED BY AVANTI INTERNATIONAL OF HOUSTON, TEXAS, OR ANY EQUAL AS APPROVED BY OWNER.

SECTION 4 – EMERGENCY SEWER REHABILITATION PVC DEFORMED**4.1 GENERAL**

- A. THE CONTRACTOR SHALL FURNISH ALL LABOR, MATERIALS, EQUIPMENT AND INCIDENTALS AND PERFORM ALL WORK REQUIRED FOR FURNISHING AND INSTALLING THE PVC PIPE LINER AS SPECIFIED HEREIN, AS REQUIRED BY JOB CONDITIONS AND AS REQUIRED AND ORDERED BY THE COUNTY.
- B. THE WORK CONTEMPLATED UNDER THIS REQUIREMENTS CONTRACT INCLUDES LINING EXISTING SANITARY SEWER LINES WITHIN THE COUNTY WITH **PVC ONLY** PIPE LINER. ITEMS BELOW INCLUSIVE ARE INCLUDED UNDER THIS CONTRACT TO ESTABLISH UNIT PRICES THAT CAN BE UTILIZED FOR PIPE LINING WORK IN AREAS WITHIN THE COUNTY SANITARY SEWER COLLECTION

VENDOR: NATIONAL WATER MAIN CLEANING

SYSTEM THROUGHOUT THE DURATION OF THE CONTRACT PERIOD. THE UNIT PRICES PROVIDED IN THE BID SHEET SHALL BE IN EFFECT FOR A PERIOD OF THREE (3) YEARS FROM THE DATE OF COMMENCEMENT OF CONTRACT TIME FOR THIS CONTRACT.

- C. WORK UNDER THIS SECTION SHALL INCLUDE, BUT NOT BE LIMITED TO, MOBILIZATION, DEMOBILIZATION, DIGITAL SCANNING EVALUATION OF PIPE PRIOR TO LINER INSTALLATION, FURNISHING AND INSTALLING THE PVC DEFORMED PIPE LINER, RECONNECTION OF HOUSE CONNECTION, DIGITAL SCANNING, AS PER TECHNICAL SPECIFICATION, OF PIPE AFTER INSTALLATION OF LINER, RESTORATION OF DAMAGED FACILITIES AND ALL OTHER WORK REQUIRED FOR THE COMPLETE INSTALLATION OF THE PVC PIPE LINER SUBJECT TO ACCEPTANCE BY THE COUNTY, EXCLUSIVE OF THE WORK SPECIFIED UNDER SEPARATE ITEMS.
- D. THE CONTRACTOR SHALL SUBMIT TO THE COUNTY FOR APPROVAL, IMMEDIATELY FOLLOWING AUTHORIZATION TO LINE SEWER PIPES, SHOP DRAWINGS OR LINER SIZES AND THICKNESSES, EQUIPMENT TO BE USED FOR THE INSTALLATION AND INSTALLATION LAYOUTS AND METHODS, DESIGN CALCULATIONS AND PROVIDE MATERIAL CERTIFICATIONS FOR THE LINER MATERIALS AT THE TIME OF SHIPMENT TO THE SITE OF THE WORK.
- E. COMMENCEMENT / COMPLETION OF EMERGENCY WORK: UPON NOTIFICATION FROM THE COUNTY TO BEGIN PIPE LINE REHABILITATION UTILIZING DEFORMED PVC PIPE LINER, THE CONTRACTOR SHALL HAVE THIRTY (30) DAYS FROM THE DATE OF SAID NOTIFICATION TO COMMENCE SAID WORK.

4.2 SAFETY REQUIREMENTS

- A. THE CONTRACTOR'S ATTENTION IS DIRECTED TO THE FACT THAT HARMFUL AND TOXIC VAPORS MAY EXIST WITHIN THE MANHOLES AND SEWERS AND THEY ARE, THEREFORE, CONSIDERED A CONFINED SPACE. THESE VAPORS WILL POSE A HAZARD TO WORKMEN WITHIN THE MANHOLE AS WELL AS THOSE IN PROXIMITY TO THE MANHOLE AT GRADE. THE CONTRACTOR SHALL BE REQUIRED TO ADHERE TO ALL OSHA, NIOSH, ETC. REGULATIONS AS WELL AS APPLICABLE HEALTH AND LABOR CODES THROUGHOUT THE ENTIRE DURATION OF WORK AT EACH MANHOLE. EMPHASIS SHALL BE PLACED UPON THE REQUIREMENTS FOR ENTERING CONFINED SPACES.
- B. THE CONTRACTOR SHALL FURNISH ALL REQUIRED SAFETY APPARATUS INCLUDING FANS, DUCTS, BREATHING APPARATUS, SAFETY HARNESSSES, GAS DETECTION EQUIPMENT, TRIPODS AND ALL OTHER EQUIPMENT REQUIRED TO INSURE ABSOLUTELY SAFE CONDITIONS.

4.3 SUBMITTALS

- A. THE CONTRACTOR SHALL SUBMIT TO THE OWNER FOR APPROVAL, IMMEDIATELY FOLLOWING AUTHORIZATION TO LINE A PARTICULAR SEWER PIPE;
 - 1) SHOP DRAWINGS FOR LINER SIZE, MATERIAL AND THICKNESS.
 - 2) DRAWINGS AND/OR TECHNICAL INFORMATION ON ALL MATERIALS AND EQUIPMENT TO BE USED FOR THE INSTALLATION IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
 - 3) DESIGN CALCULATIONS FOR THE EXISTING SOIL AND HYDRAULIC LOADINGS.
 - 4) PROVIDE MATERIAL CERTIFICATIONS FOR THE LINER MATERIALS AT THE TIME OF SHIPMENT TO THE SITE OF WORK.
 - 5) EACH SUBMITTAL SHALL COMPLETE IN ALL RESPECTS, INCORPORATING ALL INFORMATION AND DATA LISTED HEREIN AND ALL ADDITIONAL INFORMATION REQUIRED FOR EVALUATION OF THE PROPOSED MATERIALS IN COMPLIANCE WITH THE CONTRACT DOCUMENTS.
 - 6) PARTIAL, INCOMPLETE OR ILLEGIBLE SUBMISSIONS WILL BE RETURNED TO THE CONTRACTOR WITHOUT REVIEW FOR RESUBMISSION.

4.4 QUALITY ASSURANCE

VENDOR: NATIONAL WATER MAIN CLEANING

- A. THE FINISHED PIPE LINER SHALL BE FABRICATED FROM MATERIALS WHICH, WHEN INSTALLED WILL BE CHEMICALLY RESISTANT TO WITHSTAND INTERNAL EXPOSURE TO DOMESTIC SEWAGE.
- B. TO BE ACCEPTABLE, A MINIMUM OF FIVE HUNDRED THOUSAND (500,000') LINEAR FEET OF WASTEWATER COLLECTION SYSTEM INSTALLATION OF THE PRODUCT IN THE U.S. MUST BE DOCUMENTED.
- C. TO BE ACCEPTABLE, THE INSTALLER MUST HAVE HAD AT LEAST TEN (10) YEARS ACTIVE EXPERIENCE IN THE COMMERCIAL INSTALLATION OF THE PRODUCT AND MUST HAVE INSTALLED AT LEAST SIXTY FIVE THOUSAND (65,000') LINEAR FEET OF THE PVC DEFORMED LINER IN WASTEWATER COLLECTION SYSTEMS.
- D. A LIST OF REFERENCES FOR BOTH THE PRODUCT AND THE INSTALLER SHALL BE INCLUDED WITH THE BID.

4.5 MTH LATERAL REHABILITATION LINING**GENERAL****WORK INCLUDED**

- A. THE WORK COVERED BY THIS SECTION OF THE SPECIFICATIONS INCLUDES THE FURNISHING OF ALL LABOR, TOOLS, EQUIPMENT AND MATERIAL, FOR THE RECONSTRUCTION OF THE EXISTING SEWER LATERALS BY INSERTION OF THE LINER PRODUCT INTO THE LATERAL CONNECTIONS FROM THE SEWER MAIN WITHOUT ACCESS THROUGH A CLEAN-OUT BY THE CURED-IN-PLACE-PIPE (CIPP) METHOD. THE LATERALS WILL BE CLEANED OF ALL DEBRIS AND ROOTS PRIOR TO INSTALLATION OF THE LINER. IN THE EVENT OF ACTIVE INFILTRATION OR INFLOW INTO THE LATERAL, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ELIMINATING THE INFILTRATION OR INFLOW, AT NO ADDITIONAL COST TO THE TOWNSHIP, FOR PROPER INSTALLATION OF THE LINER.
- B. THE LINER IS VACUUM IMPREGNATED WITH THE RESIN AND PLACED INSIDE A PROTECTIVE LAUNCHING DEVICE WITH A TRANSLUCENT SILICONE BLADDER. THE PROCESS INCLUDES THE INVERSION LINING OF EXISTING SEWERS WITH A THERMOSETTING FLEXIBLE RESIN-IMPREGNATED POLYESTER FIBER FELT LINER HAVING AN IMPERMEABLE INNER SURFACE. THE POLYESTER FIBER FELT LINER SHALL BE AS SPECIFIED HEREIN. THE COMPLETED AND CURED CIPP LINER SHALL EXTEND TO A PRE-DETERMINED LENGTH INTO THE SEWER LATERAL CONNECTION OF THE SEWER MAIN AND BE A CONTINUOUS TIGHT FITTING WATERTIGHT PIPE-WITHIN-A-PIPE AND SHALL PROVIDE A STRUCTURALLY SOUND IMPERMEABLE, JOINT-LESS AND CLOSE-FITTING-PIPE-WITHIN-A-PIPE TO THE HOST PIPE AS SPECIFIED HEREIN AND SHOWN ON THE DRAWINGS. **THE ONE PIECE SECTION LINER SHALL BE MANUFACTURED IN A FACTORY SETTING PRIOR TO ITS ARRIVAL ON SITE. NO COMPONENT OF THE LINER (I.E. LATERAL TUBE TO MAINLINE PIECE) SHALL BE GLUED OR SEWN FUSED I THE FIELD PRIOR TO INSTALLATION.**
- C. THE RESIN IMPREGNATED LINER SHALL BE FORMED TO THE HOST PIPE BY UTILIZING AIR PRESSURE.
- D. CURING SHALL BE ACCOMPLISHED BY STEAM (OR OTHER APPROVED METHOD).

SYSTEM DESCRIPTION

- A. ALL MATERIALS (POLYESTER FIBER FELT LINER, THERMOSETTING RESIN, ETC.) SHALL BE ACCOMPANIED BY TEST REPORTS CERTIFYING THAT THE MATERIAL CONFORMS TO THE ASTM LISTED HEREIN. MATERIALS SHALL BE SHIPPED, STORED AND HANDLED IN A MANNER CONSISTENT WITH THE WRITTEN RECOMMENDATIONS OF THE MANUFACTURER.

VENDOR: NATIONAL WATER MAIN CLEANING

- B. THE CONTRACTOR SHALL CONFORM WITH ALL WORK SAFETY REQUIREMENTS OF PERTINENT REGULATORY AGENCIES AND SHALL SECURE THE SITE FOR THE WORKING CONDITION IN COMPLIANCE WITH THE SAME. THE CONTRACTOR SHALL ERECT SUCH SIGNS AND OTHER DEVICES AS ARE NECESSARY FOR THE SAFETY OF THE WORK SITE.
- C. THE CONTRACTOR SHALL ALSO PERFORM ALL OF THE WORK IN ACCORDANCE WITH APPLICABLE OSHA STANDARDS AND APPLICABLE CONFINED SPACE ENTRY PROCEDURES. EMPHASIS SHALL BE PLACED UPON THE REQUIREMENTS FOR ENTERING CONFINED SPACES AND WORKING WITH SCAFFOLDING.
- D. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING CLEANING AND CURING WATER. THE CONTRACTOR SHALL MAKE ALL NECESSARY ARRANGEMENTS WITH A LOCAL WATER COMPANY WITH REGARD TO THE WATER HOOK UP. ALL COSTS INCLUDING PIPING, HOOKUPS, TANKER TRUCKS, WATER METERING AND COST RELATED TO WATER PURCHASE FROM THE LOCAL WATER COMPANY SHALL BE INCLUDED IN THE LINEAR FOOT PRICE OF THE LINER.

REFERENCES

- A. AMERICAN SOCIETY FOR TESTING AND MATERIAL STANDARDS;
 - 1) ASTM F-1216 STANDARD PRACTICE FOR REHABILITATION OF EXISTING PIPELINES AND CONDUITS BY THE INVERSION AND CURING OF A RESIN-IMPREGNATED TUBE.
 - 2) ASTM D-638 TEST METHOD FOR TENSILE PROPERTIES OF PLASTICS.
 - 3) ASTM D-790 TEST METHOD FOR TENSILE PROPERTIES OF UNREINFORCED AND REINFORCED PLASTICS AND ELECTRICAL INSULATING MATERIALS.
- B. AMERICAN WATER WORKS ASSOCIATION STANDARDS
- C. AMERICAN NATIONAL STANDARDS INSTITUTE
- D. NATIONAL ASSOCIATION OF SEWER SERVICE COMPANIES
- E. NJ STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION; LATEST EDITION

SUBMITTALS

- A. **PRODUCT DATA:** SUBMIT MANUFACTURER'S TECHNICAL PRODUCT DATA AND DETAILED INSTALLATION INSTRUCTIONS FOR ALL EQUIPMENT AND PRODUCTS OF THIS SECTION.
- B. **SHOP DRAWINGS:** SUBMIT SHOP DRAWINGS FOR ALL EQUIPMENT AND MATERIALS TO BE USED DURING REHABILITATION LINING.
- C. MANUFACTURER'S DESCRIPTION OF THE PROPOSED LINING METHODOLOGY. SUBMITTALS SHALL INCLUDE INFORMATION ON THE POLYESTER FIBER FELT TUBING LINER AND THERMOSETTING RESIN INTENDED TO BE UTILIZED. IT SHALL INCLUDE DETAILED INSTRUCTIONS WITH REGARD TO CURING PROCEDURES INCLUDING CURING TEMPERATURE AND REQUIRED CURING AND COOLING TIME.
- D. TWO (2) COPIES OF THE REQUIRED LINER THICKNESS AND DESIGN CALCULATIONS SHALL BE SUBMITTED BY THE CONTRACTOR. THE CALCULATIONS SHALL BE SIGNED AND SEALED BY A REGISTERED PROFESSIONAL ENGINEER.
- E. COPY OF THE PROPOSED LETTER TO THE HOMEOWNERS ADVISING THEM ABOUT THE PROPOSED REPAIR AND NECESSITY OF SHUTTING THE SEWER SERVICE FOR A DAY SHALL BE SUBMITTED FOR ENGINEERS REVIEW AND APPROVAL PRIOR TO DISTRIBUTION. LETTER SHALL BE DISTRIBUTED BY THE CONTRACTOR TO THE HOMEOWNERS NOT LESS THAN 24 HOURS PRIOR TO CONSTRUCTION.

CONTRACTOR (QUALIFICATIONS / REFERENCES)

VENDOR: NATIONAL WATER MAIN CLEANING

- A. THE CONTRACTOR PERFORMING THE LATERAL LINING WORK SHALL PROVIDE A LIST OF REFERENCES, INCLUDING OWNER NAME, CONTACT NAME WITH PHONE NUMBER, START AND COMPLETION DATES AND QUANTITY OF LATERALS LINED, WITH THE CIPP LATERAL LINING SYSTEM USED FOR THAT SPECIFIC PROJECT PROVIDED, VERIFYING COMPLIANCE WITH THESE QUALIFICATIONS.
- B. A FIVE (5) YEAR HISTORY OF SATISFACTORY PERFORMANCE I THE CIPP INDUSTRY.
- C. A MINIMUM OF 5,000 CIPP LATERAL INSTALLATIONS, MINIMUM OF TWO (2) FEET.
- D. A MINIMUM OF TWO (2) YEARS CONTINUOUS EXPERIENCE INSTALLING CIPP LATERAL LINING IN PIPE OF SIMILAR SIZE, LENGTH AND CONFIGURATION AS PROPOSED IN THIS PROJECT.
- E. THE ON-SITE SUPERINTENDENT MUST HAVE INSTALLED OVER 1,500 CIPP LATERALS OF LIKE CONDITION AND HAVE A MINIMUM OF FIVE (5) YEARS OF CIPP INDUSTRY EXPERIENCE.
- F. LICENSE OR CERTIFICATION THAT THE PROPOSED INSTALLER IS APPROVED TO INSTALL THE PROPOSED PRODUCT.

PRODUCTS**LINER**

- A. THE LINER ASSEMBLY SHALL CONSIST OF A ONE PIECE PVC COATED FELT FULL WRAP SADDLE ATTACHED TO CONTINUOUS PVC COATED FELT TUBULAR LINER AND IMPREGNATED WITH A 100% SOLIDS EPOXY. **NO POLYESTER RESINS WILL BE ACCEPTED.** THE FULL WRAP SADDLE WILL INCORPORATE A NEEDLE PUNCHED FELT COATED WITH PVC. THE INNER-FACE LAMINATE IS PRESSED AGAINST THE SURFACE OF THE SEWER MAIN PIPELINE, THE PVC COATING WILL BE ON THE INSIDE OF THE REPAIR APPARENT WHEN TELEVISED FOR FINAL INSPECTION. THE FELT WILL BE AGAINST THE PIPELINE STRUCTURE. THE CONTINUOUS TUBULAR LINER SHALL BE MADE OF FELT WITH A PVC COATING AND FORMED TOGETHER USING A NEEDLE HOOP STITCHING OR BUTT WELDING TECHNIQUE WITH TRANSLUCENT SEAM TAPE. **THE ONE PIECE SECTION LINER SHALL BE MANUFACTURED IN A FACTORY SETTING PRIOR TO ITS ARRIVAL ON SITE. NO COMPONENT OF THE LINER (I.E. LATERAL TUBE TO MAINLINE PIECE) SHALL BE GLUED OR SEWN FUSED IN THE FIELD PRIOR TO INSTALLATION.** THE MATERIALS USED TO CONSTRUCT THE FULL WRAP SADDLE AND LINER TUBE MUST WITHSTAND INSTALLATION PRESSURES, HAVE SUFFICIENT STRENGTH TO BRIDGE MISSING PIPE SEGMENTS AND FLEXIBILITY TO FIT IRREGULAR PIPE SECTIONS. THE SADDLE DIMENSIONS SHALL BE A 360° DEGREE FULL WRAP IN THE MAIN WITH AT LEAST FIVE (5) INCHES ON EITHER SIDE OF THE LATERAL.
- B. THE ONE PIECE FULL WRAP SADDLE AND LINER TUBE SHALL CONFORM TO THE SHAPE OF A “T” OR “WYE” FITTING.

RESIN

- A. THE RESIN SYSTEM SHALL CONSIST OF A TWO-PART EPOXY RESIN THAT WHEN CURED WILL CONFORM TO THE ASTM F1216-05 PHYSICAL PROPERTIES. THE RESIN SHALL MEET THE ASTM F1216-05 CHEMICAL RESISTANCE REQUIREMENTS. ALL TESTING IS TO BE PERFORMED BY A THIRD PARTY TESTING LABORATORY. THE RESIN, WHEN CURED, SHALL BE CONSISTENT WITH THE FELT LINER AND CONFORM TO THE EXISTING PIPE WITH GAPS, VOIDS, AND/OR ANNULAR SPACE. THE FINISHED CURED IN PLACE LINER SHALL BE WATER TIGHT AND PASS A 31B AIR TEST AT THREE (3) MINUTES MINIMUM. **POLYESTER, VINYLESTER RESINS WHICH PRODUCE SHRINKAGE AND UV CURED SYSTEMS WILL NOT BE ACCEPTED.**

- B. RESIN AND MATERIALS SHALL BE SUPPLIED BY TRELLEBORG/EPROS, MILFORD, NEW HAMPSHIRE OR EQUAL.

LATERAL MATERIAL TEST

CURED LINER	STANDARD	RESULTS
TENSILE STRESS	ASTM D-638	5,200 PSI
FLEXURAL STRESS	MODIFIED ASTM D-790	11,500 PSI
MODULES OF ELASTICITY	MODIFIED ASTM D-790	375,000 PSI

APPROVED MANUFACTURES PRODUCTS

- 1) TRELLEBORG/EPROS, INC.
- 2) OR APPROVED EQUAL

THE FINISHED PIPE MUST BE SUCH THAT WHEN THE RESIN CURES, THE TOTAL WALL THICKNESS WILL BE A HOMOGENEOUS AND MONOLITHIC FELT COMPOSITE COATED WITH PVC THAT WILL BE CHEMICALLY RESISTANT TO WITHSTAND INTERNAL EXPOSURE TO DOMESTIC SEWERAGE.

THE CONTRACTOR SHALL FURNISH, PRIOR TO USE OF THE LINING MATERIALS, SATISFACTORY WRITTEN GUARANTEE OF HIS COMPLIANCE WITH THE MANUFACTURER’S STANDARDS FOR ALL MATERIALS AND TECHNIQUES BEING USED IN THE INVERSION LINING PROCESS. THE CONTRACTOR SHALL PROVIDE CERTIFIED TEST RESULTS FOR APPROVAL BY THE ENGINEER, FROM THE MANUFACTURER THAT THE MATERIAL CONFORMS WITH THE APPLICABLE REQUIREMENTS AND THIS SPECIFICATION. MATERIAL NOT COMPLYING WITH THE REQUIREMENTS SHALL BE REJECTED.

THE LINER THICKNESS FOR EACH SECTION OF PIPE IN EACH SIZE CLASS SHALL BE DESIGNED BY THE CONTRACTOR BASED ON THE PIPE CONDITION AND ACTUAL FIELD EVALUATION OF SITE, SOIL, GROUNDWATER AND LOADS.

PREPARATION OF INSTALLATION OF LINER

ACCESS

- A. IF THE CONTRACTOR REQUIRES ACCESS THROUGH A CLEANOUT OR ACCESS PIT TO COMPLETE THE LATERAL LINING THE COST ASSOCIATED WITH THE CLEANOUT OR ACCESS PIT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR AND NEEDS TO BE INCORPORATED INTO THE CONTACTOR’S UNIT PRICE FOR LATERAL LINING AND THE CONTRACTOR MUST OBTAIN WRITTEN APPROVAL FROM THE ENGINEER.
- B. IF A CLEANOUT IS REQUIRED BY THE OWNER, IT SHALL BE CONSTRUCTED OF MATERIALS WHICH PROVIDE A FOUR (4”) INCH MINIMUM DIAMETER CIRCULAR OPENING. IF SERVICE LATERAL IS SIX (6”) INCH, THEN A SIX (6”) INCH MINIMUM DIAMETER OPENING IS REQUIRED IN THE LATERAL FOR THE CLEANOUT.
- C. THE CONTRACTOR SHALL DISTRIBUTE A LETTER TO THE HOMEOWNERS ADVISING THEM ABOUT THE PROPOSED DISRUPTION OF SEWER SERVICE A MINIMUM OF 24 HOUR NOTICE PRIOR TO PROPOSED WORK.
- D. THE CONTRACTOR SHALL INSURE THE CLEANLINESS OF THE EXISTING LATERAL SEWER PRIOR TO INSERTION OF THE LINER. ALL DEBRIS AND OBSTRUCTION SHALL BE REMOVED. INSTALLATION OF THE LINER WILL NOT BEGIN UNTIL THE CONTRACTOR HAS APPROVAL FROM THE ENGINEER. ONCE THE INVERSION LINING PROCESS HAS BEGUN, WASTEWATER FLOW SHALL BE MAINTAINED BY THE CONTRACTOR UNTIL THE LINING IS TOTALLY CURED.

VENDOR: NATIONAL WATER MAIN CLEANING

- E. THE LINER SHALL BE CONSTRUCTED OF A MATERIAL WHICH, WHEN INSTALLED, SHALL PROVIDE A JOINT-LESS AND CONTINUOUS STRUCTURALLY SOUND LINER ABLE TO WITHSTAND ALL IMPOSED STATIC, DYNAMIC AND HYDROSTATIC LOADS ON A LONG-TERM BASIS. **THE ONE PIECE SECTION LINER SHALL BE MANUFACTURED IN A FACTORY SETTING PRIOR TO ITS ARRIVAL ON SITE. NO COMPONENT OF THE LINER (I.E. LATERAL TUBE TO MAINLINE PIECE) SHALL BE GLUED OR SEWN FUSED IN THE FIELD PRIOR TO INSTALLATION.**
- F. WHERE THIS SPECIFICATION DOES NOT SPECIFICALLY ADDRESS THE INSTALLATION METHOD AND/OR MATERIALS, ASTM F1216 AND ASTM F1743 SHALL GOVERN.

DESIGN REQUIREMENTS

- A. THE FOLLOWING DESIGN REQUIREMENTS MUST BE MET BY THE CONTRACTOR FOR HIS PIPE LINER MATERIAL AND METHOD OF CONSTRUCTION:
- 1) THE REHABILITATION OF THE SEWER LATERAL SHALL BE PERFORMED WITHOUT THE NEED OF A CLEANOUT, EXCAVATION OR DEMOLITION OF EXISTING STRUCTURES, WHICH WILL MINIMIZE THE DISRUPTIONS TO NEIGHBORING HOMES AND TRAFFIC. IN THE EVENT THAT A CLEANOUT BECOMES NECESSARY BECAUSE OF LATERAL DEFECTS, HEAVY CLEANING OR EMERGENCIES IT SHALL BE PERMITTED, BUT ONLY AS REQUIRED AND AUTHORIZED BY THE ENGINEER.
 - 2) THE REHABILITATED SEWER LATERALS SHALL NOT BE SUSCEPTIBLE TO H₂S CORROSION.
 - 3) THE LINER DESIGNED BY THE CONTRACTOR SHALL HAVE SUFFICIENT STRUCTURAL STRENGTH TO SUPPORT ALL DEAD LOADS, LIVE LOADS AND GROUND WATER LOAD IMPOSED WITH THE ASSUMPTION THAT THE EXISTING PIPE CANNOT SHARE ANY LOADING OR CONTRIBUTE TO STRUCTURAL INTEGRITY OF THE LINER. ALL HOST PIPES SHALL BE CONSIDERED FULLY DETERIORATED.
 - 4) THE LINER SHALL PROVIDE THE LEAST POSSIBLE THICKNESS OR DECREASE IN PIPE DIAMETER TO MEET THE STRENGTH AND OTHER DESIGN REQUIREMENTS OF THIS SECTION.
 - 5) THE REHABILITATED SEWER LATERALS SHALL HAVE NO INFILTRATION. ANY INFILTRATION OBSERVED AFTER COMPLETION OF LINING SHALL BE REPAIRED AND ELIMINATED TO THE SATISFACTION OF THE ENGINEER AT NO COST TO THE OWNER.
 - 6) THE REHABILITATED SEWER LATERALS SHALL BE UNIFORMLY ROUND AND SHALL NOT HAVE ANY VISIBLE OVALNESS IN CIRCUMFERENCE OR ANY OTHER VISIBLE DEFECTS SUCH AS WRINKLES, COLLAPSED OR PUSHED IN SECTIONS. LINED SECTION OF PIPE SHALL ACCOMMODATE STANDARD SEWER CLEANING EQUIPMENT FOR THE SPECIFIC PIPE SIZE AND SHALL NOT CREATE ANY FLOW OBSTRUCTION. ANY LINED SECTION OF PIPE WHICH DOES NOT MEET THESE REQUIREMENTS SHALL NOT BE ACCEPTED AND PAID FOR. THE CONTRACTOR SHALL REPAIR ANY DEFECTIVE SECTIONS TO THE SATISFACTION OF THE ENGINEER AT NO EXTRA COST TO THE OWNER.

PREPARATION OF EXISTING SEWER FOR LINER

- A. PRIOR TO ANY LINING OF A LATERAL PIPE SO DESIGNATED, IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO REMOVE INTERNAL DEPOSITS FROM THE PIPELINE AND TO CLEAN EACH SECTION OF PIPE OF ALL FOREIGN MATERIAL.
- B. TELEVISION INSPECTION OF LATERAL PIPELINES SHALL BE PERFORMED BY CERTIFIED NASSCO LACP CERTIFIED PERSONNEL TRAINED IN LOCATING BREAKS, HOLES, LEAKING JOINTS, H₂S DAMAGE, INFILTRATION AND OBSTACLES BY CLOSED CIRCUIT TELEVISION. THE INTERIOR OF THE LATERAL PIPELINE SHALL BE CAREFULLY INSPECTED TO DETERMINE THE LOCATION AND EXTENT OF ANY STRUCTURAL FAILURES. THE LOCATIONS OF ANY CONDITIONS WHICH MAY PREVENT

VENDOR: NATIONAL WATER MAIN CLEANING

PROPER INSTALLATION OF LINING MATERIALS INTO THE LATERAL PIPELINES SHALL BE NOTED SO THAT THESE CONDITIONS CAN BE CORRECTED. A DIGITAL VIDEO FILE (MPEG, AVI, ETC.) AND SUITABLE INSPECTION LOGS SHALL BE KEPT FOR LATER REFERENCE BY THE ENGINEER.

- C. THE CONTRACTOR SHALL PROVIDE FOR THE CONTROL AND BLOCKING OF FLOW WITHIN THE SECTION OR SECTIONS OF LATERAL PIPE THAT ARE TO BE LINED.
- D. THE CONTRACTOR SHALL NOT INTERFERE WITH THE EMPLOYEES, SUPPLIERS OR CONTRACTORS OF THE OWNER IN PERFORMANCE OF ANY WORK THAT THEY MAY CONSIDER NECESSARY TO MAINTAIN THE FLOW INTO THE EXISTING GRAVITY SYSTEM IN AN EMERGENCY.
- E. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO CLEAR THE LINE OF OBSTRUCTIONS SUCH AS SOLIDS, ROOTS OR BROKEN PIPE THAT WILL PREVENT THE INSERTION OF THE LINER. A HIGH SPEED ROTATING HYDRAULIC CUTTER SHALL BE USED TO CUT ROOTS, GREASE OR OTHER OBSTRUCTIONS IN THE PIPE. THE CUT SHALL BE MADE FLUSH WITH THE WALL OF THE PIPE TO BE RESTORED. THE DEBRIS SHALL BE PUSHED DOWN THE LATERAL PIPE TO THE MAIN PIPE AND TO THE DOWNSTREAM MANHOLE AND IS TO BE REMOVED BY THE CONTRACTOR. IF INSPECTION REVEALS AN OBSTRUCTION THAT CANNOT BE REMOVED BY CONVENTIONAL CLEANING EQUIPMENT, THE CONTRACTOR SHALL NOTIFY THE ENGINEER AND THE CLEANING EFFORT SHALL BE ABANDONED. THE CONTRACTOR SHALL CONFIRM THAT THE SEWER IS CLEAN ENOUGH TO ENSURE AN EFFECTIVE LINING. THE LINE SEGMENT SHALL NOT BE LINED UNTIL APPROVED BY THE ENGINEER.

INSTALLATION OF LINER**GENERAL**

- A. A RESIN AND CATALYST SYSTEM COMPATIBLE WITH THE REQUIREMENTS OF THIS METHOD SHALL BE USED. THE QUANTITIES OF THE LIQUID THERMOSETTING MATERIALS SHALL BE PER THE MANUFACTURER'S STANDARDS TO PROVIDE THE REQUIRED LINING THICKNESS.
- B. THE VACUUM IMPREGNATED WET-OUT LINER MATERIAL SHALL BE LOADED INTO THE DELIVERY SYSTEM CONSISTING OF A BLADDER/APPLICATOR PRESSURE APPARATUS ABOVE GROUND. A REMOTE POSITIONER WITH WINCH ATTACHED WILL POSITION THE APPLICATOR INTO PLACE. AIR PRESSURE, SUPPLIED TO THE PRESSURE APPARATUS SHALL BE USED TO HOLD THE WET-OUT MATERIAL IN THE CONNECTION BETWEEN AND INCLUDING THE LATERAL SERVICE PIPE AND MAINLINE PIPE CONNECTION. THE PRESSURE WILL BE ADJUSTED TO BE SUFFICIENT PRESSURE TO CAUSE THE LINER MATERIAL TO EXPAND COMPLETELY INTO THE LATERAL PIPE. THE TERMINATION POINT MAY BE WITHIN TWO (2') FEET OF AN EXISTING CLEAN-OUT, OR WITHIN TEN (10) FEET OF THE BUILDING STRUCTURE, OR TO THE RIGHT-OF-WAY LINE/PROPERTY LINE. THE MAIN/LATERAL BLADDER ASSEMBLY SHALL EXTEND PAST ALL ENDS OF THE LINER AS NO CUTTING SHALL BE REQUIRED. THE FULL WRAP SADDLE PORTION MUST FIRST BE PRESSED INTO THE MAIN LINE SEWER PIPE AND THEN THE TUBULAR PORTION INVERTED INTO THE LATERAL A MINIMUM OF TWO (2') FEET.

LINER CURING

- A. THE LINER SYSTEM MATERIAL WILL AMBIENT CURE THROUGH THE CHEMICAL REACTION BETWEEN THE TWO PART EPOXY RESIN. THE CONTRACTOR MAY USE EXTERNAL HEAT SOURCE TO EXPEDITE THE CURING PROCESS PER MANUFACTURER'S RECOMMENDATIONS SO AS NOT TO OVER STRESS THE FELT FIBER AND CAUSE DAMAGE OR FAILURE OF THE LINER PRIOR TO CURE. THE CURING PROCESS SHALL BE NO MORE THAN THREE (3) HOURS.

VENDOR: NATIONAL WATER MAIN CLEANING

- B.** INITIAL CURE SHALL BE DEEMED TO BE COMPLETED WHEN INSPECTION OF THE LINER APPEARS TO BE HARD AND SOUND. THE CURE PERIOD SHALL BE OF DURATION OF MAXIMUM THREE (3) HOURS OR AS DESIGNED FOR THE LINER SYSTEM.

COOL DOWN

THE CONTRACTOR SHALL COOL THE HARDENED LINER TO A TEMPERATURE BELOW 100°F DEGREES BEFORE RELIEVING THE HEAD PRESSURES IN THE INVERSION APPARATUS. COOL-DOWN MAY BE ACCOMPLISHED BY THE INTRODUCTION OF COOL AIR INTO THE INVERSION TUBE TO REPLACE STEAM BEING RELEASED FROM A SMALL HOLE MADE IN THE END OF THE LINER AT THE DOWNSTREAM END.

FINISH

- A.** THE FINISHED LINING SHALL BE CONTINUOUS OVER THE ENTIRE LENGTH OF AN INSERTION RUN AND BE AS FREE AS COMMERCIALY PRACTICABLE FROM VISUAL DEFECTS SUCH AS FOREIGN INCLUSIONS, DRY SPOTS, PINHOLES AND DELAMINATION. THE LINING SHALL BE IMPERVIOUS AND FREE OF ANY LEAKAGE FROM THE PIPE TO THE SURROUNDING GROUND OR FROM THE GROUND TO THE INSIDE OF THE LINED PIPE. THE SURFACE SHALL BE SMOOTH AND FREE OF WAVINESS THROUGHOUT THE PIPE. INFILTRATION LEAKS SHALL NOT BE VISIBLE AT MANHOLES AND AT LATERALS.
- B.** ANY DEFECTS WHICH WILL OR COULD AFFECT THE INTEGRITY OR STRENGTH OF THE LININGS SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE, IN A MANNER APPROVED BY THE ENGINEER, AT NO ADDITIONAL COST TO THE OWNER.

TESTING OF THE LINER

- A.** FOR EVERY FIFTY (50) LATERALS ONE FLAT PLATE SAMPLE SHALL BE TAKEN AND SENT TO A THIRD PARTY TEST LABORATORY FOR CONFIRMATION OF SHORT TERM FLEXURAL MODULES AND STRENGTH PROPERTIES IN ACCORDANCE WITH ASTM F1216.
- B.** THE TEST RESULTS SHALL MEET OR EXCEED THE VALUES USED IN THE DESIGN OF THE CIPP LATERAL LINER.
- C.** ANY INFILTRATION LEAKS AT THE POINT OF CONNECTION OF THE LINER TO THE MAIN PIPE MUST BE REPAIRED TO THE SATISFACTION OF THE ENGINEER AT NO EXTRA COST TO THE OWNER.

FINAL INSPECTION

AFTER INSTALLATION OF THE LINER, THE CONTRACTOR SHALL PERFORM A TV INSPECTION IN THE PRESENCE OF THE OWNER'S REPRESENTATIVE. A LATERAL LAUNCHING TV CAMERA SHALL BE USED. THE FINISHED LINER SHALL BE CONTINUOUS OVER THE ENTIRE LENGTH OF THE INSTALLATION. THE LINER SHALL BE FREE OF VISUAL DEFECTS, DAMAGE, DEFLECTION, HOLES AND THE LIKE. THERE SHALL BE NO INFILTRATION THROUGH THE LINER. ANY EVIDENCE OF INFILTRATION SHALL RESULT IN REPAIRS PERFORMED BY THE CONTRACTOR TO THE SATISFACTION OF THE ENGINEER AT NO EXTRA COST TO THE OWNER.

CLEAN -UP

AFTER INSTALLATION OF THE LINER, THE CONTRACTOR SHALL CLEAN-UP THE ENTIRE PROJECT AREA AND RETURN THE GROUND COVER TO GRADE. ALL EXCESS MATERIAL AND DEBRIS NOT INCORPORATED INTO THE PERMANENT INSTALLATION SHALL BE DISPOSED OF BY THE CONTRACTOR,

IN ACCORDANCE WITH STATE AND FEDERAL LAWS AND REGULATIONS. THE PROJECT AREA AFFECTED BY THE CONTRACTOR'S OPERATIONS SHALL BE REINSTATED.

WARRANTY

- A. THE LINER SHALL BE CERTIFIED BY THE MANUFACTURER FOR SPECIFIED MATERIAL PROPERTIES. THE CONTRACTOR SHALL WARRANT THE LINER AND LINER INSTALLATION FOR ONE (1) YEAR. DURING THE WARRANTY PERIOD, ANY DEFECTS WHICH AFFECT THE INTEGRITY OR STRENGTH OF THE PIPE SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE IN A MANNER MUTUALLY AGREED BY THE OWNER AND THE CONTRACTOR.
- B. IF A LINER FAILS TO CURE, THE CONTRACTOR SHALL BE REQUIRED TO REMOVE THE FAILED LINER AT NO ADDITIONAL COST. THIS SHALL INCLUDE ALL MATERIAL, EXCAVATION, BACKFILLING, CUTTING CONCRETE, PIPE SHORING, TEMPORARY PAVEMENT, PERMANENT PAVEMENT, PERMITS AND OTHER INCIDENTAL WORK REQUIRED TO REMOVE THE LINER FROM THE EXISTING PIPE. THERE SHALL BE NO PAYMENT FOR THIS WORK.

MEASUREMENT AND PAYMENT

SEWER LATERAL REHABILITATION LINING

- A. THE QUANTITY OF SANITARY GRAVITY LINING FOR WHICH PAYMENTS WILL BE MADE SHALL BE PER UNIT OF LATERAL CONNECTIONS LINED.
- B. PAYMENT FOR SANITARY SEWERS LATERAL LINING SHALL BE MADE FOR THE QUANTITY AS DETERMINED ABOVE AT THE PRICE BID PER UNIT FOR THE RESPECTIVE ITEMS IN THE PROPOSAL. THIS PAYMENT SHALL INCLUDE ALL COSTS OF LABOR, MATERIALS AND EQUIPMENT; PRE AND POST INSTALLATION TV SEWER INSPECTION, SEWER CLEANING; SANITARY LATERALS FLOW CONTROL AND PROTECTION OF UTILITIES; LINER THERMAL CURING INCLUDING WATER, WATER TANKER TRUCKS AND WATER HOOK-UP AND PURCHASE; JOINTING; CLEANING; TESTING; ARRANGEMENT FOR WATER SUPPLY FOR CURING.

4.6 PVC DEFORMED LINER

GENERAL

- A. PVC PIPE LINER SHALL MEET THE PERFORMANCE REQUIREMENTS OF ASTM D 3034.
- B. PVC PIPE LINER SHALL BE MANUFACTURED FROM VIRGIN PVC COMPOUND CONTAINING NO FILLERS.
- C. UNLESS OTHERWISE REQUIRED BY INSTALLATION DEPTH OR SIZE OF PIPE, LINER SHALL HAVE AN SDR OF 32.5 OR AS RECOMMENDED BY THE MANUFACTURER. THE MINIMUM LENGTH OF THE PVC LINER PIPE SHALL BE THAT DEEMED NECESSARY BY THE CONTRACTOR TO EFFECTIVELY SPAN THE DISTANCE FROM THE INLET TO THE OUTLET OF THE RESPECTIVE MANHOLES AND TO PROVIDE FOR A TIGHT SEAL AT THE MANHOLE CONNECTIONS. THE CONTRACTOR SHALL BE RESPONSIBLE TO VERIFY THE EXISTING SEWER PIPE LENGTHS AND DIAMETERS IN THE FIELD PRIOR TO THE MANUFACTURE OF MATERIALS.
- D. IT SHOULD BE NOTED THAT THE DIGITAL SCAN INSPECTION OF THE INDIVIDUAL SEWER LINE REPRESENTS THE CONDITION OF THE PIPELINE FOLLOWING CLEANING. THE PIPELINE MUST BE ADEQUATELY CLEANED BY THE CONTRACTOR PRIOR TO LINER INSTALLATION AS NECESSARY AND/OR REQUIRED, TO INSTALL THE LINER.
- E. LINER SHALL BE MARKED AT FIVE (5') FOOT INTERVALS OR LESS WITH A CODED NUMBER, WHICH IDENTIFIES THE MANUFACTURER, SDR, SIZE MATERIAL, TO WHICH THE LINER WAS EXTRUDED. AT THE END OF THE PRODUCTION SHIFT DURING WHICH A PRODUCTION LOT HAS BEEN EXTRUDED, THE

MARKING CODE ON THE LINER SHALL BE CHANGED TO INDICATE THAT SAID TIME INTERVALS HAVE ELAPSED AND A NEW PRODUCTION SHIFT HAS BEGUN.

4.7 PHYSICAL CHARACTERISTICS

A. THE COMPOUND USED FOR THE DEFORMED PIPE SHALL CONFORM TO ASTM F-1867 AND F-1871. COMPOUNDS THAT HAVE DIFFERENT CELL CLASSIFICATIONS BECAUSE ONE OR MORE PROPERTIES ARE SUPERIOR TO THOSE OF THE SPECIFIED COMPOUNDS ARE ALSO ACCEPTABLE.

B. PIPE LINERS COMPLYING WITH ASTM F-1867 AND F-1871 WILL MEET OR EXCEED THE FOLLOWING MINIMUM PHYSICAL PROPERTIES;

- 1) COMBUSTIBILITY: SELF-EXTINGUISHING/FLAME RESISTANT
- 2) FLEXURAL MODULUS (ASTM D790): 145,000 PSI @ 73F
- 3) FLEXURAL STRENGTH (ASTM D790): 4,100 PSI @ 73F
- 4) IZOD IMPACT (ASTM D256): 0.65 TO 1.2 FT. LB./IN
- 5) TENSILE ELONGATION (ASTM-638): 150% MIN.
- 6) TENSILE MODULUS (ASTM D638): 155,000 PSI MIN.

C. PERFORMANCE CHARACTERISTICS: THE PVC PIPE LINER MUST BE CAPABLE OF EXPANDING ONE SIZE LARGER THAN THE HOST PIPE DIAMETER WITHOUT SPLITTING OR RUPTURING, (I.E. 8” TO 10”, 12” TO 15”), TO ENSURE THE PIPE LINERS ABILITY TO PROPERLY THERMOFORM AND ATTAIN A TIGHT FIT. ADDITIONALLY, THE PIPE LINER MUST BE CAPABLE OF LINING BENDS, SUCH AS THOSE CREATED BY OFFSETS UP TO 90° DEGREES, WITHOUT VERTICAL BUCKLING OR RIPPING. AFTER BEING EXPANDED BY THERMOFORMING, THE INSTALLED PIPE LINER SHALL MATCH THE CONFIGURATION OF THE HOST PIPE, WITH A CONCAVE DIMPLE APPEARING AT EACH SERVICE CONNECTION. INSTALLATION, REFORMATION AND PROCESSING SHALL CAUSE NO DEGRADATION OF PVC PIPE LINER DESIGN PROPERTIES.

D. THE OWNER MAY, AT ANY TIME, DIRECT THE MANUFACTURER TO OBTAIN COMPOUND SAMPLES AND PREPARE TEST SPECIMENS IN ACCORDANCE WITH ASTM D-1784. THE SPECIMENS SHALL COMPLY WITH THE MINIMUM PROPERTY VALUES SHOWN BELOW WITH APPLICABLE ASTM REQUIREMENTS;

<u>MATERIAL</u>	<u>PROPERTY</u>	<u>ASTM METHOD</u>	<u>INITIAL VALUE</u>	<u>112</u>
<u>DAY EXPOSURE</u>				
PVC	TENSILE STRENGTH	D638	3,500 PSI	3,500 PSI
PVC	IMPACT STRENGTH	D256	1.2 FT. LBS/IN	1.2 FT. LBS/IN
PVC	FLEXURAL MODULUS	D790	145,000 PSI	4 DAYS

E. GENERAL CORROSION REQUIREMENTS: THE FOLD-AND-FORM PVC PIPE LINER SHALL BE MANUFACTURED FROM MATERIALS THAT, WHEN PROCESSED, WILL BE CHEMICALLY RESISTANT TO AND ABLE TO WITHSTAND EXPOSURE TO CONDITIONS THAT NORMALLY OCCUR IN SEWERS CONVEYING DOMESTIC SEWAGE. THIS INCLUDES EXPOSURE TO HYDROGEN SULFIDE GAS AND TO DILUTE SULFURIC ACID.

REFERENCE STANDARDS - COMPLY WITH APPLICABLE PROVISIONS AND RECOMMENDATIONS OF THE FOLLOWING;

- 1) ASTM D256: STANDARD TEST METHODS FOR DETERMINING THE PENDULUM IMPACT RESISTANCE OF NOTCHED SPECIMENS
- 2) ASTM D638: STANDARD TEST METHOD FOR TENSILE PROPERTIES OF PLASTICS
- 3) ASTM F1871: STANDARD SPECIFICATION FOR FOLDED/FORMED POLYVINYL CHLORIDE (PVC) PIPE TYPE A FOR EXISTING SEWER AND CONDUIT REHABILITATION

VENDOR: NATIONAL WATER MAIN CLEANING

- 4) ASTM F1504: STANDARD SPECIFICATION FOR FOLDED POLYVINYL CHLORIDE (PVC) PIPE FOR EXISTING SEWER AND CONDUIT REHABILITATION
- 5) ASTM D790: STANDARD TEST METHODS FOR FLEXURAL PROPERTIES OF UN-REINFORCED AND REINFORCED PLASTICS AND ELECTRICAL INSULATING MATERIALS
- 6) ASTM D1784: STANDARD SPECIFICATION FOR RIGID POLYVINYL CHLORIDE (PVC) COMPOUNDS AND CHLORINATED POLYVINYL CHLORIDE (CPVC) COMPOUNDS
- 7) ASTM D2412: STANDARD TEST METHOD FOR DETERMINATION OF EXTERNAL LOADING CHARACTERISTICS OF PLASTIC PIPE BY PARALLEL-PLATE LOADING
- 8) ASTM D2444: STANDARD TEST METHOD FOR IMPACT RESISTANCE OF THERMOPLASTIC PIPE AND FITTINGS BY MEANS OF A TAP (FALLING WEIGHT)

MANUFACTURER - THE PVC DEFORMED PIPE LINING SHALL BE PIPE AS MANUFACTURED BY;

- 1) AMERICAN PIPE & PLASTICS, INC. (AM LINER II)
- 2) OR APPROVED EQUAL

SECTION 5 – PART I - MANHOLE REHABILITATION

EPOXY MANHOLE REHABILITATION

5.1 SCOPE OF WORK

- A. FURNISH ALL LABOR, MATERIALS, EQUIPMENT AND INCIDENTALS REQUIRED AND INSTALL AND TEST MANHOLE MONOLITHIC LINING SYSTEM AND APPURTENANCES COMPLETE AS SPECIFIED HEREIN. THE MONOLITHIC LINING SHALL BE USED TO REHABILITATE THE INTERIOR OF THE DESIGNATED, EXISTING SEWER MANHOLES. THE SYSTEM SHALL BE SUITABLE FOR COMPLETELY SEALING OUT ALL INFILTRATION IN EXISTING MANHOLES.
- B. THE CONTRACTOR SHALL ACCURATELY FIELD MEASURE AND SIZE EACH INDIVIDUAL MANHOLE. THE CONTRACTOR IS REMINDED THAT EACH EXISTING SEWER MANHOLE DESIGNATED TO RECEIVE A MONOLITHIC LINING MAY HAVE A DIFFERENT CONFIGURATION AND VARYING FIELD DIMENSIONS. ALL FIELD MEASUREMENTS SHALL CONFORM TO THE REQUIREMENTS OF THE MONOLITHIC LINING MANUFACTURER.

5.2 SUBMITTALS

- A. SUBMIT TO THE ENGINEER, SHOP DRAWINGS AND SCHEDULES OF ALL EPOXY MANHOLE MONOLITHIC LINING SYSTEMS (EMMLS) AND APPURTENANCES. SUBMIT DESIGN DATA AND SPECIFICATION DATA SHEETS LISTING ALL PARAMETERS USED IN THE MONOLITHIC LINING SYSTEM DESIGN AND THICKNESS CALCULATIONS BASED ON APPLICABLE PROVISIONS OF ASTM C722.
- B. SUBMIT TO THE ENGINEER, WITHIN TEN (10) DAYS OF THE EFFECTIVE DATE OF THE AGREEMENT THE NAME OF THE SUPPLIER (MANUFACTURER), INSTALLER AND A LIST OF MATERIALS TO BE FURNISHED.
- C. SUBMIT A STEP-BY-STEP DESCRIPTION OF THE METHODS, PRACTICES, INTERVALS, ETC. TO BE USED IN THE APPLICATION AND CURING OF THE MONOLITHIC LINING SYSTEM TO MEET THE REQUIREMENTS OF THIS SPECIFICATION SECTION.

5.3 TEST REPORTS

PRIOR TO EACH SHIPMENT OF MATERIALS, SUBMIT CERTIFIED TEST REPORTS THAT THE MATERIALS FOR THIS CONTRACT WERE MANUFACTURED AND TESTED IN ACCORDANCE WITH THE ASTM STANDARDS SPECIFIED HEREIN.

REFERENCE STANDARDS – AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- 1) ASTM C722: STANDARD SPECIFICATION FOR CHEMICAL-RESISTANT RESIN MONOLITHIC SURFACINGS
- 2) ASTM C882: TEST METHOD FOR BOND STRENGTH OF EPOXY-RESIN SYSTEMS USED WITH CONCRETE
- 3) ASTM C884: TEST METHOD FOR THERMAL COMPATIBILITY BETWEEN CONCRETE AND AN EPOXY-RESIN OVERLAY
- 4) ASTM D790: TEST METHODS FOR FLEXURAL PROPERTIES OF UNREINFORCED AND REINFORCE PLASTICS
- 5) ASTM D870: PRACTICE FOR TESTING WATER RESISTANCE OF COATINGS USING WATER IMMERSION
- 6) ASTM D1763: STANDARD SPECIFICATIONS FOR EPOXY RESINS
- 7) ASTM D2247: PRACTICE FOR TESTING WATER RESISTANCE OF COATINGS IN 100% RELATIVE HUMIDITY

WHERE REFERENCE IS MADE TO ONE OF THE ABOVE STANDARDS, THE REVISION IN EFFECT AT THE TIME OF BID OPENING SHALL APPLY.

5.4 QUALIFICATIONS

- A. THE CONTRACTOR PERFORMING THE WORK SHALL BE FULLY QUALIFIED, EXPERIENCED AND EQUIPPED TO COMPLETE THIS WORK EXPEDITIOUSLY AND IN A SATISFACTORY MANNER. THE CONTRACTOR SHALL SUBMIT THE FOLLOWING INFORMATION TO THE ENGINEER FOR REVIEW AND APPROVAL BEFORE ANY WORK IS PERFORMED.
- 1) THE NUMBER OF YEARS OF EXPERIENCE IN PERFORMING THIS TYPE OF SPECIALIZED WORK WITH A MINIMUM OF FIVE (5) YEARS' EXPERIENCE.
 - 2) NAME OF THE MANUFACTURER AND SUPPLIER FOR THIS WORK AND PREVIOUS WORK LISTED BELOW. THE CONTRACTOR SHALL BE AN APPROVED INSTALLER AS CERTIFIED AND LICENSED BY THE MANUFACTURER.
 - 3) A LIST OF MUNICIPAL CLIENTS THAT THE CONTRACTOR HAS PERFORMED THIS TYPE OF WORK;
 - a) THE LIST SHALL CONTAIN NAMES AND TELEPHONE NUMBERS OF PERSONS WHO CAN BE CALLED TO VERIFY PREVIOUS SATISFACTORY PERFORMANCE.
 - b) INSTALLATION DATES AND A DESCRIPTION OF THE ACTUAL WORK PERFORMED.
 - c) THE MANUFACTURER SHALL PROVIDE AN INSTALLATION LIST OF HIS PRODUCT USED FOR SIMILAR SEWER MANHOLE REHABILITATION PROJECTS.
- B. THE CONTRACTOR SHALL ALSO BE CAPABLE OF PROVIDING CREWS AS NEEDED TO COMPLETE THIS WORK WITHOUT UNDUE DELAY AND SHALL BEGIN WORK WITHIN SEVEN (7) DAYS FROM AUTHORIZED NOTICE TO PROCEED.
- C. THE OWNER RESERVES THE RIGHT TO APPROVE OR DISAPPROVE THE CONTRACTOR BASED ON THE SUBMITTED QUALIFICATIONS AND A FOLLOW-UP INTERVIEW.

5.5 GUARANTEE

- A. ALL MONOLITHIC LINING PLACED SHALL BE GUARANTEED BY THE CONTRACTOR FOR A PERIOD OF ONE (1) YEAR FROM THE DATE OF ACCEPTANCE. DURING THIS PERIOD, ALL DEFECTS DISCOVERED IN THE MONOLITHIC LINING AS DETERMINED BY THE OWNER OR ENGINEER, SHALL BE REPAIRED OR

VENDOR: NATIONAL WATER MAIN CLEANING

REPLACED IN A SATISFACTORY MANNER AT NO COST TO THE OWNER. SUCH REPAIR OR REPLACEMENT SHALL INCLUDE THE COST OF REMOVAL AND REINSTALLATION. NINE (9) MONTHS FOLLOWING SUBSTANTIAL COMPLETION OF THE MANHOLE LINING THE OWNER / ENGINEER WILL INSPECT ALL OF THIS WORK TO ENSURE PROPER PERFORMANCE. IF ANY DEFICIENCIES ARE FOUND DURING THESE INSPECTIONS, THE CONTRACTOR SHALL REPAIR THEM AT NO ADDITIONAL COST TO THE OWNER.

- B. THE CONTRACTOR IS RESPONSIBLE FOR STOPPING ALL LEAKS PRIOR TO THE INSTALLATION OF THE MONOLITHIC LINING SYSTEM.

5.6 QUALITY ASSURANCE

- A. ALL MONOLITHIC EPOXY LINING SHALL BE FROM A SINGLE MANUFACTURER. THE SUPPLIER SHALL BE RESPONSIBLE FOR THE PROVISIONS FOR ALL TEST REQUIREMENTS SPECIFIED IN ASTM STANDARDS C722, C882, C884, D870, O1763, AND D2247 AS APPLICABLE FOR MONOLITHIC LINING.
- B. INSPECTIONS OF THE EPOXY MANHOLE MONOLITHIC LINER MATERIAL (EMMLM) MAY BE MADE BY THE ENGINEER OR OTHER REPRESENTATIVES OF THE OWNER AFTER DELIVERY. THE EMMLM SHALL BE SUBJECT TO REJECTION AT ANY TIME ON ACCOUNT OF FAILURE TO MEET ANY OF THE SPECIFICATION REQUIREMENTS, EVEN THOUGH SAMPLE EMMLM MAY HAVE BEEN ACCEPTED AS SATISFACTORY AT THE PLACE OF MANUFACTURE. EMMLM REJECTED AFTER DELIVERY SHALL BE MARKED FOR IDENTIFICATION AND SHALL BE REMOVED FROM THE JOB AT ONCE.

5.7 SUMMARY

- A. CARE SHALL BE TAKEN IN SHIPPING, HANDLING AND PLACING TO AVOID DAMAGING THE EMMLM. EXTRA CARE WILL BE NECESSARY DURING COLD WEATHER CONSTRUCTION. ANY MMLM DAMAGED IN SHIPMENT SHALL BE REPLACED AS DIRECTED BY THE ENGINEER.
- B. ANY EMMLM LINING SHOWING DETERIORATION, OR WHICH HAS BEEN EXPOSED TO ANY OTHER ADVERSE STORAGE CONDITION THAT MAY HAVE CAUSED DAMAGE, EVEN THOUGH NO SUCH DAMAGE CAN BE SEEN, SHALL BE MARKED AS REJECTED AND REMOVED AT ONCE FROM THE WORK.
- C. WHILE STORED, EMMLM LINING SHALL BE ADEQUATELY PACKAGED AND PROTECTED. EMMLM SHALL BE STORED IN A MANNER AS RECOMMENDED BY THE MANUFACTURER.

EPOXY MANHOLE MONOLITHIC LINING SYSTEM (EMMLS)**5.8 PRODUCTS**

- A. THE EPOXY MANHOLE MONOLITHIC LINING SYSTEM (EMMLS) SHALL BE A RESIN-FILLED SYSTEM SUITABLE FOR USE AS A TROWEL-, SPRAY- OR SPIN-APPLIED MONOLITHIC LINING IN SEWER MANHOLES. THE RESIN SHALL BE 100% SOLIDS EPOXY RESIN. THE MMSS SHALL CONFORM TO ASTM C722. THE EMMLS MATERIALS SHALL BE SUITABLE FOR ALL THE SPECIFIED DESIGN CONDITIONS.
 - 1) THE EMMLS SHALL PROVIDE A MINIMUM SERVICE LIFE OF FIFTY (50) YEARS.
 - 2) THE CURED EMMLS SHALL BE CONTINUOUSLY BONDED TO ALL THE BRICK, MORTAR, CONCRETE, CHEMICAL SEALANT GROUT PIPE AND OTHER SURFACES INSIDE THE SEWER MANHOLE. PROVIDE BOND STRENGTH DATA ON CURED EMMLS BASED ON ASTM C882 TEST METHOD.
 - 3) THE CURED EMMLS SHALL PROVIDE A MINIMUM TOTAL THICKNESS OF 0.10 INCHES (100 MILS). THE CURED LINING THICKNESS SHALL BE CONTINUOUS WITH PROPER SEALING CONNECTIONS TO ALL UNSURFACED AREAS AND SHALL BE PLACED AND CURED IN ONE APPLICATION.

VENDOR: NATIONAL WATER MAIN CLEANING

- 4) CHEMICAL SEALANTS OR GROUTS USED TO SEAL ACTIVE MANHOLE LEAKS, TO PATCH CRACKS, TO FILL VOIDS AND TO OTHERWISE PREPARE THE MANHOLE SURFACES SHALL BE COMPATIBLE WITH THE EMMLS
- B. WHEN CURED, THE EMMLS SHALL FORM A CONTINUOUS, TIGHT-FITTING HARD, IMPERMEABLE LINING WHICH IS SUITABLE FOR SEWER SYSTEM SERVICE AND CHEMICALLY RESISTANT TO ANY CHEMICALS OR VAPORS NORMALLY FOUND IN DOMESTIC SEWAGE.
- C. THE EMMLS SHALL BOD TO THE SEWER MANHOLE BEING REHABILITATED AFTER BEING PLACED AND CURED. THE EMMLS SHALL COVER THE INTERIOR OF THE EXISTING SEWER MANHOLE INCLUDING THE BENCHES (SHELVES) AND PIPE CONNECTIONS. THE EMMLS SHALL PROVIDE A CONTINUOUS WATERTIGHT SEAL OR BARRIER.
- 1) THE EMMLS SHALL EFFECTIVELY SEAL THE INTERIOR SURFACES OF THE SEWER MANHOLE AND PREVENT ANY PENETRATION OR LEAKAGE OF GROUNDWATER INFILTRATION.
 - 2) PROVIDE WATER RESISTANCE DATA ON EMMLS BASED ON ASTM STANDARDS D870 AND D2247 TEST METHODS.
 - 3) THE EMMLS SHALL BE COMPATIBLE WITH THE THERMAL CONDITION OF THE EXISTING SEWER MANHOLE SURFACES. SURFACE TEMPERATURES WILL RANGE FROM 30°F DEGREES TO 80°F DEGREES. PROVIDE TEST DATA ON EMMLS THERMAL COMPATIBILITY BASED ON ASTM C884.
 - 4) THE EMMLS SHALL BE SEPARATED FROM THE MANHOLE FRAME BY A SUITABLE JOINT. THE JOINT SHALL BE SEALED WITH A CHIMNEY SEAL; SHERWIN WILLIAMS OR EQUAL. THE SEAL SHALL OVERLAP THREE (3”) INCHES ONTO THE EMMLS AND THREE (3) INCHES ONTO THE EXISTING FRAME.
- D. THE EMMLS SHALL BE MANUFACTURED BY RAVEN LINING SYSTEMS OR APPROVED EQUAL.

EXECUTION**5.9 INSTALLATION**

- A. THE CONTRACTOR SHALL CLEAN EACH SEWER MANHOLE TO BE SURFACED AND SHALL DISPOSE OF ANY RESULTING MATERIAL.
- 1) USE A HIGH POWER JET WASH AT A MINIMUM OF 1500-2000 PSI WATER PRESSURE. REMOVE ALL DUST, LAITANCE, BIOLOGICAL GROWTHS, GREASE, OIL PAINT OR ANY OTHER SURFACE CONTAMINANTS OR COATINGS.
 - 2) COATINGS THAT CANNOT BE REMOVED SHALL BE SANDED WITH COARSE SAND PAPER TO ROUGH THE SURFACE SUFFICIENT TO OBTAIN AND INSURE ADEQUATE BONDING OF THE EMMLS.
- B. THE CONTRACTOR SHALL DRY AND CONDUCT A VISUAL INSPECTION OF EACH MANHOLE AFTER IT IS CLEANED. ALL ACTIVE, HYDROSTATIC INFILTRATION LEAKS SHALL BE PLUGGED OR SEALED WITH GROUT. REMOVE ALL LOOSE MORTAR AND RUBBLE OF EXISTING BENCHES AND INVERTS. REMOVE ANY PROTRUDING RUBBER GASKETS BETWEEN WALL SEAMS. PREPARE MANHOLE TO RECEIVE ES AS NECESSARY BY RESHAPING AND REPAIRING BENCHES, INVERTS AND WALLS WHERE REQUIRED. PROTECT ALL PIPE CONNECTIONS. ALL INTERIOR SURFACES SHALL BE PREPARED FOR ES AS RECOMMENDED BY THE MANUFACTURER.
- 1) ALL CRACKS AND OTHER VOIDS MUST BE REPAIRED AND FILLED WITH SUITABLE NON-SHRINKING CEMENTS, SEALANTS OR GROUTS.
 - 2) ALL SURFACES SHALL BE CLEAN AND STRUCTURALLY SOUND.
 - 3) MANHOLE RUNGS;
 - a) AS DETERMINED BY THE ENGINEER, EXISTING MANHOLE RUNGS WHICH ARE STRUCTURALLY SOUND SHALL BE PROTECTED.

VENDOR: NATIONAL WATER MAIN CLEANING

- b) AS DETERMINED BY THE ENGINEER, EXISTING MANHOLE RUNGS WITH ARE NOT STRUCTURALLY SOUND, SHALL BE CUT OFF AND GROUND SMOOTH.
- 4) ALL SURFACES SHALL BE DRY AND/OR SUITABLY PREPARED FOR THE REQUIRED BONDING OF THE ES.
- C. THE CONTRACTOR SHALL NOTIFY ALL PROPERTY OWNERS WHO DISCHARGE SEWAGE DIRECTLY TO THE MANHOLE BEING SURFACED THAT THEIR SERVICE WILL BE DISCONTINUED WHILE THE ES IS BEING PLACED, CURED AND ACTIVE PIPE AND SERVICE CONNECTIONS REOPENED. THE CONTRACTOR SHALL NOTIFY INDIVIDUAL PROPERTY OWNERS AT LEAST FORTY-EIGHT (48) HOURS IN ADVANCE, GIVING THE DATE, START TIME AND ESTIMATED COMPLETION TIME FOR THE WORK BEING CONDUCTED.
- D. THE CONTRACTOR SHALL PROVIDE BYPASS PUMPING OF SEWAGE FLOWS WHERE AND WHEN THE REHABILITATION WORK IS BEING PERFORMED.
- E. THE CONTRACTOR SHALL FURNISH AND PLACE THE EMMLS IN THE MANHOLE. THE INSTALLATION OF THE EMMLS SHALL BE IN COMPLETE ACCORDANCE WITH THE APPLICABLE PROVISIONS OF ASTM C722 AND THE MANUFACTURER’S SPECIFICATIONS;
 - 1) PRIOR TO PLACING THE EMMLS THE INSPECTOR MUST APPROVE THE SURFACE PREPARATION WORK AND INSTALLATION CONDITIONS.
 - 2) ALL SURFACES SHALL BE SUFFICIENTLY DRY AND EVEN.
 - 3) ALL BOTTOM AND HORIZONTAL SURFACES INCLUDING THE BENCHES AND PIPE CONNECTIONS SHALL HAVE THE ES APPLIED TO THE REQUIRED THICKNESS BY HAND TROWELLING OR SPRAY-ON METHODS.
 - 4) ALL SIDE VERTICAL SURFACES SHALL HAVE THE EMMLS APPLIED TO THE REQUIRED THICKNESS BY SPIN-COAT MECHANICAL OR SPRAY-ON METHOD.
 - 5) TEMPERATURE LIMITATIONS MUST BE HANDLED AS APPROPRIATE AND AS APPROVED BY THE MANUFACTURER.
- F. ALL CUTTING AND/OR SEALING OF EMMLS AT MANHOLE PIPE, CURED-IN-PLACE LINER, RUNGS AND TOP CONNECTIONS SHALL PROVIDE WATERTIGHT SEALS.
- G. THE CONTRACTOR SHALL REOPEN ALL OF THE EXISTING ACTIVE PIPE CONNECTIONS IN EACH SEWER MANHOLE FOLLOWING LINING.
- H. THE EXISTING FRAME AND COVERS, MANHOLE MUGS AND PIPE CONNECTIONS SHALL BE RESTORED TO AN ACCEPTABLE CONDITION AS APPROVED BY THE ENGINEER.

5.10 FIELD TESTING AND ACCEPTANCE

- A. FIELD ACCEPTANCE OF EMMLS SHALL BE BASED ON THE ENGINEERS EVALUATION OF THE PROPER MONOLITHIC LINING OF THE MANHOLE. FIELD ACCEPTANCE SHALL ALSO BE BASED ON THE ENGINEER’S EVALUATION OF THE APPROPRIATE INSTALLATION AND CURING TEST DATA ALONG WITH REVIEW OF THE MANHOLE INSPECTIONS.
- B. THE EMMLS SHALL PROVIDE A CONTINUOUS MONOLITHIC LINING WITH UNIFORM THICKNESS THROUGHOUT THE MANHOLE INTERIOR. IF THE THICKNESS OF THE EMMLS IS NOT UNIFORM OR IS LESS THAN SPECIFIED, IT SHALL BE REPAIRED OR REPLACED AT NO ADDITIONAL COST TO THE OWNER.
 - 1) THE ENGINEER OR OWNER WILL MEASURE THE EMMLS CURED THICKNESS BY PHYSICALLY CUTTING THROUGH THE LINING (BY DRILLING OR CORING) AND MAKING A DIRECT MEASUREMENT. THERE WILL BE UP TO THREE (3) THICKNESS MEASUREMENT LOCATIONS IN EACH ES MANHOLE. **A SUITABLE NON-DESTRUCTIVE TYPE OF THICKNESS MEASUREMENT MAY ALSO BE USED.**

VENDOR: NATIONAL WATER MAIN CLEANING

- 2) ALL THE EMMLS THICKNESS MEASUREMENT LOCATIONS SHALL BE REPAIRED BY THE CONTRACTOR IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS. THESE REPAIRS SHALL BE INCLUDED IN THE THREE (3) YEAR EMMLS GUARANTEE.
 - 3) THE CONTRACTOR SHALL ALSO PERFORM IN-PLACE TESTING IN EACH MANHOLE TO VERIFY THE BONDING OF THE EMMLS TO THE EXISTING MANHOLE SUBSTRATE. BOND STRENGTH TESTS SHALL BE IN ACCORDANCE WITH ASTM D7234. TWO (2) TESTS SHALL BE PERFORMED IN TEN (10%) PERCENT OF THE MANHOLE LOCATIONS DIRECTED BY THE ENGINEER. TESTING SHALL CONSIST OF A CALIBRATED PULL TEST. ALL EQUIPMENT SHALL BE PROVIDED BY THE CONTRACTOR. SAMPLES MUST MEET A MINIMUM PRESSURE RESISTANCE OF 400 PSI.
- C. GROUNDWATER INFILTRATION OF THE EMMLS LINING SHALL BE ZERO.
- D. ALL PIPE CONNECTIONS SHALL BE OPEN AND CLEAR.
- E. THERE SHALL BE NO CRACKS, VOIDS, PINHOLES, UNCURED SPOTS, DRY SPOTS, LIFTS, DELAMINATION'S OR OTHER TYPE DEFECTS IN THE EMMLS.
- F. IF ANY DEFECTIVE EMMLS IS DISCOVERED AFTER IT HAS BEEN INSTALLED, IT SHALL BE REPAIRED OR REPLACED IN A SATISFACTORY MANNER WITHIN SEVENTY-TWO (72) HOURS AND AT NO ADDITIONAL COST TO THE OWNER. THIS REQUIREMENT SHALL APPLY FOR THE ENTIRE GUARANTEE PERIOD.

SECTION 5 – PART II - MANHOLE REHABILITATION**CEMENTATIONS MANHOLE REHABILITATION****5.11 SCOPE OF WORK**

- A. FURNISH ALL LABOR, MATERIALS AND EQUIPMENT REQUIRED FOR MANHOLE REHABILITATION FOR THE PURPOSE OF ELIMINATING INFILTRATION AND EXFILTRATION, PROVIDING CORROSION PROTECTION, REPAIR OF VOIDS AND RESTORATION OF THE STRUCTURAL INTEGRITY OF THE MANHOLE AS A RESULT OF APPLYING A MONOLITHIC FIBER REINFORCED STRUCTURAL/STRUCTURALLY ENHANCED CEMENTITIOUS LINER TO THE WALL AND BENCH SURFACES OF BRICK CONCRETE OR ANY OTHER MASONRY CONSTRUCTION MATERIAL. LINING SHOULD EXTEND FROM INVERT TO TOP OF CONE, AS SPECIFIED.
- B. DESCRIBED ARE PROCEDURES FOR MANHOLE PREPARATION, CLEANING, APPLICATION AND TESTING. THE APPLICATOR SHALL BE APPROVED AND TRAINED BY THE MANUFACTURER AND SHALL FURNISH ALL LABOR, EQUIPMENT AND MATERIALS FOR APPLYING A CEMENTITIOUS MIX TO FORM A MONOLITHIC LINER OF A MINIMUM ½" INCH THICKNESS, WITH MACHINERY SPECIALLY DESIGNED FOR THE APPLICATION. ALL ASPECTS OF THE INSTALLATION SHALL BE IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATION AND WITH THE FOLLOWING SPECIFICATIONS WHICH INCLUDE;
- 1) THE REMOVAL OF ANY LOOSE AND UNSOUND MATERIAL AND THE REMOVAL OF PROTRUSIONS OR OTHER SUCH OBSTRUCTIONS.
 - 2) CLEANING OF THE AREA TO BE SPRAYED WITH HIGH PRESSURE WATER.
 - 3) THE REPAIR AND FILLING OF VOIDS.
 - 4) THE REPAIR AND SEALING OF THE INVERT, PIPE CONNECTIONS AND BENCHES.
 - 5) THE ELIMINATION OF ALL ACTIVE INFILTRATION FROM THE CORBEL, SEAMS, HOLES, PIPE CONNECTIONS, ETC. PRIOR TO MAKING THE APPLICATION.
 - 6) THE SPRAY APPLICATION OF A CEMENTITIOUS MIX TO FORM A STRUCTURAL/STRUCTURALLY ENHANCED MONOLITHIC LINER.

5.12 SUBMITTALS

VENDOR: NATIONAL WATER MAIN CLEANING

- A. CONTRACTOR AND MANUFACTURER OF THE SELECTED MANHOLE REHABILITATION LINING SHALL FURNISH MATERIAL AND INSTALLATION SUBMITTALS WHICH SHALL INCLUDE;
- 1) METHOD OF REHABILITATION FOR EACH MANHOLE TYPE AND CONDITION.
 - 2) METHOD OF REBUILDING BENCH AND INVERT AND SEALING PIPE AT MANHOLES.

5.13 REFERENCE STANDARDS

THIS SPECIFICATION REFERENCES AMERICAN SOCIETY FOR TESTING AND MATERIALS (AS STANDARD SPECIFICATIONS, WHICH ARE MADE A PART HEREOF BY SUCH REFERENCE AND SHALL BE THE LATEST EDITION AND REVISION THEREOF).

- 1) C-94 SPECIFICATION FOR-READY-MIXED CONCRETE
- 2) C-150 SPECIFICATION FOR PORTLAND CEMENT
- 3) C-293 TEST METHOD FOR FLEXURAL STRENGTH OF CONCRETE
- 4) C-321 TEST METHOD FOR BOND STRENGTH OF CHEMICAL-RESISTANT MORTARS
- 5) C-495 TEST METHOD FOR COMPRESSIVE STRENGTH OF LIGHTWEIGHT INSULATING CONCRETE
- 6) C-496 TEST METHOD FOR SPLITTING TENSILE STRENGTH OF CYLINDRICAL CONCRETE SPECIMENS
- 7) C-5798 TEST METHOD FOR COMPRESSIVE STRENGTH OF CHEMICAL-RESISTANT MORTARS, GROUTS AND MONOLITHIC SURFACING
- 8) C-596 TEST METHOD FOR DRYING SHRINKAGE OF MORTAR CONTAINING PORTLAND CEMENT

5.14 QUALITY ASSURANCE

THE CONTRACTOR OR SUBCONTRACTOR TO FURNISH AND INSTALL MONOLITHIC LINING SYSTEM SHALL BE FULLY QUALIFIED, EXPERIENCED AND EQUIPPED TO COMPLETE THE WORK IN A TIMELY AND SATISFACTORY MANNER. SUBMIT THE FOLLOWING INFORMATION TO THE ENGINEER FOR REVIEW AND APPROVAL BEFORE ANY WORK IS PERFORMED;

- 1) THE NUMBER OF YEARS OF EXPERIENCE CONTRACTOR AND APPLICATOR HAVE IN PERFORMING THIS TYPE OF SPECIALIZED WORK; WITH A MINIMUM OF FIVE (5) YEARS' EXPERIENCE.
- 2) NAME OF MANUFACTURER AND SUPPLIER FOR THIS WORK AND PREVIOUS WORK PERFORMED. THE CONTRACTOR SHALL BE CERTIFIED BY THE MANUFACTURER TO INSTALL THE MONOLITHIC LINING SYSTEM.
- 3) A LIST OF ALL MUNICIPAL INSTALLATIONS PERFORMED BY THE MANUFACTURER AND CONTRACTOR OVER THE PAST FIVE (5) YEARS ALONG WITH THE CONTACT NAME, TELEPHONE NUMBER AND BRIEF DESCRIPTION OF WORK PERFORMED.
- 4) THE OWNER RESERVES THE RIGHT TO DISAPPROVE THE USE OF THE CONTRACTOR BASED ON THE SUBMITTED QUALIFICATIONS.

5.15 GUARANTEE

ALL MONOLITHIC MANHOLE LINING SHALL BE GUARANTEED BY THE CONTRACTOR FOR A PERIOD OF ONE (1) YEAR FROM THE DATE OF ACCEPTANCE. DURING THIS PERIOD, ALL DEFECTS IN THE LINING SHALL BE REPAIRED IN A MANNER SATISFACTORY TO THE ENGINEER OR THE LINING SHALL BE RE-APPLIED AT NO COST TO THE OWNER. NINE (9) MONTHS FOLLOWING SUBSTANTIAL COMPLETION OF THE MANHOLE LINING, THE OWNER / ENGINEER SHALL INSPECT ALL OF THIS WORK TO ENSURE PROPER PERFORMANCE. IF ANY DEFICIENCIES ARE FOUND DURING THESE INSPECTIONS, THE CONTRACTOR SHALL REPAIR THEM AT NO ADDITIONAL COST TO THE OWNER.

MANHOLE MONOLITHIC LINING SYSTEM (EMMLS)

5.16 PRODUCTS

- A. THE MANUFACTURER OF THE LINER SYSTEM SHALL BE STRONG-SEAL MS-2 AS MANUFACTURED BY STRONG SEAL; OCTOCRETE AS MANUFACTURED BY IPA SYSTEMS, INC.; PERMACAST AS MANUFACTURED BY AP/M PERMA FORM OR APPROVED EQUAL. OTHER MANUFACTURERS THAT MEET THE REQUIREMENTS OF THIS SPECIFICATION MUST SUBMIT PRODUCT DATA IN ACCORDANCE WITH THESE SPECIFICATIONS.
- B. WHEN CURED, THE SYSTEM SHALL FORM A CONTINUOUS, TIGHT-FITTING, HARD, IMPERMEABLE SURFACING WHICH IS SUITABLE FOR SEWER SYSTEM SERVICE AND CHEMICALLY RESISTANT TO AND CHEMICALS AND VAPORS NORMALLY FOUND IN SEWERS.
- 1) THE SYSTEM SHALL PROVIDE A MINIMUM SERVICE LIFE OF TWENTY-FIVE (25) YEARS.
 - 2) THE CURED SYSTEM SHALL BE CONTINUOUSLY BONDED TO ALL BRICK, MORTAR, CONCRETE, CHEMICAL SEALANT GROUT PIPE AND OTHER SURFACES INSIDE THE SEWER MANHOLE. PROVIDE BOND STRENGTH DATA ON CURED SYSTEM BASED ON ASTM C882.
 - 3) CHEMICAL SEALANTS, GROUTS OR PATCHING MATERIALS USED TO SEAL ACTIVE MANHOLE LEAKS, TO PATCH CRACKS, TO FILL VOIDS AND TO OTHERWISE PREPARE THE MANHOLE SURFACE PRIOR TO APPLICATION OF THE SYSTEM SHALL BE FULLY COMPATIBLE WITH THE SYSTEM.

5.17 PATCHING MIX

A RAPID-SET HIGH EARLY STRENGTH CEMENTITIOUS MATERIAL (STRONG-SEAL QSR OR APPROVED EQUAL) SHALL BE USED AS A PATCHING MIX AND IS TO BE MIXED AND APPLIED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS AND SHALL HAVE THE FOLLOWING MINIMUM PHYSICAL PROPERTIES;

- 1) COMPRESSIVE STRENGTH 1400 PSI, 6 HRS. // (ASTM C579B) 2000 PSI, 24 HRS.
- 2) SHRINKAGE (ASTM C596) 0% AT 90% R.H.
- 3) BOND STRENGTH (ASTM C321) 28 DAYS, 150 PSI
- 4) CEMENT (SULFATE RESISTANT)
- 5) DENSITY; WHEN APPLIED 105 + 5 PCF

5.18 INFILTRATION CONTROL

- A. A RAPID-SETTING CEMENTITIOUS PRODUCT SPECIFICALLY FORMULATED FOR LEAK CONTROL (STRONG-SEAL, STRONG PLUG OR APPROVED EQUAL) SHALL BE USED TO STOP MINOR WATER INFILTRATION, SHALL BE MIXED AND APPLIED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS AND SHALL HAVE THE FOLLOWING MINIMUM PHYSICAL PROPERTIES;
- 1) COMPRESSIVE STRENGTH 600 PSI, 1 HR. // (ASTM C579B) 1000 PSI, 24 HRS.
 - 2) SHRINKAGE (ASTM C596) 0% @ 90% R.H.
 - 3) BOND (ASTM C321) 40 PSI, 1 HR. / 80 PSI, 24 HR.
- B. A CEMENTITIOUS SPRAYABLE MATERIAL (STRONG SEAL MS-2 OR APPROVED EQUAL) SHALL BE USED TO FORM A STRUCTURAL/STRUCTURALLY ENHANCED MONOLITHIC LINER COVERING ALL INTERIOR MANHOLE SURFACES AND SHALL HAVE THE FOLLOWING MINIMUM PHYSICAL PROPERTIES AT TWENTY-EIGHT (28) DAYS;
- 1) COMPRESSIVE STRENGTH (ASTM C579B) 3000PSI
 - 2) SHRINKAGE @ 90% RELATIVE HUMIDITY // (ASTM C596) 0% PSI
 - 3) BOND STRENGTH (ASTM C321) 130 PSI

VENDOR: NATIONAL WATER MAIN CLEANING

- C. IN APPLICATIONS WHERE THERE IS NO OR VERY MILD SULFIDE CONDITIONS (PH 3.0 OR HIGHER), STRONG SEAL MS-2A OR APPROVED EQUAL, SHALL BE USED ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS AND SHALL BE MADE WITH ASTM C150 TYPE I OR TYPE HI PORTLAND CEMENT.
- D. IN APPLICATIONS WHERE THERE IS EVIDENCE OF SEVERE SULFIDE CONDITIONS (PH LESS THAN 3.0), STRONG SEAL MS-2C OR APPROVED EQUAL, SHALL BE USED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS AND SHALL BE MADE WITH CALCIUM ALUMINATE CEMENT.

5.19 MATERIAL TESTING

TESTS FOR COMPLIANCE WITH THIS SPECIFICATION SHALL BE MADE ACCORDING TO THE APPLICABLE ASTM SPECIFICATION. A CERTIFICATE OF COMPLIANCE WITH THIS SPECIFICATION UPON REQUEST SHALL BE PROVIDED BY THE MANUFACTURER FOR ALL MATERIAL FURNISHED UNDER THIS SPECIFICATION.

EXECUTION**5.20 INSTALLATION**

- A. EQUIPMENT USED IN THE APPLICATION OF THE LINER SYSTEM SHALL BE AS RECOMMENDED BY THE MANUFACTURER AND SHALL BE COMPLETE WITH WATER STORAGE, METERING SYSTEM AND HYDRAULICALLY POWERED MIXER AND PUMP.
- B. THE CONTRACTOR SHALL PLACE COVERS OVER INVERT TO PREVENT EXTRANEOUS MATERIAL FROM ENTERING THE SEWER LINES.
- C. ALL FOREIGN MATERIAL SHALL BE REMOVED FROM THE MANHOLE WALLS AND BENCH USING A HIGH PRESSURE WATER SPRAY. THE PRESSURE SHALL BE SUFFICIENT TO REMOVE ALL LOOSE DEBRIS AND CLEAN ALL BRICK AND MORTAR SURFACES (3000 PSI). LOOSE AND PROTRUDING BRICK MORTAR AND CONCRETE SHALL BE REMOVED USING A MASON'S HAMMER AND CHISEL AND/OR SCRAPER. ANY LARGE VOIDS INCLUDING HOLES SHALL BE FILLED WITH QUICK SETTING PATCH MIX.
- D. ACTIVE LEAKS SHALL BE STOPPED USING QUICK SETTING CHEMICAL GROUT, SPECIALLY FORMULATED MIXES ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS. SOME LEAKS MAY REQUIRE WEEP HOLES TO LOCALIZE THE INFILTRATION DURING THE APPLICATION AFTER WHICH THE WEEP HOLES SHALL BE PLUGGED WITH THE QUICK SETTING MIX PRIOR TO THE FINAL LINER APPLICATION. WHEN SEVERE INFILTRATION IS PRESENT DRILLING MAY BE REQUIRED IN ORDER TO APPLY CHEMICAL GROUT.
- E. MANHOLE RUNGS;
 - 1) AS DETERMINED BY THE ENGINEER, EXISTING MANHOLE RUNGS WHICH ARE STRUCTURALLY SOUND SHALL BE PROTECTED.
 - 2) AS DETERMINED BY THE ENGINEER, EXISTING MANHOLE RUNGS WHICH ARE NOT STRUCTURALLY SOUND SHALL BE CUT OFF AND GROUND SMOOTH.
- F. THE LINER MIX SHALL BE MIXED AS SPECIFIED BY THE MANUFACTURER USING EQUIPMENT 30 SECONDS TO ONE (1) MINUTE AFTER ALL MATERIALS HAVE BEEN PLACED IN THE MIXING HOPPER. MIXING SHALL BE ACCOMPLISHED SUCH THAT THE MIX CAN BE SPRAYED IN A CONTINUOUS MANNER WITHOUT INTERRUPTION UNTIL EACH SUPPLICATION IS COMPLETE.
- G. THE SURFACE PRIOR TO SPRAYING SHALL BE CLEAN AND FREE OF ALL FOREIGN MATERIAL AND SHALL BE DAMP WITHOUT NOTICEABLE FREE WATER DROPLETS OR RUNNING WATER, BUT TOTALLY SATURATED, JUST PRIOR TO APPLICATION. MATERIALS SHALL BE SPRAY APPLIED FROM THE BOTTOM OF THE WALL TO THE TOP, TO MINIMUM UNIFORM THICKNESS, TO INSURE THAT ALL CRACKS, CREVICES AND VOIDS ARE FILLED AND A RELATIVELY SMOOTH SURFACE REMAINS AFTER

VENDOR: NATIONAL WATER MAIN CLEANING

LIGHT TROWELING. THE LIGHT TROWELING IS PERFORMED TO COMPACT THE MATERIAL INTO VOIDS AND TO SET THE BOND.

- H. A SECOND APPLICATION (IF NEEDED) SHALL BE APPLIED AFTER THE 1ST APPLICATION HAS BEGUN TO TAKE AN INITIAL SET (DISAPPEARANCE OF SURFACE SHEEN WHICH COULD BE FIFTEEN (15) MINUTES TO ONE (1) HOUR DEPENDING UPON AMBIENT CONDITIONS) TO ASSURE A MINIMUM TOTAL FINISHED THICKNESS OF ½” INCH . AGAIN, APPLICATION SHALL BE FROM THE BOTTOM UP. THE SURFACE SHALL THEN BE TROWELED TO A SMOOTH FINISH BEING CAREFUL NOT TO OVER TROWEL SO AS TO BRING ADDITIONAL WATER TO THE SURFACE AND WEAKEN IT. MANUFACTURER’S RECOMMENDATIONS SHALL BE FOLLOWED WHENEVER MORE THAN TWENTY-FOUR (24) HOURS HAVE ELAPSED BETWEEN APPLICATIONS. A BRUSH FINISH IS ACCEPTED AND IS APPLICATOR’S OPTION.
- I. THE COVERS PLACED OVER THE INVERT SHALL BE REMOVED AND THE BENCH SPRAYED SUCH THAT A GRADUAL SLOPE IS PRODUCED FROM THE WALLS TO THE INVERT WITH THE THICKNESS AT THE EDGE OF THE INVERT BEING NO LESS THAN ½” INCH. THE WALL/BENCH INTERSECTION SHALL BE ROUNDED TO A UNIFORM RADIUS THE FULL CIRCUMFERENCE OF THE INTERSECTION.
- J. CAUTION SHALL BE TAKEN TO MINIMIZE EXPOSURE OF APPLIED PRODUCT TO SUNLIGHT AND AIR MOVEMENT. AT NO TIME SHALL THE FINISHED PRODUCT BE EXPOSED TO SUNLIGHT OR AIR MOVEMENT FOR LONGER THAN FIFTEEN (15) MINUTES BEFORE REPLACING THE MANHOLE COVER. IN EXTREMELY HOT AN ARID CLIMATES THE MANHOLE SHALL BE SHADED WHILE RECONSTRUCTION IS IN PROCESS. THE FINAL APPLICATION SHALL HAVE A MINIMUM OF FOUR (4) HOURS CURE TIME BEFORE BEING SUBJECTED TO ACTIVE FLOW. TRAFFIC SHALL NOT BE ALLOWED OVER MANHOLES FOR TWENTY-FOUR (24) HOURS AFTER RECONSTRUCTION IS COMPLETE.
- K. NO APPLICATION SHALL BE MADE TO FROZEN SURFACES OF IF FREEZING IS EXPECTED TO OCCUR INSIDE THE MANHOLE WITHIN TWENTY-FOUR (24) HOURS AFTER APPLICATION. IF AMBIENT TEMPERATURES ARE IN EXCESS OF 95°F DEGREES, PRECAUTIONS SHALL BE TAKEN TO KEEP THE MIX TEMPERATURE AT TIME OF APPLICATION BELOW 90°F DEGREES. MIX WATER TEMPERATURE SHALL NOT EXCEED 85°F DEGREES. CHILL WITH ICE IF NECESSARY.

5.21 FIELD TESTING AND ACCEPTANCE

- A. FOUR (4), TWO (2”) INCH CUBES SHALL BE CAST EACH DAY, OR FROM EVERY FIFTY (50) BAGS OF PRODUCT USED AND SHALL BE PROPERLY LABELED AND SENT IN FOR TESTING, IN ACCORDANCE WITH THE ENGINEER’S DIRECTIONS, FOR COMPRESSION STRENGTH TESTING AS DESCRIBED IN ASTM C579B.
- B. THE FINISHED MANHOLE SURFACE SHALL BE CONTINUOUS AND AS FREE AS COMMERCIALY PRACTICABLE FROM SIGNIFICANT DEFECTS. ANY DEFECTS WHICH WILL AFFECT, IN THE FORESEEABLE FUTURE, OR WARRANTY PERIOD, THE INTEGRITY OR STRENGTH OF THE MANHOLE SHALL BE REPAIRED AT THE CONTRACTOR’S EXPENSE, IN A MANNER MUTUALLY AGREED UPON BY THE ENGINEER AND THE CONTRACTOR.
- C. AFTER THE INSTALLATION WORK HAS BEEN COMPLETED AND ALL INSPECTIONS ACCEPTABLE, THE CONTRACTOR SHALL CLEAN UP THE ENTIRE PROJECT AREA. ALL EXCESS MATERIAL AND DEBRIS NOT INCORPORATED INTO THE PERMANENT INSTALLATION SHALL BE DISPOSED OF BY THE CONTRACTOR.
- D. FIELD ACCEPTANCE SHALL BE BASED ON THE ENGINEER’S EVALUATION OF THE PROPER MONOLITHIC SURFACING OF THE MANHOLE. FIELD ACCEPTANCE SHALL ALSO BE BASED ON THE ENGINEER’S EVALUATION OF THE APPROPRIATE INSTALLATION AND CURING TEST DATA ALONG WITH REVIEW OF THE MANHOLE INSPECTIONS.

VENDOR: NATIONAL WATER MAIN CLEANING

- E. THE LINER SHALL PROVIDE A CONTINUOUS MONOLITHIC SURFACING WITH UNIFORM THICKNESS THROUGHOUT THE MANHOLE INTERIOR. IF THE THICKNESS OF THE CEMENTITIOUS LINER IS NOT UNIFORM OR IS LESS THAN SPECIFIED IT SHALL BE REPAIRED OR REPLACED AT NO ADDITIONAL COST TO THE OWNER.
- 1) A NON-DESTRUCTIVE THICKNESS MEASUREMENT OF SEVERAL LOCATIONS SHALL BE PERFORMED BY THE CONTRACTOR IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
- F. GROUNDWATER INFILTRATION OF THE LINING SHALL BE ZERO.
- G. ALL PIPE CONNECTIONS SHALL BE OPEN AND CLEAR.
- H. THERE SHALL BE NO CRACKS, VOIDS, PINHOLES, UNCURED SPOTS, DRY SPOTS, LIFTS, DELAMINATION'S OR OTHER TYPE DEFECTS IN THE LINER.
- I. IF ANY DEFECTS ARE DISCOVERED AFTER LINER HAS BEEN INSTALLED, IT SHALL BE REPAIRED OR REPLACED IN A SATISFACTORY MANNER WITHIN SEVENTY-TWO (72) HOURS AND AT NO ADDITIONAL COST TO THE OWNER. THIS REQUIREMENT SHALL APPLY FOR THE ENTIRE GUARANTEE PERIOD.

SECTION 6 – BYPASS PUMPING**6.1 GENERAL**

- A. THE CONTRACTOR'S ATTENTION IS DIRECTED TO THE FACT THAT ALL SEWER LINING WORK IS BEING PERFORMED IN EXISTING AND ACTIVE SANITARY SEWERS AND IT IS NECESSARY TO MAINTAIN UNINTERRUPTED SEWAGE FLOW THROUGHOUT THE ENTIRE CONSTRUCTION PERIOD. NOTIFICATION TO COLLECTION SYSTEM CUSTOMERS REGARDING INTERRUPTION OF SERVICES SHALL ALSO BE THE RESPONSIBILITY OF THE CONTRACTOR.
- B. THE WORK SHALL BE PLANNED SO THAT THERE WILL BE NO OVERFLOW OF SANITARY SEWAGE. AN OVERFLOW WOULD BE DETRIMENTAL TO THE PUBLIC HEALTH OR APT TO CAUSE INJURY OR DAMAGE TO PERSONS, PROPERTY, STRUCTURES OR PIPELINES.
- C. THE CONTRACTOR SHALL BE PREPARED TO BYPASS FLOWS AT ALL TIMES. IF ANY LAW IS VIOLATED OR IF ANY DAMAGE OCCURS TO PERSONS OR PROPERTY BECAUSE OF THE CONTRACTOR'S INABILITY TO BYPASS THESE FLOWS, ALL CONSEQUENCES SHALL BE THE COMPLETE RESPONSIBILITY OF THE CONTRACTOR.
- D. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY EQUIPMENT INCLUDING PUMPS, MOTORS, HOSES, TANK TRUCKS, GENERATORS AND ANY OTHER EQUIPMENT REQUIRED TO PERFORM WORK AS SPECIFIED HEREIN. WHERE PUMPING SYSTEMS ARE BEING UTILIZED, A BACKUP PUMPING SYSTEM SHALL ALSO BE PROVIDED. AUTOMATIC CONTROL SYSTEMS SHALL BE PROVIDED AS DIRECTED BY THE ENGINEER. SHOULD BYPASSING OPERATIONS CONTINUE OVERNIGHT, ALL EQUIPMENT SHALL BE HOUSED IN A SECURE, TEMPORARY BUILDING TO DISCOURAGE VANDALISM AND ATTENUATE NOISE TO COMPLY WITH LOCAL NOISE ORDINANCE.
- E. THE CONTRACTOR SHALL COORDINATE THE OPERATION OF HIS BYPASSING IN ORDER TO MINIMIZE THE FREQUENCY AND DURATION OF THE SHUTDOWN TIME AND THE BYPASSING OF SEWAGE.
- F. **PRIOR TO COMMENCING WORK, THE CONTRACTOR SHALL MEET WITH THE COUNTY REPRESENTATIVE TO DISCUSS AND PRESENT A DETAILED WRITTEN SCHEDULE OF OPERATIONS THAT IS COMPATIBLE WITH THE DUTIES OF THE CONTRACTOR AND IS ALSO AGREEABLE TO THE OWNER.**
- G. THIS SCHEDULE OF OPERATIONS SHALL DESCRIBE IN COMPLETE DETAIL THE METHODS, SEQUENCES, PROCEDURES AND FACILITIES HE PROPOSES TO USE TO INSURE CONTINUOUS OPERATION OF EXISTING SEWERS AND INDIVIDUAL SERVICE CONNECTIONS DURING THE DIGITAL SCAN WORK.

VENDOR: NATIONAL WATER MAIN CLEANING

- H. IF THE BYPASSING OPERATION REQUIRES EQUIPMENT TO BE IN PLACE ABOVE GROUND, THE CONTRACTOR SHALL INSURE THAT THE PROPER LIGHTS, SIGNS AND ANY OTHER REQUIRED SAFETY DEVICES, BE IN PLACE AND WORKING THROUGHOUT THE DURATION OF THE BYPASSING OPERATION.
- I. THE CONTRACTOR SHALL INCLUDE IN HIS BID ALL COSTS FOR REQUIRED LABOR, MATERIALS AND EQUIPMENT, AS WELL AS ANY INCIDENTAL EXPENSES DUE TO THE STAGED CONSTRUCTION.
- J. THE CONTRACTOR SHALL INVESTIGATE EXISTING FLOWS PRIOR TO LINER INSTALLATION WORK TO FAMILIARIZE HIMSELF WITH THE QUANTITY OF SEWAGE FLOW WITHIN THE SANITARY SEWER SEGMENT. THE CONTRACTOR SHALL SCHEDULE HIS WORK DURING MINIMUM FLOW PERIODS AS REQUIRED, TO PERFORM THE NEW WORK. ALL NIGHTTIME WORK SHALL BE SCHEDULED AND APPROVED BY THE COUNTY ENGINEER. NOTIFICATION OF INDIVIDUAL SERVICE CONNECTION USERS AND MAINTENANCE OF INDIVIDUAL SERVICE CONNECTIONS IS THE CONTRACTOR'S RESPONSIBILITY. THE CONTRACTOR'S COSTS FOR PERFORMING ANY WORK BEYOND THE NORMAL WORKDAY HOURS WILL BE COMPENSATED. PREMIUM TIME FOR LABOR WHEN HOURS EXCEED AN EIGHT-HOUR SHIFT.
- K. PRIOR TO PERFORMING ANY WORK ON THE EXISTING PIPE, THE CONTRACTOR SHALL DEVISE AND IMPLEMENT A RELIABLE SYSTEM TO BYPASS SEWAGE AROUND THE WORK AREA TO ENABLE ALL WORK TO BE PERFORMED IN THE DRY, TO THE SATISFACTION OF THE OWNER.
- L. DURING THE BYPASSING OPERATION, SEWAGE SHALL BE CONVEYED IN A WATERTIGHT CONDUIT AND SHALL BE DISCHARGED ONLY TO AN EXISTING SANITARY SEWER. AT NO TIME SHALL SEWAGE BE SPILLED ON THE GROUND OR ALLOWED TO FLOW INTO A STORM DRAIN. THE CONTRACTOR SHALL PROVIDE ALL PUMPS, HOSES, GENERATORS AND ANY OTHER APPURTENANCES NEEDED TO ACCOMPLISH THE BYPASSING OPERATION. SEWAGE SHALL BE BYPASSED TWENTY-FOUR (24) HOURS PER DAY UNTIL THE RELINING IS COMPLETE AND ACCEPTED BY THE OWNER. A BACKUP PUMPING SYSTEM SHALL BE PROVIDED AT ALL TIMES, ACCEPTABLE TO THE OWNER.

6.2 CLEANING OF SEWERS

- A. IN ORDER TO PREPARE THE EXISTING SEWER PIPE FOR INSTALLATION OF THE LINER, IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO REMOVE ALL INTERNAL DEBRIS OUT OF THE EXISTING SEWER PIPE AS SPECIFIED HEREIN.
- B. THE CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIALS AND EQUIPMENT NECESSARY FOR THE PROPER CLEANING OF THE SEWERS PRIOR TO THE RELINING OF THE SEWER PIPE. THE EQUIPMENT SELECTED FOR CLEANING SHALL BE CAPABLE OF REMOVING DIRT, GREASE, ROCKS, ROOTS AND OTHER DELETERIOUS MATERIALS AND OBSTRUCTIONS FROM THE SEWER LINES.
- C. DURING ALL SEWER PIPE CLEANING OPERATIONS, SATISFACTORY PRECAUTIONS SHALL BE TAKEN TO PROTECT THE SEWER LINES FROM DAMAGE THAT MIGHT BE INFLICTED BY THE IMPROPER USE OF CLEANING EQUIPMENT. WHENEVER HYDRAULICALLY PROPELLED CLEANING TOOLS DEPEND UPON WATER PRESSURE TO PROVIDE THEIR CLEANING FORCE, OR TOOLS WHICH RETARD THE FLOW OF WATER IN THE SEWER LINE OR HIGH VELOCITY HYDRO-CLEANING EQUIPMENT IS USED, PRECAUTIONS SHALL BE TAKEN TO ENSURE THAT THE WATER PRESSURE CREATED DOES NOT CAUSE ANY DAMAGE OR FLOODING TO PUBLIC OR PRIVATE PROPERTY. ANY SEWER DAMAGED AS A RESULT OF THE CONTRACTOR'S OPERATION SHALL BE PROMPTLY REPAIRED BY AND AT THE EXPENSE OF THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER.
- D. IF FRESHWATER IS TO BE UTILIZED DURING ANY PART OF THE CONTRACT WORK, IT WILL BE PROVIDED BY THE COUNTY AT NO ADDITIONAL COST TO THE CONTRACTOR.
- E. ALL SLUDGE, DIRT, SAND, ROCKS, GREASE, ROOTS AND OTHER SOLID OR SEMI-SOLID MATERIAL RESULTING FROM THE CLEANING OPERATION SHALL BE REMOVED AT THE DOWNSTREAM MANHOLE OF THE SECTION BEING CLEANED AND DISPOSED OF BY THE CONTRACTOR. PASSING

VENDOR: NATIONAL WATER MAIN CLEANING

MATERIAL FROM MANHOLE SECTION TO MANHOLE SECTION, WHICH COULD CAUSE LINE STOPPAGES, ACCUMULATIONS OF SAND OR DAMAGE PUMPING EQUIPMENT, SHALL NOT BE PERMITTED. ALL SOLIDS OR SEMI-SOLIDS RESULTING FROM THE CLEANING OPERATIONS SHALL BE REMOVED FROM THE SITE AND PROPERLY DISPOSED OF IN A MANNER APPROVED BY THE OWNER AND IN ACCORDANCE WITH THE STATE AND LOCAL LAWS BY THE CONTRACTOR. IN NO INSTANCE WILL THE MATERIAL BE DISPOSED OF AT OR ON OWNER'S PROPERTY OR IN OWNER'S SEWERS. ALL MATERIALS SHALL BE REMOVED FROM THE SITE NOT LESS OFTEN THAN AT THE END OF EACH WORKDAY. UNDER NO CIRCUMSTANCES WILL THE CONTRACTOR BE ALLOWED TO ACCUMULATE DEBRIS, ETC., ON THE SITE OF WORK BEYOND THE STATED TIME. CLEANING SHALL BE PAID FOR AND DISPOSAL OF SEWER CONTAMINATED MATERIALS WILL BE PAID AT THE UNIT PRICE PER CUBIC YARD. (AS PER PRICING CHART IN LINE ITEM 2 E.)

- F. THE EQUIPMENT SELECTED FOR CLEANING SHALL BE CAPABLE OF REMOVING DIRT, GREASE, ROCKS, SAND, ROOTS AND OTHER DELETERIOUS MATERIALS AND OBSTRUCTIONS FROM THE SEWER LINES. ALL EQUIPMENT SHALL BE HEAVY-DUTY MUNICIPAL OR COMMERCIAL TYPE, TRUCK MOUNTED, AS APPROVED BY THE OWNER. IF NECESSARY, THE CONTRACTOR SHALL EVALUATE THE SEWER FROM EACH END WHEN OBSTRUCTION OR PIPE FRACTURE PREVENTS THE ENTIRE INSPECTION FROM ONE MANHOLE.
- G. PRECAUTIONS SHALL BE TAKEN TO PROTECT THE SEWER LINES FROM DAMAGE THAT MIGHT BE INFLICTED BY THE IMPROPER USE OF CLEANING EQUIPMENT. ANY SEWER DAMAGED AS A RESULT OF THE CONTRACTOR'S OPERATIONS SHALL BE PROMPTLY REPAIRED BY AND AT THE EXPENSE OF THE CONTRACTOR.
- H. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO CLEAR THE EXISTING PIPE OF MINOR OBSTRUCTIONS SUCH AS SOLIDS, ROOTS, DROPPED JOINTS, MINOR PROTRUDING SERVICE CONNECTIONS OR COLLAPSED PIPE THAT WILL PREVENT LINER INSTALLATION OR AFFECT THE FINAL LINER INSTALLATION (IN THE OPINION OF THE OWNER).

6.3 PVC DEFORMED PIPE LINER

- A. THE CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIALS AND EQUIPMENT NECESSARY FOR MAINTAINING THE CONSTANT FLOW OF SEWAGE AROUND THE SECTION OF PIPE BEING LINED AS SPECIFIED HEREIN UNDER "BYPASSING SEWAGE".
- B. A CABLE SHALL BE STRUNG THROUGH THE EXISTING PIPE TO BE REHABILITATED AND ATTACHED TO THE LINER THROUGH AN EXISTING MANHOLE OR ACCESS POINT. THE LINER SHALL BE PULLED THROUGH THE EXISTING CONDUIT BY THIS CABLE. CARE SHALL BE TAKEN NOT TO DAMAGE THE DEFORMED PIPE DURING INSTALLATION. APPROPRIATE SLEEVES AND ROLLERS SHALL BE USED TO PROTECT THE LINER.
- C. WHEN THE DEFORMED PIPE IS IN PLACE, IT SHALL BE CUT AND THE PROCESSING MANIFOLDS (PIPE END CLOSING ASSEMBLY USED FOR HEAT AND PRESSURE CONTROL WITHIN LINER) SHALL BE ATTACHED IN AND SECURED AT BOTH PIPE ENDS. THE TEMPERATURE AND PRESSURE MEASURING INSTRUMENTS SHALL BE ATTACHED TO THE DEFORMED PIPE AT BOTH ENDS.
- D. THROUGH THE USE OF STEAM AND AIR PRESSURE, THE DEFORMED PIPE SHALL BE PROGRESSIVELY REFORMED TO CONFORM TO THE EXISTING PIPE WALL. THE DEFORMED PIPE SHALL BE PRESSURIZED UP TO TWO (2) PSIG, MAXIMUM, WHILE THE TERMINATION POINT VALVES ARE KEPT WIDE OPEN TO PROVIDE HEAT FLOW. THE PRESSURE SHALL THEN BE INCREASED IN INCREMENTS UP TO A MAXIMUM OF SEVEN (7) PSI DEPENDING UPON MATERIAL CELL CLASSIFICATION AND STANDARD DIMENSIONAL RATIO (SDR).
- E. THE CONTRACTOR SHALL COOL THE REFORMED PIPE ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS.
- F. WHEN THE TEMPERATURE REDUCES TO 100°F DEGREES, THE CONTRACTOR SHALL THEN SLOWLY RAISE THE PRESSURE TO A MINIMUM OF ELEVEN (11) PSI (PRESSURE TO BE DETERMINED AS PER AN

VENDOR: NATIONAL WATER MAIN CLEANING

EXISTING PIPE CONDITION) WHILE APPLYING AIR FOR CONTINUED COOLING. THE EQUIPMENT SHALL BE DISCONNECTED AFTER AMBIENT TEMPERATURE IS ATTAINED.

- G. TEMPERATURE AND PRESSURES SHALL BE MONITORED AND RECORDED THROUGHOUT THE INSTALLATION PROCESS TO ENSURE THAT EACH PHASE OF THE PROCESS IS ACHIEVED AT THE MANUFACTURER'S RECOMMENDED TEMPERATURE AND PRESSURE LEVELS. COPIES OF THESE RECORDS SHALL BE GIVEN TO THE OWNER AT THE COMPLETION OF EACH INSTALLATION.
- H. SERVICE CONNECTIONS: AFTER THE LINER HAS BEEN INSTALLED, THE CONTRACTOR SHALL RECONNECT THE EXISTING SERVICE CONNECTIONS. THIS SHALL BE DONE FROM THE INTERIOR OF THE PIPELINE WITHOUT EXCAVATION UTILIZING A ROBOTIC CUTTER. WHERE HOLES ARE CUT THROUGH THE LINER, THEY SHALL BE NEAT AND SMOOTH IN ORDER TO PREVENT BLOCKAGE AT THE SERVICE CONNECTIONS. CUT-IN SERVICE CONNECTIONS SHALL BE OPENED TO A MINIMUM OF NINETY (90%) PERCENT OF THE FLOW CAPACITY OF THE BUILDING SEWER. ALL COUPONS SHALL BE RECOVERED AT THE DOWNSTREAM MANHOLE AND REMOVED. THE CONTRACTOR SHOULD NOT REACTIVATE ANY LINE SECTIONS UNTIL ACCEPTED BY THE OWNER.

6.4 TESTING

- A. ALL SANITARY SEWER PIPE LINED WITH DEFORMED PVC PIPE SHALL BE DIGITALLY SCANNED THROUGHOUT THEIR ENTIRE LENGTH IMMEDIATELY FOLLOWING THE INSTALLATION OF THE LINER SO AS TO CONFIRM THE NEWLY INSTALLED PIPE IS FREE OF DEFECTS AND OBSTRUCTIONS OF ANY KIND.
- B. THE CONTRACTOR WILL FURNISH ALL NECESSARY AND APPROVED MATERIAL, EQUIPMENT, LABOR AND OTHER FACILITIES REQUIRED TO SATISFACTORILY PERFORM THE POST LINING EVALUATION AND SHALL MAKE ALL NECESSARY REPAIRS OR REPLACEMENTS, AS REQUIRED, AT HIS OWN EXPENSE.
- C. FINAL INSPECTION OF THE LINER SHALL BE PERFORMED AGAIN SHOULD REPAIRS BE REQUIRED AFTER THE LINER HAS BEEN INSTALLED AND PROCESSED.

SECTION 7 – PRICING

THE QUANTITY TO BE PAID FOR UNDER ITEM A-8 SHALL BE THE ACTUAL NUMBER OF LINEAL FEET, BY PIPE DIAMETER AND LINEAL FOOT LENGTH OF PVC DEFORMED SEWER PIPE LINER FURNISHED AND INSTALLED, MEASURED ALONG THE CENTERLINE OF THE PIPE FROM INSIDE FACE OF MANHOLE TO INSIDE FACE OF MANHOLE. WHERE SEWERS ORDERED TO BE LINED ARE IN LINE WITH ONE ANOTHER (CONTINUOUS BETWEEN MANHOLES) AND IT IS POSSIBLE TO INSTALL THE LINER FOR MULTIPLE SEWER SECTIONS IN ONE OPERATION, THE QUANTITY TO BE MEASURED AND PAID FOR WILL BE THE ACTUAL NUMBER OF LINEAL FEET INSTALLED AT THE UNIT PRICE BID FOR THAT ITEM.

THE CONTRACTOR'S ATTENTION IS DIRECTED TO THE FACT THAT INDIVIDUAL SEWER LINER WORK MUST BE PERFORMED AS DIRECTED BY THE OWNER. THE UNIT PRICES PROVIDED SHALL TAKE INTO CONSIDERATION THAT EACH SEWER TO BE LINED WILL REQUIRE MOBILIZATION AND DEMOBILIZATION AND THAT MULTIPLE SEWER LINING MAY NOT BE POSSIBLE. THE CONTRACTOR SHALL LINE EACH INDIVIDUAL SEWER UPON DIRECTION BY THE OWNER AFTER SATISFYING ALL PREPARATORY WORK AS MAY BE REQUIRED; INSTALLATION OF CHEMICAL GROUTS FOR PIPE STABILIZATION OR WATER INFILTRATION, ALL ROBOTIC OBSTRUCTION REMOVAL AND HEAVY CLEANING WITH DISPOSAL OF ALL WASTE. THE UNIT PRICE PER LINEAL FOOT OF SEWER PIPE LINER BID SHALL INCLUDE MOBILIZATION AND DEMOBILIZATION FOR EACH SEWER LINE TO BE REPAIRED, DESIGN CALCULATIONS FOR THE LINER WALL THICKNESS, FURNISHING AND INSTALLING THE PVC DEFORMED PIPE LINER, SPECIALIZED EQUIPMENT AND MATERIALS NECESSARY TO INSTALL THE LINER, SUPPLYING WATER, HEATING AND

VENDOR: NATIONAL WATER MAIN CLEANING

CURING THE LINER, SEALING THE LINER AT EXISTING MANHOLE CONNECTIONS, DIGITAL SCANNING AND TESTING OF INSTALLED LINER, RESTORATION OF ANY DAMAGED EXISTING FACILITIES, LANDSCAPING, ETC., TOGETHER WITH ALL MATERIALS, LABOR, TOOLS, EQUIPMENT AND INCIDENTALS NECESSARY TO COMPLETE THE WORK AS SPECIFIED.

NASCO CIPP TRAINING

NASSCO INSPECTOR TRAINING AND CERTIFICATION PROGRAM (ITCP) FOR CURED-IN-PLACE PIPE INSTALLATION.

THIS TRAINING IS INTENDED FOR MUNICIPAL ENGINEERS WHO PERFORM INSPECTION ON THEIR PROJECTS, INSPECTORS WHO ARE ON SITE INSPECTING THE PROJECT, AND EMPLOYEES INVOLVED IN THE MAINTENANCE & REPAIR OF COLLECTION SYSTEMS WHO NEED A COMPREHENSIVE UNDERSTANDING OF THE CURED-IN-PLACE PIPELINE RENEWAL TECHNOLOGY. THE ITCP COURSE WILL COVER SPECIFIC AREAS OF EXPERTISE THAT ARE NEEDED TO ENSURE THAT A TRENCHLESS PROJECT IS BUILT CORRECTLY AND MEETS THE REQUIREMENTS OF THE CONTRACT DOCUMENTS. THE ITCP HAS BEEN STRUCTURED TO ACHIEVE THIS TRAINING. THE TRAINING COURSE INCLUDES TWO DAYS OF TECHNOLOGY AND SPECIFICATION INFORMATION THAT THE INSPECTOR NEEDS TO KNOW. THE COURSE INCLUDES SAMPLE FORMS THAT CAN BE USED BY THE ATTENDEE AS THE BASIS FOR RECORDING INFORMATION ON THE PROJECT SITE. THE FORMS WILL HAVE SPECIFIC QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS THE CIPP TECHNOLOGY, THE INSPECTION PROCEDURES REQUIRED, AND THE INFORMATION, WHICH NEEDS TO BE DOCUMENTED FOR A COMPLETE INSPECTION RECORD. THE CLASSES WILL BE HELD IN BERGEN POINT, WEST BABYLON, NY.

NASSCO'S INSPECTOR TRAINING AND CERTIFICATION PROGRAM (ITCP) IS A NEW STANDARD NATIONAL TRAINING AND CERTIFICATION PROGRAM THAT PROVIDES FIELD CONSTRUCTION PROFESSIONALS (EXAMPLE: CONSULTING AND MUNICIPAL ENGINEERS, CONTRACTORS) WITH COMPREHENSIVE LEARNING AND TOOLS TO UNDERSTAND AND INSPECT TRENCHLESS PIPELINE RENEWAL TECHNOLOGY.

ATTENDEES WHO SUCCESSFULLY COMPLETE THE TRAINING WILL RECEIVE 1.35 CONTINUING EDUCATION UNITS AND A CERTIFICATE. THEY WILL ALSO GET A COPY OF THE TRENCHLESS ASSESSMENT GUIDE FOR REHABILITATION (TAG-R), AN INTERACTIVE SOFTWARE PROGRAM THAT WILL ALLOW THE ENGINEER AND INSPECTOR TO SELECT APPLICABLE TECHNOLOGIES FOR DIFFERENT PROJECT CONDITIONS.

MINIMUM OF 8 PEOPLE PER CLASS, INCLUDES ALL TRAINING MATERIALS AND TRAINER EXPENSES