

ADDENDUM

Engineering Department
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City of Reedley
Engineering Department

ADDENDUM NO. 3

TO THE SPECIFICATIONS FOR

STPL-5216(050)
MANNING AVENUE PH. 1
FROM I STREET TO FRANKWOOD AVENUE

Bid Date: August 25, 2020

The following additions and/or corrections shall become part of the Contract Documents and Construction Specifications for the subject project.

Notice to all Contractors submitting bids for this work and to all contract document holders.

You are hereby notified of the following changes to the Contract Documents, more specifically, to the Bid Proposal Package and the construction plans for this project. This addendum shall supersede the original contract documents wherein it contradicts the same and shall take precedence over anything to the contrary therein. All conditions remain the same.

Approved by:

Julianna for Mavity Morales 8/21/20
City Engineer Date

NOTICE: This Addendum shall be acknowledged by the Contractor submitting the bid in the space provided below and this addendum shall be submitted with the Contractor's Bid Proposal as well as faxed for acknowledgement of receipt to the City of Reedley. Failure to acknowledge may result in the proposal being rejected as not responsive.

**Sign and fax this sheet to
559-637-2139**

Contractor: _____

Contractor's Signature

Date

Item No.	Reference	Description of Change
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Bid and Contract Documents

1.	N/A	
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Project Special Provisions

1.	Appendix A	Add the attached Technical Specifications document to the project specifications as Appendix A.
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Plan Sheets

1.	N/A	Contractor shall install 1” water service per updated Standard Drawings W-4. See attached.
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TECHNICAL SPECIFICATIONS

SECTION 1 CURED-IN-PLACE PIPE (CIPP) LINER

1.01 GENERAL

A. SCOPE

The Cured-In-Place Pipe (CIPP) liner rehabilitation of the existing sewer shall consist of rehabilitating the existing sanitary sewer pipes by installing a resin-impregnated flexible tube which will be inverted into the host conduit using the hydrostatic head method. After the resin will be cured in place by hot water circulated within the tube, resulting in a continuous, watertight, and tightly closed pipe formed to the host pipe.

The calculated full-pipe capacity of the finished rehabilitated pipe shall be equal to or greater than that of the host pipe, based on a Manning's "n" roughness coefficient of 0.013 for the host pipe and not less than 0.010 for the finished rehabilitated pipe. The new finished roughness coefficient for the rehabilitated pipe shall be documented by hydraulic test data acceptable by the Engineer.

The Contractor shall provide all materials, labor, equipment, and services necessary for bypass pumping and/or diversion of sewage flows, CIPP liner installation, service connection reinstatement, initial and final cleaning, initial and final CCTV inspection, and final testing. The Contractor shall install the CIPP liner properly and accurately.

B. REFERENCED DOCUMENTS

The latest editions of the following documents and standards are hereby incorporated by reference as a part of these Technical Specifications. When a difference exists between the requirements of referenced documents, the stricter provisions as directed by the Engineer, shall apply.

- ASTM D543 Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents
- ASTM D732 Standard Test Method for Shear Strength of Plastics by Punch Tool
- ASTM D790 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
- ASTM F1216 Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of Resin-Impregnated Tube
- ASTM D2990 Standard Test Methods for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics
- ASTM D5813 Standard Specification for Cured-in-Place Thermosetting Resin Sewer Pipe

"Greenbook" Standard Specifications for Public Works Construction, latest edition and current supplements thereto, BNi Publications, Inc. (hereinafter referred to as "Greenbook").

Recommended Specifications for Sewer Collection System Rehabilitation, National Association of Sewer Service Companies (NASSCO).

C. MANUFACTURER'S QUALIFICATIONS

The tube and resin manufacturers for the proposed CIPP shall have previous successful manufacturing experience for CIPP installed in sanitary sewers owned by public agencies or municipalities. The Contractor shall upon request submit information, satisfactory to the Engineer, demonstrating manufacturer experience

and qualifications, including project reference contacts. Unless otherwise approved by the Engineer, in writing, manufacturer experience and qualifications, as of the date of the bid opening, shall include the following items, as a minimum.

1. The tube and resin manufacturers shall be experienced in commercial manufacturing for CIPP, and shall have manufactured the tube and resin materials that were used for a minimum of 50,000 linear feet of CIPP successfully installed in sanitary sewers owned by public agencies or municipalities in the United States, without restriction as to the type of resin employed.
2. The tube and resin manufacturers shall have manufactured the tube and resin materials that were used for a minimum of 20,000 linear feet of CIPP successfully installed in sanitary sewers, owned by public agencies or municipalities in the state of California, where the CIPP has been in successful service for a minimum of 3 years, without restriction as to the type of resin employed.

D. CONTRACTOR QUALIFICATIONS

The Contractor, or the CIPP Subcontractor, shall have previous successful experience in the installation of CIPP in sanitary sewers owned by public agencies or municipalities. The experience shall include that of the Contractor or Subcontractor itself, and shall not include the experience of individual employees gained during projects done in the employ of other contracting firms. Unless otherwise approved by the Engineer, in writing, the Contractor's experience and qualifications, as of the date of the bid opening, shall include the following items, as a minimum.

1. The Contractor shall be certified, authorized, or licensed by the manufacturer or licensor of the CIPP process that the Contractor will use or employ. The Contractor shall be experienced with and knowledgeable about the maintenance, operation and repair of the equipment used for CIPP when used for the rehabilitation of sanitary sewers. The Contractor shall defend, indemnify and hold harmless the City from and against any and all liability, loss, damage, claims, suits, judgments, or costs arising, in whole or in part, from any allegation of patent infringement by the City or the Contractor, or both, on account of the use or employment of the proposed CIPP process on this project by the Contractor. In the event that the CIPP process used or employed on this project is determined to infringe upon the patent rights of another, then the Contractor either shall secure for the City approval of the CIPP process, as modified, so that the alleged patent infringement ceases, or pay any and all liability, loss, damage, claims, suits, judgments, or costs attributable to the use or employment of the infringing CIPP process plus costs incurred by the City in connection therewith.
2. The Contractor shall have a minimum of 3 years of active experience in the commercial installation of CIPP for sewer rehabilitation, and shall have successfully completed the installation of 20,000 linear feet of CIPP in sanitary sewers owned by public agencies or municipalities in the United States. At least one of the CIPP projects included in that length shall be similar in size and scope to this project.
3. The Contractor's foreman and personnel who will perform CIPP installation shall have a minimum of two years of training and experience in the installation of CIPP for sewer rehabilitation.
4. The Contractor shall be knowledgeable of, and able to comply with, all applicable requirements and regulations for confined space entry and the transportation, handling, storage and use of materials and chemicals related to the work.

E. SUBMITTALS

The Contractor shall submit the following items to the Engineer for review and acceptance prior to the commencement of any CIPP installation operations.

1. Shop drawings, catalog data and manufacturer's technical data showing complete information on material composition, physical properties, and dimensions of CIPP materials, including manufacturer's recommendation for handling, storage, and repair if damaged.

2. Infrared spectrography chemical fingerprint of the CIPP resin.
3. CIPP installation plan, including description of equipment and processes, service connection reinstatement, and end treatment at manholes and structures.
4. Total quality management or quality assurance procedures for product manufacturing and installation, including inspection programs, testing procedures, and standards.
5. Certificates of compliance, including third party test results for physical properties and chemical resistance properties.
6. Material Safety Data Sheets.
7. Manufacturer's recommendations for the CIPP process, including material storage, resin application, installation, curing, lateral reinstatement, end treatment, trimming and finishing.
8. Manufacturer's certification that the Contractor is licensed for use of the CIPP process.
9. Wastewater bypass pumping plan, including emergency response and backup provisions, sealed and signed by a Professional Civil Engineer registered in the State of California. Refer to Section 4, "Temporary Handling of Wastewater Flows," of these Technical Specifications.
10. A detailed, dimensioned plan showing layout of the areas the Contractor intends to occupy for CIPP installation, including equipment setup and access point locations.
11. Labeling proposed for CCTV inspection digital versatile discs (DVDs).
12. Television inspection reports and DVDs made during CCTV inspection prior to and after CIPP installation.
13. Volume of resin required per unit length for each diameter and thickness of CIPP used.

Following wet-out of each tube, the Contractor shall submit the volume of resin actually used for each tube to the Engineer.

1.02 MATERIALS AND EQUIPMENT

A. CIPP LINER TUBE AND RESIN

The proposed CIPP liner tube and resin shall conform to the requirements of ASTM F1216 and ASTM D5813 for Type III, and the provisions in these Technical Specifications. CIPP resin shall be epoxy resin approved by the Engineer. Installed and cured CIPP shall conform to the minimum structural properties requirements in the following table.

CIPP MINIMUM STRUCTURAL PROPERTIES		
Structural Property	Test Method(s)	Minimum Value
Flexural Strength (Initial)	ASTM D790	4,500 psi
Flexural Modulus (Initial)	ASTM D790	300,000 psi
Flexural Modulus (Long Term - 50 Year)	ASTM D790 ASTM D2990	150,000 psi
Wall Thickness	ASTM D2122	As Specified
Impact Strength	ASTM D256 Method E	1.9 ft-lb/in

The installed CIPP liner shall be designed in accordance with ASTM F1216-07a Appendix X1 (except earth loading, which shall be calculated as specified in the following paragraph) to accommodate internal and external pressures corresponding to uniform earth loading and traffic loading for the depths of cover shown on the Plans, using the structural design parameters in the following table.

CIPP STRUCTURAL DESIGN PARAMETERS		
Variable	Description	Design Value
w	Unit Weight of Original Backfill	120 lbs/ft ³
K μ'	Product of "K", Rankine's or Conjugate Ratio for Original Backfill, and " μ' ", Coefficient of Sliding Friction Between Original Backfill and Trench Walls	0.150
N	Factor of Safety	2.00
E _L	CIPP Modulus of Elasticity, Long Term	150,000 psi
q	Ovality of Existing Pipe	5%
H _w	Height of Groundwater Above Top of Pipe	0.00 ft
E' _s	Modulus of Soil Reaction	1,000 psi

Traffic loading shall be AASHTO HS20 loading, except under railroads where the loading shall be Cooper E-80 loading. Earth loading shall be determined based on Marston's Theory, assuming that all earth loading imposed on the existing rigid sewer pipe for original trench installation conditions is imposed on the CIPP liner. The CIPP design life shall be 50 years, and the existing host pipe shall be considered to be fully deteriorated for the entire design life. The maximum value that may be used for the long-term (50-year) modulus of elasticity in structural design calculations for CIPP shall be the tabulated value. The maximum allowable calculated deflection shall be 3.75% of the mean installed CIPP liner diameter. Complete design calculations, sealed by a Civil Engineer registered to practice in the State of California, verifying that the CIPP liner the Contractor proposes to install is of adequate long-term structural capacity for the specified loads and conditions, shall be prepared and submitted to the Engineer for approval prior to the commencement of work. Structural design calculations shall demonstrate that the proposed CIPP liner will accommodate design loading under specified conditions for the duration of its design life, without excessive deflection, overstress condition, or buckling failure. Design calculations that do not contain the seal and signature of a Civil Engineer registered to practice in the State of California will be returned to the Contractor and will not be reviewed until they contain an appropriate seal and signature.

Minimum CIPP wall thicknesses shall be as shown on the Plans.

Cured and finished CIPP material shall meet the chemical resistance requirements of ASTM F1216 Appendix X2.

The outside layer of the CIPP liner tube (before inversion) shall consist of a transparent flexible plastic material compatible with the resin used, and shall not be subject to delamination after cure. The resin shall be tinted with a compatible blue dye that contrasts with the liner tube material to allow visual confirmation of complete resin saturation of the tube material.

The bond between CIPP layers shall be strong and uniform. All layers, after cure, shall form one homogeneous structural pipe wall, with all parts of the tube having complete resin saturation. The liner tube shall contain no intermediate or encapsulated elastomeric layers, and no other materials that are subject to delamination after cure.

The volume of resin used for tube impregnation shall be sufficient to fill all the volume of air voids in the tube with additional allowance for polymerization shrinkage and the loss of resin through cracks and irregularities in the host pipe wall. A roller system shall be used to uniformly distribute the resin throughout the tube. The Contractor shall specify the roller system gap dimension that will pass the required volume of resin per unit length within the confines of the plastic coating perimeter. The Engineer will make random gap dimension checks and may provide a suitable inelastic compliant material to the Contractor to have it passed through the roller system for gap verification.

B. SERVICE CONNECTION REINSTATEMENT EQUIPMENT

When service connection reinstatement is done by remote methods, the equipment shall be a remote controlled cutting device (cutter) specifically designed for such work and approved for such work by the

CIPP manufacturer. The remote-controlled cutting device shall be monitored by a CCTV camera. The Contractor shall have a minimum of 2 complete working cutters and spare replacement parts for key components available at the job site prior to the commencement of each CIPP installation operation.

C. PACKAGING AND TRANSPORTATION

CIPP materials shall be packaged and transported as recommended by the manufacturer, and in a manner designed to ensure delivery to the project neatly, intact, and without physical damage. The transportation carrier shall use appropriate methods and intermittent checks to ensure materials are properly supported, stacked, and restrained during transport. CIPP materials damaged before or during installation shall be repaired as recommended by the manufacturer, or replaced at Contractor's expense, as directed by the Engineer.

D. WATER HEATING EQUIPMENT

Boilers or water heating equipment for the CIPP curing process shall be equipped with integral safety systems and feature manage burner operation. Such safety systems and features shall include, but not necessarily be limited to, the following:

1. Flame safeguard system to control the burner during start, run and shutdown periods.
2. Flame detector system that will:
 - a) Shut off fuel valves when absence of flame is identified by the monitoring system, and
 - b) Prohibit fuel valves from opening until pilot flame is established.
3. Burner management control system with lockout ability at ignition and during operation.
4. Control system with lockout ability to monitor and control temperature, pressure and water level, with a low water cutoff control.
5. Fuel source conforming to burner manufacturer's specifications, with a safeguard system which will shut off fuel when a boiler system imbalance is detected.

The Contractor shall submit to the Engineer a boiler inspection certification for the equipment that will be used for this project, current within 90 days prior to the date of submittal and prepared by a certified independent boiler inspection firm. No such equipment shall be transported to or operated at the job site prior to the Engineer's written approval of the certification.

Boiler or water heating equipment shall be operated by a certified technician. Weekly routine boiler inspections shall be conducted by the operator, and a written log containing inspection results shall be kept at the job site and made available to the Engineer upon request.

1.03 EXECUTION

A. GENERAL

The Contractor shall conduct CIPP installation operations in the most feasible, efficient and safe manner, installing the specified materials to the lines and grades shown on the Plans, in conformance with the provisions in the Specifications, and as directed by the Engineer.

B. HANDLING AND STORAGE

CIPP handling and storage shall conform to the manufacturer's recommendations.

C. TEMPORARY HANDLING OF WASTEWATER FLOWS

Temporary handling of wastewater flows shall conform to the provisions in Section 4, "Temporary Handling of Wastewater Flows," of these Technical Specifications.

D. SEWER CLEANING

The host pipe shall be cleaned immediately prior to CIPP liner installation for each continuous installation operation, in conformance with the provisions in Section 8, "Sewer Cleaning and Disposal of Material Removed from Sewers," of these Technical Specifications. No more than 24 hours may elapse between the completion of sewer cleaning operations and commencement of CIPP liner installation, unless otherwise approved or directed by the Engineer.

E. PROTRUDING LATERALS

For service or lateral sewer connections where the connecting pipe protrudes into the host pipe more than 1" beyond the inside surface of the host pipe, the Contractor shall trim the protruding pipe to be flush with the inside surface of the host pipe prior to CIPP installation. Trimming shall be done without excavation, by remote-controlled or manual-controlled cutting or grinding equipment operated within the host pipe. Such equipment shall be specifically intended for such use, and shall be approved by the Engineer and CIPP manufacturer for such use. Remote-controlled equipment shall include a CCTV camera to allow visual location and observation of trimming operations.

F. INITIAL CCTV INSPECTION

The Contractor shall conduct initial CCTV sewer inspection in conformance with the provisions in Section 10, "Closed Circuit Television (CCTV) Sewer Inspection," of these Technical Specifications.

G. CIPP INSTALLATION

CIPP installation shall conform to the requirements of ASTM F1216, the provisions in these Technical Specifications, and the manufacturer's recommendations. In the case of conflicting requirements, provisions, or recommendations, the strictest in the opinion of the Engineer shall apply, unless otherwise directed or approved by the Engineer.

The Contractor shall submit to the Engineer a detailed CIPP installation plan showing the proposed installation procedures, types of equipment, equipment set-up, limits of individual inversions, and sewer access points. No CIPP installation operations shall commence until the Engineer has approved the CIPP installation plan in writing. Reference is made to Subsection 1.01E, "Submittals," of these Technical Specifications.

CIPP liner shall extend continuously from the beginning of sewer rehabilitation to the end of sewer rehabilitation for each sewer designated for rehabilitation, which may comprise numerous contiguous manhole-to-manhole sewer reaches and numerous individual CIPP inversions. At terminal manholes, those situated at the beginning of sewer rehabilitation and the end of sewer rehabilitation, the CIPP liner shall be neatly cut flush to terminate at the nearest edge of the access opening in the top of the pipe, or at the interior surface of the manhole wall, or at the end of the host pipe entering the manhole, as best suits field conditions in the opinion of the Engineer.

CIPP liner ending at the end of a pipe or at a wall penetration shall be neatly cut flush with the end of the pipe or the wall surface. CIPP liner ending at a location within the pipe or within a manhole flow channel shall be neatly cut around its circumference in a plane normal to the longitudinal axis of the pipe. At all CIPP liner end points, and at all other exposed edges of the cured and finished liner, the liner shall be permanently sealed to the host pipe or surface using a suitable sealant material compatible with the CIPP liner and approved by the Engineer. Cured and finished sealant material shall meet the chemical resistance requirements of Greenbook 210-2.3.

Where CIPP liner is to be installed in a host pipe extending through any intermediate manhole, the cured and finished CIPP liner shall be continuous through the manhole, such that the interior surface of the host pipe through the manhole is completely covered with the CIPP liner material, except as hereinafter specified. Where the intermediate manhole serves as the endpoint for separate CIPP inversions, the end of the subsequent inversion shall overlap the end of the preceding inversion during curing. The cured overlapping CIPP liner shall be neatly cut to match the end of the overlapped liner, leaving a space of no

more than 1 inch between the two ends, and the overlapping portion of the CIPP liner shall be removed. The space between the two ends shall be filled and sealed with the sealant material specified above for the sealing of liner end points and exposed edges, forming a continuous smooth surface through the manhole.

Where CIPP liner is to be installed in a host pipe that does not extend through an intermediate manhole, but the manhole base includes a shaped flow channel between the ends of the host pipe on either side of the manhole, the CIPP liner shall also cover that portion of the flow channel that is shaped to match the interior surface of the host pipe.

Cured and finished CIPP liner shall fit tightly and neatly against the surface of the host pipe, and shall be homogeneous throughout. Cured and finished CIPP liner shall be free of:

1. Abrasions, cuts or gouges deeper than 10% of the liner thickness
2. Kinks, flat spots, cracks, holes or blisters
3. Foreign inclusions or other injurious defects
4. Any wrinkles below the centerline of the pipe that are larger than the following:

Maximum Allowable Wrinkle Height	
Pipe Size	Height of Wrinkle
≤ 15"	3% of pipe diameter
> 15"	½"

5. Wrinkles above pipe centerline that protrude more than 1 inch from the surrounding surface

H. SERVICE CONNECTION REINSTATEMENT

Reinstatement of service connections shall be done without excavation, within the installed CIPP liner, by remote-controlled equipment, or by worker-entry methods using manually operated equipment. Reinstatement equipment shall be specifically intended for such use, and shall be approved by the CIPP manufacturer for such use. Remote-controlled equipment shall include a CCTV camera to allow visual location of the service connection and observation of reinstatement work. For reinstatement of service connections by worker-entry methods, the Contractor shall comply with all applicable requirements and regulations for confined space entry, including but not limited to preparation of an emergency rescue plan, provision of emergency rescue equipment, and provision of adequate ventilation.

After reinstatement, the invert of the service connection shall match the bottom of the reinstated service opening. The area of the reinstated service connection opening shall be a minimum of 95 percent to a maximum of 100 percent of the area of the original service connection opening. The new edge shall be smooth and crack free with no loose or abraded material.

For sewers with a nominal internal diameter greater than 24 inches or for sewers where worker-entry methods are used to reinstate the service connection, the service connection shall be sealed after reinstatement with an ultra-high-build, 100% solids epoxy coating specifically formulated and intended for such use and approved by the Engineer. Cured and finished epoxy coating shall meet the chemical resistance requirements of Greenbook 210-2.3.

I. TESTING

1. General

The physical properties of the installed CIPP liner shall be verified through field sampling and laboratory testing. The Contractor shall remove or prepare samples of the cured CIPP liner at locations designated by the Engineer, as specified in this section. Resulting voids in the CIPP liner shall be repaired by the Contractor using a resin mixture compatible with the CIPP.

CIPP liner samples shall be tested in accordance with applicable ASTM test methods, including but not necessarily limited to those listed in the following table, to evaluate compliance with specification requirements.

LABORATORY TEST METHODS	
Liner Thickness	ASTM D2122
Flexural Strength	ASTM D790
Flexural Modulus	ASTM D790
Impact Strength	ASTM D256 Method E

Where test sample conditioning is required or allowed by applicable test specifications, but the test specifications do not specifically require or allow a maximum sample conditioning or "aging" period, the sample conditioning period shall not exceed 120 hours. Testing shall be completed within 7 days of obtaining the sample.

In the event a single CIPP liner sample fails to meet specification requirements as determined by laboratory testing, the Contractor shall provide an additional sample from the same general location for repeat testing. Should the second CIPP liner sample fail to meet specification requirements, the CIPP liner will be rejected by the Engineer.

2. Testing by Contractor's Approved Testing Laboratory

The Contractor shall retain an independent, third-party testing laboratory for material testing. The laboratory shall be approved by the Engineer in writing prior to the commencement of any CIPP liner installation operations. The testing laboratory so approved is hereinafter referred to as the Contractor's Approved Testing Laboratory.

Prior to installing the CIPP liner, the Contractor shall submit to the Engineer an infrared spectrography chemical fingerprint of the CIPP resin approved for use on this project. During construction, the Engineer will direct the taking of random samples of the CIPP resin for infrared spectrography chemical fingerprint analysis by the Contractor's Approved Testing Laboratory. The Contractor shall take resin samples, or assist in the taking of resin samples, when and as directed by the Engineer. Infrared spectrography chemical fingerprinting results shall be submitted to the Engineer, at the same scale as the pre-construction analysis, for comparison with the pre-construction fingerprint to verify that the resin used is the same resin approved for use on this project. CIPP liner installed with resins other than the approved resin will be rejected, and shall be removed and replaced at the Contractor's expense.

For each individual CIPP inversion, the Contractor shall provide CIPP samples for testing by the Contractor's Approved Testing Laboratory as follows:

- a) Two samples, one prepared by each of the two methods specified in ASTM F1216, Section 8, or by such other methods as may be approved by the Engineer.

The samples so provided shall be tested by the Contractor's Approved Testing Laboratory to determine liner thickness, flexural strength and flexural modulus. Results of laboratory testing shall be submitted to the Engineer in the form of reports containing certified test results. The reports shall clearly identify the Engineer's station, date and time of day at which each sample was taken, and the duration of curing for each sample.

3. Testing by Engineer's Testing Laboratory

The Engineer will also retain an independent, third-party testing laboratory for material testing, which laboratory is hereinafter referred to as the Engineer's Testing Laboratory. The Engineer's Testing Laboratory is in addition to, and may be an entity apart from, the accredited testing laboratory that may be engaged by the Engineer for inspection of materials not locally produced.

In addition to the CIPP samples provided for testing by the Contractor's Approved Testing Laboratory, the Contractor shall also provide CIPP samples for testing by the Engineer's Testing Laboratory. The

Contractor shall provide CIPP samples for testing by the Engineer's Testing Laboratory at one location for every four individual CIPP inversions or installations, but at not less than one location for every 3,000 feet of CIPP liner installed, as follows:

- a) One sample for flexural testing prepared by placing a thin 12" by 24" steel plate in the pipe invert at a location designated by the Engineer. For pipe sizes in which use of the specified steel plate is impractical, another sample preparation method approved by the Engineer may be employed. The samples shall be clearly labeled with the Engineer's station at which the sample was taken, and date, time of day, and duration of curing.
- b) Two samples prepared by core drilling 2-inch diameter test plugs at locations directed by the Engineer, for measurement of liner thickness.

The samples so provided will be tested by the Engineer or the Engineer's Testing Laboratory to determine liner thickness, and by the Engineer's Testing Laboratory to determine flexural strength and flexural modulus.

4. Payment

Full compensation for preparing samples, taking samples, assisting in the taking of samples, leakage testing, and for all testing and reporting by the Contractor's Approved Testing Laboratory, shall be considered as included in the contract price paid per linear foot for CIPP sewer rehabilitation, and no additional compensation will be allowed therefor. The City of Reedley will pay for testing and reporting by the Engineer's Testing Laboratory.

J. FINAL CCTV INSPECTION

The Contractor shall conduct final CCTV inspection in conformance with the provisions in Section 10, "Closed Circuit Television (CCTV) Sewer Inspection," of these Technical Specifications.

1.04 NON-CONFORMING WORK

A. GENERAL

CIPP liner that fails to meet specification requirements in any respect, as determined by laboratory testing or visual inspection, will be rejected by the Engineer. When notified of rejected work by the Engineer, the Contractor shall either repair or remove and replace the defective work, or offer a credit to the Engineer as specified in the following subsections. Any credits will be withheld from the next progress payment, the final payment, and/or the retention.

B. REPAIR OR REMOVE AND REPLACE

The Contractor shall develop remedial methods for repair, or removal and replacement, of the rejected work and shall submit the proposed methods to the Engineer for review and approval. Remedial methods may include removal and replacement of the CIPP liner or another method approved in writing by the Engineer.

Upon notice of the Engineer's approval of the proposed remedial method or methods, the Contractor shall implement the approved methods to bring rejected work into compliance with specification requirements as directed by the Engineer. The Contractor shall bear the full expense of all remedial work and related testing.

C. CREDIT

1. General

The Contractor may offer a cost credit to the City of Reedley for non-conforming work in accordance with the following subsections in lieu of repair or removal and replacement. The City of Reedley is under no obligation to accept the credit, and reserves the right to have the non-conforming work repaired or removed and replaced.

2. Wrinkles Below Pipe Centerline

The Contractor may offer a credit to the City of Reedley for wrinkles in the installed CIPP liner that are below the pipe centerline. The credit shall apply along the entire length of a particular wrinkle. The credit shall be determined as shown in the following table:

Pipe Size	Direction	Height of Wrinkle	Severity	Credit
≤ 24"	Any	Maximum Allowable Wrinkle Height ¹ to 4% of pipe diameter	Minor	0.25 x (Contract Unit Price)
≤ 24"	Longitudinal	>4% of pipe diameter to 8% of pipe diameter	Severe	0.50 x (Contract Unit Price)
≤ 24"	Transverse	>4% of pipe diameter	Unacceptable	N/A
≤ 24"	Longitudinal	>8% of pipe diameter	Unacceptable	N/A
> 24"	Any	Maximum Allowable Wrinkle Height ¹ to 1"	Minor	0.25 x (Contract Unit Price)
> 24"	Longitudinal	>1" to 2"	Severe	0.50 x (Contract Unit Price)
> 24"	Transverse	>1"	Unacceptable	N/A
> 24"	Longitudinal	>2"	Unacceptable	N/A

¹ See Item 4 of Subsection 1.03G of these Technical Specifications.

Wrinkle height and direction shall be estimated from the CCTV inspections, and the final determination of the severity and direction will be made by the Engineer.

3. Deficient Liner Thickness

The Contractor may offer a credit to the City of Reedley for installed CIPP liner that is thinner than the specified thickness. Each reach containing deficient CIPP liner thickness shall have its own credit, and the credit shall apply along the entirety of each reach. The reaches shall be determined as shown on the profiles contained in the Plans.

For each reach containing deficient CIPP liner thickness, the thickness of the installed CIPP liner shall be determined as specified in Subsection 1.03I, "Testing," of these Technical Specifications and the specified thickness is shown on the profiles contained in the Plans. The credit shall be no less than the credit calculated by the following formula, which accounts for the reduction in the factor of safety in the CIPP liner design:

$$\text{Credit} = 5 \times \left[1 - \left(\frac{\text{Installed Thickness}}{\text{Specified Thickness}} \right)^{1.5} \right] \times (\text{Contract Unit Price})$$

No credit for deficient CIPP liner thickness will be accepted if the installed thickness of the CIPP liner is less than 94% of the specified thickness of the CIPP liner.

4. Deficient Initial Flexural Modulus

The Contractor may offer a credit to the City of Reedley for installed CIPP liner that has a lower initial flexural modulus than the specified initial flexural modulus. Each reach containing deficient initial flexural modulus shall have its own credit, and the credit shall apply along the entirety of each reach. The reaches shall be determined as shown on the profiles contained in the Plans.

For each reach containing deficient initial flexural modulus, the initial flexural modulus of the installed CIPP liner shall be determined as specified in Subsection 1.03I, "Testing," of these Technical Specifications and the specified initial flexural modulus is shown in the table entitled "Minimum CIPP Structural Properties" in Subsection 1.02A, "CIPP Liner Tube and Resin," of these Technical Specifications. The credit shall be no less than the credit calculated by the following formula, which accounts for the reduction in the factor of safety in the CIPP liner design:

$$\text{Credit} = 5 \times \left[1 - \left(\frac{\text{Installed Initial Flexural Modulus}}{\text{Specified Initial Flexural Modulus}} \right)^{0.5} \right] \times (\text{Contract Unit Price})$$

No credit for deficient initial flexural modulus will be accepted if the installed initial flexural modulus of the CIPP liner is less than 81% of the specified initial flexural modulus of the CIPP liner.

5. Deficient Initial Flexural Strength

The Contractor may offer a credit to the City of Reedley for installed CIPP liner that has a lower initial flexural strength than the specified initial flexural strength. Each reach containing deficient initial flexural strength shall have its own credit, and the credit shall apply along the entirety of each reach. The reaches shall be determined as shown on the profiles contained in the Plans.

For each reach containing deficient initial flexural strength, the initial flexural strength of the installed CIPP liner shall be determined as specified in Subsection 1.03I, "Testing," of these Technical Specifications, and the specified initial flexural strength is shown in the table entitled "Minimum CIPP Structural Properties" in Subsection 1.02A, "CIPP Liner Tube and Resin," of these Technical Specifications. The credit shall be no less than the credit calculated by the following formula, which accounts for the reduction in the factor of safety in the CIPP liner design:

$$\text{Credit} = 5 \times \left[1 - \left(\frac{\text{Installed Initial Flexural Strength}}{\text{Specified Initial Flexural Strength}} \right) \right] \times (\text{Contract Unit Price})$$

No credit for deficient initial flexural strength will be accepted if the installed initial flexural strength of the CIPP liner is less than 90% of the specified initial flexural strength of the CIPP liner.

1.05 MEASUREMENT

CIPP liner will be measured by the linear foot, as the installed length measured horizontally along the longitudinal axis of the pipe for both tangent and curved alignments. Where the installed CIPP extends through a manhole or other structure, measurement will include the distance through the structure. Where the installed CIPP terminates at the wall of a manhole or other structure, measurement will be made to the point of termination and will not include the distance through the structure. Where the host pipe enters a structure at an angle different from a right angle and the CIPP is cut to conform to the inside surface of the structure, measurement will be made to the point of intersection of the longitudinal axis of the pipe with the inside surface of the structure.

SECTION 2 MANHOLES

2.01 GENERAL

The work under this section shall consist of furnishing all materials and constructing manholes as shown on the Plans and Standard Drawings, in conformance with the provisions in the Specifications, and as directed by the Engineer. Reference is made to Section 29, "Sewer and Storm Drain Structures," of the Standard Specifications.

The interior surfaces of all precast concrete elements of manholes, such as riser sections, reducing cones, adjustment rings, and flat slab lids, shall be PVC-lined. The interior surfaces of all cast-in-place concrete

elements of manholes, such as bases, foundations, flow channels, and benches shall be coated with a manhole coating.

Manholes shall conform to Standard Drawings S-3 through S-5, as appropriate for the size of the sewer main, or as shown on the Plans, except as otherwise specified in this section. New manholes are not shown on the Plans, but may be required by the Contractor's temporary handling of wastewater flows plan.

For manhole construction outside of public rights-of-way, the Contractor shall coordinate with the affected property owners to minimize the impact on the property owner's use of their property.

2.02 MATERIALS

A. CAST-IN-PLACE CONCRETE

Concrete for cast-in-place construction shall be Class A concrete conforming to the provisions in Section 24, "Portland Cement Concrete; Pavement; Cement Mortar," of the Standard Specifications, unless otherwise shown on the Plans. Portland cement shall be Type II Modified. The Contractor shall submit mix designs to the Engineer, and no cast-in-place construction shall commence prior to the Engineer's written approval of the mix designs.

B. MORTAR

Mortar used in manhole construction shall conform to the provisions in Section 51-1.02F, "Mortar," of the 2018 State Standard Specifications.

C. PRECAST REINFORCED CONCRETE MANHOLE SECTIONS

Precast reinforced concrete manhole sections shall conform to the provisions in ASTM C478. Elliptical single line reinforcement is not allowed. Manhole sections shall be fitted with a PVC liner having continuous integral projecting locking extensions designed to allow concrete to flow around them during the casting process, resulting in permanent mechanical anchorage of the liner to the concrete.

The ends of manhole sections shall be in planes at right angles to the longitudinal axis of the section. The ends of manhole sections shall be finished to regular smooth surfaces, and no point on any surface of either the spigot end or bell end shall project beyond, or be more than 1/4 inch short of, the specified plane.

In addition to the tongue and groove joints shown on the Standard Drawings, joints for manhole sections may be rubber gasket joints of flush bell and spigot design with a contained rubber gasket. Joints and gaskets shall conform to the provisions in ASTM C443 for standard gaskets, except as modified or required otherwise in these Technical Specifications. The gasket shall be confined in a groove or by a shoulder on the spigot end of the manhole section so that neither movement of the section nor hydrostatic pressure can displace the gasket. When the joint is assembled, the gasket shall be compressed to effect a watertight seal.

Rubber gasket joint assemblies shall be formed and accurately manufactured so that installed manhole sections will form a continuous watertight manhole with a smooth and uniform interior surface, and shall provide for slight movements of the sections due to expansion, contraction, settlement, or lateral displacement. The shape and dimensions of the joint shall be such that it shall be self-centering upon closure, and so designed that the gasket will not be required to support the weight of the manhole sections. The rubber gasket shall be the sole element of the joint depended upon to provide water tightness.

D. MANHOLE ADJUSTMENT RINGS

In addition to the precast concrete manhole adjustment rings shown on the Standard Drawings, manhole adjustment rings may be injection molded high density polyethylene (HDPE) adjustment rings, as manufactured by Ladtech, Inc., or approved equal. HDPE adjustment rings shall be designed to accommodate AASHTO HS25 live loading, including impact. HDPE material shall conform to the provisions in ASTM D1248.

E. PVC LINER MATERIAL

PVC liner for manholes and other structures shall conform to the provisions in Section 3, "Polyvinyl Chloride (PVC) Liner," of these Technical Specifications.

F. MANHOLE COATING

Manhole coating shall conform to the applicable provisions in Subsection 12.04, "Manhole Coating," of these Technical Specifications.

G. ACCESS FRAMES AND COVERS

Metal frames and covers for manholes and other structures shall be cast iron meeting the provisions in ASTM A48 for Class 25, and shall conform to Standard Drawings and the details on the Plans.

2.03 CONSTRUCTION

A. GENERAL REQUIREMENTS

Manholes shall consist of a cast-in-place concrete base section, reinforced concrete riser section(s), reinforced concrete taper (cone) section(s), adjustment rings, a cast iron frame and cover, and a cast-in-place concrete collar.

The top of the cast-in-place manhole base section shall be keyed to receive the tongue end of the riser section. The key shall be formed in the freshly cast concrete by using a template manufactured to the dimensions of the riser section.

Manhole sections of various heights shall be used to result in the required overall height of the manhole barrel.

The cast-in-place manhole base shall be troweled smooth with a wooden trowel. All excess material and any other debris shall be removed from the manhole.

A rubber gasket approved by the Engineer shall be installed around the outside of all PVC pipes entering manholes, such that the gasket will be situated in the approximate center of the concrete surrounding the pipe where it penetrates the manhole base or wall.

B. PVC LINER INSTALLATION

PVC liner installation shall conform to the provisions in Section 3, "Polyvinyl Chloride (PVC) Liner," of these Technical Specifications.

C. MANHOLE COATING APPLICATION

Manhole coating application shall conform to the applicable provisions in Subsection 12.04, "Manhole Coating," of these Technical Specifications. After application, the coating shall be tested as specified in Subsection 12.05, "Field Quality Control and Testing," of these Technical Specifications.

D. FLOW CHANNELS THROUGH STARTING MANHOLES

In conformance with Subsection "Installation," of the Standard Specifications, a channel shall be formed in the bottom of all new starting manholes (a terminal manhole at the upstream end of a sewer main) and it shall extend completely through the manhole. The upstream end of the new flow channel shall terminate at the manhole wall, and the end of the flow channel shall be vertical with no fillet between the flow channel bottom and the manhole wall.

E. SETTING MANHOLE FRAMES AND COVERS TO FINISHED GRADE

Manhole frames and covers shall be set at the elevations established by the control stakes provided by the Engineer; however, when the cover is in an area to be resurfaced or in an unpaved roadway shoulder, it shall be set flush with the finished surface, unless otherwise directed by the Engineer. Manhole frames shall be set at the required grade and shall be secured in place with a concrete collar as shown on the Standard Drawings.

Manhole frames and covers shall be set to finished grade by the installation of adjustment rings between the manhole cone section and the frame and cover. No less than two adjustment rings shall be installed, and the installed height of the adjustment rings shall not exceed 18 inches. For HDPE adjustment rings, a 3/16- to 1/4-inch bead of butyl sealant approved by the adjustment ring manufacturer shall be applied to the entire circumference of the bottom of each adjustment ring as it is installed, and to the entire circumference of the bottom of the cover frame as it is installed on the topmost adjustment ring, except that a double bead shall be applied to the bottom of the lowermost adjustment ring if minor but acceptable surface irregularities are present on the top of the cone section.

After the frame is set to finished grade, a concrete collar shall be constructed around the frame and cover as shown on the Standard Drawings. In unimproved areas, the concrete collar shall be constructed flush with the manhole frame and cover. Thereafter, frames and covers shall be thoroughly cleaned to ensure a satisfactory fit, and the covers shall be installed.

SECTION 3 POLYVINYL CHLORIDE (PVC) LINER

3.01 GENERAL

PVC liner shall be flexible and specifically designed for installation in concrete sanitary sewer pipe and structures. PVC liner shall have continuous integral projecting locking extensions designed to allow concrete to flow around them during the casting process, resulting in permanent mechanical anchorage of the liner to the concrete, except that plain PVC liner sheet for repairs and special applications, and PVC joint, corner and weld strips, shall not have locking extensions.

All PVC liner materials, including joint, corner, and weld strips, shall be manufactured from a polyvinyl chloride compound that meets the requirements specified herein and is approved by the Engineer. Polyvinyl chloride resin shall constitute not less than 99 percent by weight of the resin used in the formulation. Copolymer resins will not be permitted.

At any time prior to final acceptance of the manhole or pipe, the Engineer may take sample specimens from any part of the installed or uninstalled PVC liner for testing.

Changes in formulation will be permitted only after prior notice is given to the Engineer, and Contractor demonstrates that the new PVC liner will meet or exceed all requirements specified herein for chemical resistance and physical properties.

3.02 PROPERTIES

All PVC liner sheets, including locking extensions, and all joint, corner, and welding strips shall be free of cracks, cleavages, or other defects adversely affecting the protective characteristics of the material. The Engineer may authorize the repair of such defects by approved methods.

Except at shop welds, all PVC liner sheets, joint, corner and weld strips shall have the following properties when tested at 77° ± 5° F.

Property	Initial	Exposure¹
Tensile Strength (ASTM D 412)	2,200 psi min.	2,100 psi min.
Elongation at Break (ASTM D 412)	200% min.	200% min.
Hardness, Shore durometer, Type D (ASTM D 2240 ²)	Instantaneous: 55-65 10 seconds: 35-55	±5% max. ³ ±1.5% max. ³
Weight change	----	±1.5% max. ³

¹ For 112 days in chemical solutions listed in this Subsection.

² Except that a single thickness of material shall be used.

³ With respect to initial test result.

3.03 TESTS

A. GENERAL

Samples taken from sheets, joints, or weld strips shall be tested to determine material properties. Determination of tensile strength and elongation shall be in accordance with ASTM D412 using Die B. Determination of indentation hardness shall be in accordance with ASTM D2240 using a Type D durometer, except that a single thickness of material will be used. Determination of change of weight and indentation hardness shall be made on 1-inch x 3-inch specimens. Thickness of specimens shall be the thickness of the sheet or strip.

B. MEASUREMENT OF INITIAL PHYSICAL PROPERTIES

Determine the initial values for tensile strength, weight, elongation, and indentation hardness prior to chemical resistance tests. The samples shall be conditioned 24 hours at 77° F ± 5° F before determining initial properties.

C. CHEMICAL RESISTANCE TESTS

Determine the physical properties of the specimens after exposure to chemical solutions. Test specimens shall be conditioned to constant weight at 110°F before and after submersion in the following solutions for a period of 112 days at 77° ± 5° F:

Chemical Solution	Concentration
Sulphuric acid (H ₂ SO ₄)	20% ¹
Sodium hydroxide (NaOH)	5%
Ammonium hydroxide (NH ₄ OH)	5% ¹
Nitric acid (HNO ₃)	1% ¹
Ferric chloride (FeCl ₃)	1%
Sodium Hyperchlorite	1%
Soap	0.1%
Detergent (Linear alkyl benzyl sulfonate or LAS)	0.1%
Bacteriological	BOD not less than 700 ppm

¹ Volumetric percentage of concentrated reagents of C.P. grade.

At 28-day intervals, specimens shall be removed from each chemical solution and tested. If any specimen fails to meet the 112-day requirements specified in the previous subsection before completion of the 112-day exposure, the material will be subject to rejection.

D. PULL TEST FOR LOCKING EXTENSIONS

PVC liner locking extensions embedded in concrete shall withstand a test pull of at least 100 pounds per linear inch, applied perpendicularly to the concrete surface for a period of 1 minute, without rupture of the locking extensions or withdrawal from embedment. This test shall be made at a temperature between 70° to 80° F inclusive.

E. SHOP-WELDED JOINTS

Shop-welded joints, used to fuse individual sections of PVC liner together, shall be at least equal to the minimum requirements of the PVC liner for thickness, corrosion resistance, and impermeability. Welds shall show no cracks or separations and shall be tested for tensile strength. Tensile strength measured across the welded joint in accordance with ASTM D412 using Die B shall be at least 2,000 psi. Test temperature shall be 77°±5° F, and the measured minimum width and thickness of the reduced section shall be used.

F. SPARK TESTING

Spark testing shall be performed with an approved electrical holiday detector provided by the Contractor, such as Tinker & Razor Model No. AP-W with power pack, with the instrument set at 20,000 volts minimum. Spark testing shall be done in the presence of the Engineer, unless otherwise approved in advance and in writing by the Engineer.

PVC liner shall be shop spark tested at the place of liner manufacture. Defects shall be satisfactorily repaired by qualified welders at the place of liner manufacture.

PVC liner in pre-cast concrete items shall also be shop spark tested at the place of manufacture. Defects shall be satisfactorily repaired by qualified welders at the place of manufacture. No pre-cast concrete item that fails spark testing shall be delivered to the jobsite until repairs have been made and the item has passed retesting. Pre-cast concrete items that pass spark testing shall be given a certifying mark approved by the Engineer.

3.04 DETAILS AND DIMENSIONS

A. APPROVAL OF DETAILS

PVC liner sheet, strip, and other accessory pieces shall conform to the requirements of these Specifications.

B. THICKNESS OF MATERIAL

The minimum thickness of sheet and strip shall be as follows:

Material	Thickness (Inches)
Sheet, w/ integral locking extensions	0.065
Sheet, plain	0.094
Joint strip	0.075
Weld strip	0.094

C. MATERIAL SIZES

Sheets of PVC liner shall be sized to provide the coverage required. Joint strip shall be 4 inches \pm 0.25 inch in width and shall have each edge beveled prior to application. Welding strips shall be 1 inch \pm 0.125 inch in width. All welding and outside corner strips shall have edges beveled at time of manufacture.

D. LOCKING EXTENSIONS

All PVC liner to be embedded in concrete shall have integral locking extensions.

Locking extensions shall be of the same material as the PVC liner, shall be integrally molded or extruded with the sheets, and shall have an approved cross section with a minimum height of 0.375 inch and a minimum web thickness of 0.085 inch. They shall be approximately 2-1/2 inches apart and shall be such that when the extensions are embedded in concrete, the PVC liner will be held permanently in place.

Locking extensions shall be parallel and continuous except where interrupted for joint flaps, strap channels and for other purposes indicated or permitted by the Engineer.

E. PROVISIONS FOR STRAP CHANNELS

Unless alternate methods are approved by the Engineer, PVC liner required to be secured to the inner form with straps shall have strap channels at not more than 20 inches on center perpendicular to the locking extensions. The channels, 1-inch wide maximum, shall be formed by removing the locking extensions at strap locations so that a maximum of 3/16 inch of the base remains in the strap channel. Strap channels

shall not be provided in the final two locking extensions adjacent to the terminal edge of the PVC liner coverage.

F. FLAPS

When transverse flaps are specified or required, they shall be fabricated by removing locking extensions so that a maximum of 0.032 inch of the base of the locking extensions remains on the sheet.

G. CLEANERS

Cleaners used in the installation of the PVC liner shall be approved by the Engineer prior to use. Cleaners shall be nonflammable and shall be water soluble or water dispersible and shall not be detrimental to the PVC liner.

H. ADHESIVE PRODUCTS

Adhesive products and application procedures used in the installation of the PVC liner shall be approved by the Engineer prior to use. Adhesive products intended for use inside joined PVC-lined pipe or cast-in-place structures shall be nonflammable.

3.05 INSTALLER QUALIFICATIONS

A. APPLICATORS

The application of PVC liner to forms and other surfaces is considered highly specialized work. Personnel performing such work shall be trained in methods of installation and shall demonstrate their ability to the Engineer.

B. WELDERS

Each welder shall pass a qualification welding test before doing any welding. Requalification may be required at any time deemed necessary by the Engineer. All test weld specimens shall be made in the presence of the Engineer and tested by the Engineer as follows:

1. Two pieces of PVC liner, at least 15 inches long and 9 inches wide, shall be lapped 1-1/2 inches and held in a vertical position.
2. A welding strip shall be positioned over the edge of the lap and welded to both pieces of PVC liner. Each end of the welding strip shall extend at least 2 inches beyond the liner to provide tabs.
3. Each welding strip tab, tested separately, shall be subjected to a 10-pound pull normal to the face of the PVC liner with the liner secured firmly in place. There shall be no separation between the welding strip and liner.
4. Three test specimens shall be cut from the welded sample and tested in tension across the welds. If none of these specimens fails when tested as indicated in Subsection 3.03E, the weld will be considered satisfactory.
5. If one specimen fails to pass the tension test, a retest will be permitted. The retest shall consist of testing three additional specimens cut from the original welded sample. If all three of the retest specimens pass the test, the weld will be considered satisfactory.

A disqualified welder may submit a new welding sample following sufficient off-the-job training or experience to warrant re-examination.

3.06 PVC LINER INSTALLATION

A. GENERAL

Installation of the PVC liner, including preheating of sheets in cold weather and the welding of all joints, shall be done as shown on the Plans, in conformance with the requirements of these Specifications, as directed by the Engineer, and as recommended by the liner manufacturer.

Application of PVC liner to concrete surfaces by means of adhesive shall only be done where the liner cannot otherwise be applied by means of mechanical anchorage, by embedment of the projecting locking extensions in concrete as part of the casting process, for both precast and cast-in-place items. Mechanical anchorage shall be employed wherever possible. Precast concrete items that are to be PVC lined shall be shop lined at the place of manufacture by mechanical anchorage during casting; such items may not be field lined by means of adhesive at the job site. Cast-in-place concrete items that are to PVC lined shall be field lined by mechanical anchorage, by application of liner to forms in advance of casting operations. Liner application to concrete surfaces by means of adhesive shall be used to the least extent practical, and only as approved or directed by the Engineer.

PVC liner shall be applied and secured to the forms, inspected, and approved by the Engineer prior to the placement of reinforcing steel. Forms in contact with PVC liner need not be oiled.

Coverage of the PVC liner shall not be less than the minimum indicated. For manholes and other structures, the PVC liner shall cover all interior concrete surfaces, except that floor slabs and manhole benches need not be covered.

B. POSITIONING PVC LINER

The PVC liner shall be installed with the locking extensions running vertically, unless otherwise directed or approved by the Engineer.

PVC liner shall be closely fitted to inner forms. Sheets shall be cut to fit curved and warped surfaces using a minimum number of separate pieces.

At transverse joints between sheets of PVC liner, and at manhole section joints, the space between ends of locking extensions, measured longitudinally, shall not exceed 4 inches. Where sheets are cut and joined for the purpose of fitting irregular surfaces, this space shall not exceed 2 inches.

Locking extensions shall terminate not more than 3/8 inches from the edge of the lined surface, unless otherwise approved or directed by the Engineer.

Joint flaps, when used, shall extend approximately 4 inches beyond the end of the inside surface of the manhole section.

C. SECURING PVC LINER TO INNER FORMS

The PVC liner shall be held snugly in place against inner forms by means of steel banding straps or other means recommended or approved by the liner manufacturer. Banding straps must be located in precut strap channels to prevent crushing or tilting of the locking extensions.

If banding straps are used, a steel channel, angle, or bar may be inserted along the edge locking extension of each PVC liner sheet for concrete pipe or cast-in-place structures. Steel channel, angle, or bar shall be of sufficient stiffness to hold the longitudinal edges of the PVC liner snugly against the form. These may be removed after the concrete is vibrated into place.

Where form ties or form stabilizing rods pass through PVC liner, provisions shall be made to maintain the liner in close contact with the forms during concrete placement.

D. PVC LINER RETURNS

A PVC liner return shall be installed where shown on the Plans, or wherever lined surfaces join surfaces which are not so lined, such as vitrified clay pipe, PVC pipe, unlined concrete pipe, manhole frames, and gate guides.

Unless otherwise shown on the Plans or required by the Specifications, PVC liner returns shall be made as follows:

1. Each PVC liner return shall be a separate strip of liner at least 3 inches wide joined at right angles to the main liner by means of approved corner strips.

2. Corner strips shall be welded continuously to the return and to the main liner and applied wherever possible from the back of the liner.

Locking extensions shall be provided on returns to lock the returns to the concrete of PVC-lined cast-in-place structures. Locking extensions will not be required on PVC liner returns installed on lined precast concrete pipe.

Each PVC liner return shall be sealed to adjacent construction with which it is in contact by means of a compound approved by the Engineer. If the joint space is too wide or the joint surfaces too rough to permit the use of the compound, the joint space shall be filled with 2 inches of densely caulked cement mortar, lead wool, or other caulking material approved by the Engineer, and finished with a minimum of 1 inch of an approved corrosion resistant material.

3.07 CONCRETE OPERATIONS

A. CONCRETE PLACEMENT

Concrete cast against PVC liner shall be vibrated, spaded, or compacted in a careful manner so as to protect the PVC liner and produce a dense, homogenous concrete, securely anchoring the locking extensions into the concrete.

Concrete shall be prevented from flowing around the edges of sheets at joints by welding a weld strip over the back of the joint.

Stiffeners used along locking extensions of PVC liner, installed in forms for pipe, shall be withdrawn completely during the placement of concrete in the forms. The concrete shall be re-vibrated to consolidate the concrete in the void spaces caused by the withdrawal of the stiffeners.

B. FORM REMOVAL

In removing forms, care shall be taken to protect the PVC liner from damage. Sharp instruments shall not be used to pry forms from lined surfaces. When forms are removed, any nails that remain in the PVC liner shall be pulled, without tearing the PVC liner, and the resulting holes clearly marked. Form tie holes shall be marked before ties are broken off and all areas of serious abrasion or damage shall be marked.

Following completion of form removal, PVC liner in pipe and structures shall be cleaned for inspection at the direction of the Engineer. Repairs to the liner in pipe shall be completed and approved by the Engineer prior to shipment of the pipe.

3.08 FIELD JOINTING OF PVC LINER

A. GENERAL

No field joint shall be made in PVC liner until the manhole has been backfilled and 7 days have elapsed after any jetting has been completed. Where groundwater is encountered, the joint shall not be made until pumping of ground water has been discontinued for at least 7 days and no visible leakage is evident at the joint. PVC liner at joints shall be free of all foreign material and shall be clean and dry before joints are made.

Hot joint compound shall not be brought in contact with PVC liner.

No coating of any kind shall be applied over any joint, corner, or welding strip, except where non-skid coating is applied to PVC liner surfaces.

B. FIELD JOINTS

Field joints in PVC liner at manhole section joints shall be one of the following types:

1. Type P-1 joint shall consist of a 4-inch joint strip, centered over the pipe joint and secured along each edge to adjacent liner by means of a welding strip.

2. Type P-2 joint shall be made with an integral joint flap with locking extensions removed per Subsection 3.04F, extending 4 inches \pm 1/4 inch beyond the end of the manhole section. Care shall be taken to protect the flap from damage. Excessive tension and distortion in bending the flap back to facilitate manhole section placement and jointing shall be avoided. Any flap which has been bent back and held shall be allowed to return to its original shape and flatness well in advance of making the joint.

C. INSTALLATION OF WELDING STRIPS

Welding strips shall be fusion welded to joint strips and PVC liner by qualified welders using only approved methods and techniques. The welding operation of any joint shall be continuous until that joint has been completed.

Adequate ventilation shall be maintained in confined spaces during welding operations.

The welding strip shall be centered over the cleaned surfaces to be joined and fused across its entire width. Incomplete fusion, charred, or blistered welds will be rejected.

Hot air welding guns shall provide clean effluent air at constant pressure to the surfaces to be joined within a temperature range between 500 °F and 600 °F.

All welds shall be physically tested by a nondestructive probing method. All patches over holes, or repairs to the PVC liner wherever damage has occurred, shall be accomplished as specified in this subsection.

After repairs have been made, defective welds will be re-inspected and tested.

3.09 APPLICATION OF PVC LINER TO EXISTING CONCRETE SURFACES

Liner application to concrete surfaces by means of adhesive shall be used to the least extent practical, and only as approved or directed by the Engineer. Application of PVC liner to concrete surfaces by means of adhesive shall be accomplished by the following steps.

1. The concrete surface shall be etched by sandblasting to develop a slightly granular surface. When permitted by the Engineer, the concrete surface may be acid etched in lieu of being sandblasted.
2. After sandblasting, the concrete surface shall be thoroughly cleaned of dust. Surfaces etched with acid shall be thoroughly washed with clean water and completely dried before applying primer.
3. The concrete surface shall then receive two brush coats of an approved primer. Coverage shall not exceed 250 square feet per gallon for each coat. The first coat of primer shall be thinned with an equal amount of approved thinner. The first primer coat shall be permitted to dry for at least 2 hours before the application of the second primer coat. The second coat of primer shall be applied unthinned and permitted to dry for at least 4 hours.
4. The concrete surface and the back surface of the PVC liner shall each be given two coats of an approved adhesive. Two hours drying time shall be allowed between application of these coats. Coverage shall not exceed 250 square feet per gallon for each coat.
5. One coat of an approved activator shall be applied to both the adhesive coat on the PVC liner and the adhesive coated concrete. Application of activator shall be limited to the extent that the application of coated liner can be completed within a 20-minute period. The activator shall be applied evenly by brushing. Coverage of activator shall not exceed 500 square feet per gallon.
6. When the surface of the adhesive is barely tacky to the touch, the PVC liner shall be positioned with one edge firmly pressed down. The liner shall then be rolled into place, care being taken to avoid the formation of air pockets. All joints shall be tight-fitting butt joints. The surface of the liner shall be rubbed vigorously to secure the liner firmly in place. Corner and welding strips shall be positioned over all joints and welded in place.

If the Engineer determines that the Contractor is making excessive use of adhesive for liner installation, the Contractor shall at the direction of the Engineer use approved stainless steel studs or anchors for liner anchorage, in addition to the adhesive. Stainless steel studs or anchors shall be installed and spaced as directed by the Engineer. Full compensation for the use of stainless steel studs or anchors for liner installation shall be considered as included in the contract price paid for the item in which the PVC liner is installed, and no additional compensation will be allowed therefor.

3.10 PROTECTION AND REPAIR OF PVC LINER

All necessary measures and precautions shall be taken to prevent damage to PVC liner from equipment and materials used in or taken through the work. Care shall be exercised in lifting, handling, transporting, and placing PVC-lined items to prevent damage to the liner.

Hot joint compounds, such as coal tar, shall not be poured or applied to the PVC liner.

Any damage to installed PVC liner for which repair is necessary, in the opinion of the Engineer, shall be repaired by the Contractor in accordance with the requirements set forth herein for the repair of liner. No work with damaged liner will be accepted until and unless the damage has been repaired to the satisfaction of the Engineer.

All nail and tie holes in the PVC liner, and all cut, torn, and seriously abraded areas, and all areas where the liner is not properly anchored to the lined surface, shall be patched. Patches made entirely with welding strip shall be fused to the liner over the entire patch. The use of this method is limited to patches which can be made with a single welding strip. The use of parallel, overlapping, or adjoining welding strips will not be permitted. Larger patches may consist of plain liner sheet applied over the damaged area with adhesive. All edges must be covered with welding strip fused to the patch and the sound liner adjoining the damaged area.

3.11 FIELD TESTS

All welds shall be physically tested by vigorous probing with a suitable tool, such as a metal putty knife with corners rounded, intended to reveal areas of nonexistent or inadequate fusion. A minimum of 80 percent of the undersurface of the weld strip shall be fused to the underlying PVC liner.

Field welds shall be subjected to a pull test of the weld strip. A portion of the weld strip to be tested shall be allowed to extend at least two inches beyond the intended end of the weld, to form a pull test tab. A 10-pound pull shall be applied to the pull test tab, normal to the face of the pipe or structure, by means of a spring balance. Liner adjoining the welding strip shall be held against the concrete during application of the force. The 10-pound pull shall be maintained if a weld failure develops, until no further separation occurs. Defective welds shall be retested after repairs have been made. Tabs shall be trimmed away neatly by the liner installer after the welding strip has passed inspection.

PVC liner shall be also be field spark tested at the job site. Field spark testing shall conform to the requirements of Subsection 3.03F of these Technical Specifications. The Contractor shall conduct initial field spark testing, and discovered defects shall be satisfactorily repaired by qualified welders. The affected areas shall be retested, which process shall be repeated until initial spark testing reveals no additional defects.

Following initial field spark testing and repairs, the Contractor shall notify the Engineer that the liner is ready for acceptance spark testing. Acceptance spark testing shall not be performed until all cured-in-place pipe work has been completed. Acceptance spark testing will be conducted by the Contractor in the presence of the Engineer. If defects are discovered during acceptance spark testing, acceptance spark testing will be halted and the Contractor shall repeat the initial spark testing and repair procedures.

The Contractor shall assist in field testing by providing the necessary tools, equipment and labor, adequate ventilation, ladders for access, and barricades or other traffic control devices. The Contractor shall likewise provide all tools, equipment, materials and labor necessary to comply with confined space entry requirements, and shall be responsible for opening and closing entrances and exits.

3.12 MEASUREMENT AND PAYMENT

No separate measurement for payment will be made of PVC liner. Full compensation for PVC liner shall be considered as included in the contract prices paid for the items of work in which PVC liner is installed, and no additional compensation will be allowed therefor.

SECTION 4 TEMPORARY HANDLING OF WASTEWATER FLOWS

4.01 GENERAL

A. DESCRIPTION

The work under this section shall consist of providing temporary handling of wastewater flows, by methods that may include bypass pumping systems, wastewater flow diversions as may be approved by the Engineer, advance notification of and implementation of sewer service interruptions, and restoring wastewater flows to normal service conditions, as shown on the Plans, in conformance with the provisions in the Specifications, and as directed by the Engineer.

The Contractor shall continuously operate and maintain failsafe temporary wastewater handling systems on a 24-hours per day basis, 7 days per week, including nights, weekends and holidays, whenever the Contractor's operations will otherwise result in the disruption of continuous wastewater conveyance. The Contractor shall provide continuous sanitary sewer service for all sewer mains and sewer services tributary to project sewers, and shall cooperate and coordinate temporary wastewater handling operations with the City of Reedley Sewer Maintenance Division as directed by the Engineer. Known tributary sewer mains are shown on the Plans.

Temporary wastewater handling system operation shall not result in surcharge flow conditions in sewers either upstream or downstream of the system. If a wastewater flow diversion results in surcharge conditions at any time, whether upstream or downstream of the diversion, the Contractor shall without delay provide additional temporary wastewater handling systems as necessary to supplement or replace the original system and relieve the surcharge conditions.

The Contractor shall designate a person or persons responsible for monitoring temporary wastewater handling systems and operations, who shall be authorized to act on the Contractor's behalf under both normal and emergency conditions. Their duties shall be continuous whenever temporary wastewater handling systems are in operation, including non-working hours, holidays and weekend periods when other work may not be in progress. The Contractor shall provide to the Engineer the names, addresses and telephone numbers of such persons, at which they may be contacted during working and non-working hours.

During temporary wastewater handling operations, and during performance of the work for which temporary wastewater handling is necessary, the Contractor shall provide all necessary safety provisions for the protection of personnel from the hazards of hydrogen sulfide gas in the work environment.

The Contractor's temporary wastewater handling systems shall include standby or backup provisions for use in case of equipment failure or other emergency condition.

B. WASTEWATER FLOWS

The Contractor's temporary wastewater handling systems shall be of sufficient capacity to convey all wastewater delivered to it by upstream sewers or sewer services, at the same rate the wastewater is delivered, during wet weather and dry weather, regardless of the time of day, unless otherwise approved or directed by the Engineer. The Contractor shall make such field measurements and inquiries as are necessary to develop complete self-satisfaction as to the wastewater flow conditions that must be contended with during construction. Absent other support information provided by the Contractor and acceptable to the Engineer, the Engineer will accept a temporary wastewater handling system designed for a peak wastewater flow rates not less than three times (300% of) the average wastewater flow, or designed for the full-pipe capacity of the sewer, whichever is greater. The Engineer's acceptance thereof, however,

shall not relieve the Contractor of the obligation to provide temporary wastewater handling systems conforming to the capacity provisions in these Technical Specifications.

Not all flow monitoring stations have accessible data, and data are not available for certain time periods. The availability and use of the City's flow monitor data does not relieve the Contractor of the responsibility to provide a wastewater handling system conforming to the capacity provisions in these Technical Specifications. No guarantee, express or implied, is made by the City, the Engineer, or the Design Engineer, that the City's flow monitor data are actually representative of flow conditions existing throughout the project or any part of it, or that unforeseen flow conditions will not be encountered. The availability of the City's flow monitor data shall not be construed in any way as a waiver of any provisions in the Specifications. Bidders shall satisfy themselves through their own investigations as to the conditions that will actually be encountered.

C. TEMPORARY WASTEWATER HANDLING SYSTEM PLANS

The Contractor shall prepare and submit to the Engineer detailed temporary wastewater handling system plans and calculations, for systems of any nature, including emergency response and backup provisions. The plans shall be sealed and signed by a Civil Engineer registered to practice in the State of California, and the Contractor shall secure the Engineer's approval of the plans prior to doing any work that will disrupt sewer service or wastewater conveyance. Temporary wastewater handling system plans and calculations that do not contain the seal and signature of a Civil Engineer registered to practice in the State of California will be returned to the Contractor and will not be reviewed until they contain an appropriate seal and signature. The plans shall be approved by the Engineer.

The plans, which shall include drawings, shall show the type and proposed location of temporary wastewater handling system facilities, how the systems will function, a description of liquid level monitoring provisions, and a description of alarm system provisions to alert the Contractor of malfunctions. The plans shall include complete calculations and specifications demonstrating the ability of temporary wastewater handling systems to accommodate wastewater flows as specified.

If bypass routes are shown on the Plans, the Contractor's temporary wastewater handling system plans shall include the routes, unless approved otherwise by the Engineer.

D. EMERGENCY SPILL RESPONSE PLAN

The Contractor shall prepare and submit to the Engineer an emergency spill response plan. The Contractor shall secure the Engineer's approval of the plan (and that of the County of Fresno Environmental Health Department for work in unincorporated areas of the County) prior to commencing any work that will disrupt the normal flow of wastewater. The Emergency Spill Response Plan shall include after hours contact and backup information for a local emergency responder that is capable of responding within one hour, any time of the day, including nights and weekends. After approval of the plan, a copy shall be provided to the City of Reedley Sewer Collections Division prior to the start of any contract work.

The plan shall include the requirement to contact the County of Fresno Environmental Health Department at (559) 445-3391 and the County of Fresno Sheriff's Department at (559) 488-3939 in the event of a spill in an unincorporated area of the County of Fresno.

E. USE OF EXISTING AND PROPOSED IMPROVEMENTS

The Contractor may make use of existing sewer facilities as part of temporary wastewater handling systems, as shown on the Contractor's wastewater handling plans approved by the Engineer.

The Contractor may exercise the option to construct sewer and sewer service improvements not shown on the Plans for use in temporary wastewater handling operations, as shown on the Contractor's wastewater handling plans approved by the Engineer. The Engineer may require that such improvements be removed upon completion of temporary wastewater handling operations. If manholes are constructed that will not be

removed at the completion of temporary wastewater handling operations, they shall conform to the provisions in Section 2, "Manholes," of these Technical Specifications.

Full compensation for construction of such improvements at the option of the Contractor, including the subsequent removal of such improvements if required by the Engineer, shall be considered as included in the contract lump sum price paid for temporary handling of wastewater flows, and no additional compensation will be allowed therefor.

F. RESPONSIBILITY FOR DAMAGE

It is possible or likely that existing sewers that may be affected by the Contractor's operations are aging, deteriorated facilities that could be damaged by conditions that would not affect new sewer facilities. The Contractor shall repair or replace in kind, as determined necessary by the Engineer, bearing all expense associated therewith, any and all public or private facilities damaged as a result of the Contractor's operations, including damage caused or precipitated by surcharge flow conditions, and including subsequent collateral damage to other facilities as may be precipitated by the effects of the initial damage. A surcharge flow condition shall be defined as any condition in which a sewer pipe that otherwise operates partly full under normal service conditions is completely filled with wastewater, whether flowing or not, or any condition in which a sewer pipe that operates full under normal service conditions is subjected to increased hydraulic head (pressure).

Should operation of the Contractor's temporary wastewater handling system result in surcharge conditions in sewers or sewer services either upstream or downstream, to the extent and of the duration that resultant accumulations of wastewater solids adversely affect the facilities, in the opinion of the Engineer, the Contractor shall clean the affected facilities using methods approved by the Engineer to remove such accumulations and restore the facilities to a condition as good as or better than the condition that existed prior to the surcharge.

G. PERMITS AND REGULATIONS

The Contractor shall obtain and pay for any and all permits required for temporary wastewater handling operations, and shall conduct related operations in conformance with permit requirements. As for all contract work, the Contractor shall comply with all applicable laws, ordinances, rules and regulations in the conduct of wastewater bypass operations.

Prior to implementing any work relative to temporary handling of wastewater flows within an unincorporated area of the County, the Contractor shall contact the County of Fresno Environmental Health Department at (559) 445-3391.

4.02 BYPASS PUMPING

A. GENERAL

Bypass pumping shall consist of providing temporary wastewater bypass pumping during construction, as shown on the Plans, in conformance with the provisions in the Specifications, and as directed by the Engineer. The Contractor shall furnish, install and operate temporary pumps, pipes, plugs and other equipment to divert the flow of wastewater around pipeline reaches in which work is being performed, along with all manpower necessary to setup, operate, maintain and remove continuous and failsafe wastewater bypass pumping systems.

The Contractor shall provide sufficient backup pumps that may be placed into immediate service in the event of a pump failure to ensure continuous and failsafe bypass pumping operations. For bypass pumping systems employing a single pumping unit, a minimum of one backup pump that may be placed into immediate service shall be on site at all times. For bypass pumping systems employing two or more pumping units, a minimum of two backup pumps that may be placed into immediate service shall be on site at all times. In addition to the specified number of backup pumps, replacement backup pumps shall be available on or off site, such that a replacement backup pump may be delivered to the site and ready for service within 30 minutes of the time any backup pump is placed into service.

Pumped wastewater shall be conveyed in an enclosed pipe or pipes, and shall be conveyed to an in-service manhole in the sanitary sewer system. Pipes shall be rated for a working pressure no less than two times the maximum bypass pumping system pressure. Flow velocity of pumped wastewater in bypass system pipes shall not exceed 10 feet per second, unless otherwise approved by the Engineer. At no time shall wastewater be conveyed or discharged in facilities other than the approved bypass pumping system or the sanitary sewer system.

Whenever existing pavement is cut to accommodate bypass pumping pipes and steel trench plates are used, the trench plates shall be recessed into the pavement so that the trench plates are flush with the surface of the pavement. The bypass line shall be trenched every 0.25 miles, at a minimum, to allow for vehicle turning movements.

The Contractor shall use a wet/dry vacuum or other method approved by the Engineer to clean up all sawcut slurry.

Engine-driven bypass pumps shall conform to the requirements of the following regulations and agencies relative to noise and exhaust emissions:

1. Municipal Code of the City of Reedley, Noise Regulations
2. Fresno County
3. San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD)
4. For smaller sewers, bypass pumping may also be accomplished through the use of vacuum trucks, subject to the approval of the Engineer. A minimum of two trucks shall be onsite at all times, and the temporary handling of wastewater flows plan shall provide calculations that show how many trucks are required and the amount of time it will take to fill and empty a truck. The flows used in the calculations shall be as specified in Subsection 4.01B, "Wastewater Flows," of these Technical Specifications. The temporary handling of wastewater flows plan shall also designate each suction and discharge manhole that will be used by the trucks.

WASTEWATER FLOW DIVERSIONS

Wastewater flow diversions shall consist of diverting wastewater flows into other sewers, as shown on the Plans, in conformance with the provisions in the Specifications, and as directed by the Engineer. The Contractor shall furnish, install and operate temporary plugs, weirs and other equipment to divert the flow of wastewater in sewers around or away from pipeline reaches in which work is being performed, along with all manpower necessary to setup, operate, maintain and remove continuous and failsafe wastewater flow diversion systems.

Wastewater flow diversions may be employed only to the extent of available flow capacity in receiving sewers, over and above the normal service flows of the receiving sewers, without resulting in surcharge flow conditions. For the purpose of wastewater flow diversions, flow capacity shall be defined as the open channel rate of flow at a depth of 82% of the pipe diameter, for uniform gravity flow conditions, calculated using the Manning equation. Wastewater flow diversions shall not result in surcharge flow conditions in sewers upstream of the point of diversion.

The City of Reedley makes no guarantee, express or implied, as to the existence of, and available flow capacity in, suitable receiving sewers for wastewater flow diversions, or as to the suitability of wastewater flow diversions for the project. Furthermore, the City of Reedley represents that it is ordinarily considered unlikely that suitable receiving sewers exist with sufficient available flow capacity to support wastewater flow diversions. The Contractor shall make his own determination as to the existence of suitable receiving sewers, the availability of flow capacity in receiving sewers, and the suitability of wastewater flow diversions for the project, subject to the approval of the Engineer. If, in the opinion of the Engineer, suitable receiving sewers with sufficient available flow capacity to support wastewater flow diversions do not exist, the Contractor shall provide bypass pumping systems for temporary handling of wastewater flows.

Proposed wastewater flow diversions shall be clearly identified and described on the Contractor's temporary wastewater handling system plans and calculations. No wastewater flow diversion shall be implemented that is not shown on the Contractor's temporary wastewater handling system plans and calculations as approved by the Engineer.

4.03 SEWER SERVICE INTERRUPTION

Wherever sewer services must be temporarily disconnected or plugged, or sewer service must be otherwise temporarily interrupted on account of the work, the Contractor shall provide written notice to all affected businesses, residents and tenants not less than two (2) calendar days nor more than five (5) calendar days prior to such interruption. The notice shall be in addition to any other notices required by the Specifications. The Contractor shall conduct construction operations in a manner which minimizes sewer service interruption, and shall instruct workers and subcontractors to minimize such interruption.

For residences, sewer service shall not be interrupted overnight, during the hours from 5:00 PM one day to 9:00 AM the following day. Likewise, sewer service may only be interrupted during the hours from 9:00 AM to 5:00 PM on the same day.

For businesses, sewer service shall not be interrupted during the typical work day, during the hours from 9:00 AM to 5:00 PM the same day. Likewise, sewer service may only be interrupted during the hours from 5:00 PM one day to 9:00 AM the following day.

Furthermore, under no circumstances shall sewer service be interrupted for hospitals, schools, hospices, nursing homes, convalescent homes, or similar facilities. Neither shall sewer service be interrupted for airport facilities, unless otherwise approved in writing by the Engineer.

If the Contractor's operations require that any sewer service be interrupted during hours when it is not allowed, or require that sewer service be interrupted for a facility for which it is not allowed, the Contractor shall provide bypass pumping of flow from the affected sewer service to an in-service sanitary sewer main. The proposed method of bypass pumping for sewer services shall be submitted to the Engineer for review and approval, and no such bypass pumping shall be done until the proposed method has been approved by the Engineer.

If the Contractor fails to provide sewer service interruption notices as hereinbefore specified, or allows sewer service interruption to continue beyond specified hours without required bypass pumping, or interrupts sewer service to a facility for which it is not allowed, and wastewater backs up in affected sewer services and spills or overflows, whether indoors or outdoors, the Contractor shall do all work and pay for all costs and expenses associated with related cleanup and repair, and shall pay for all costs and expenses associated with any and all related property damage claims.

SECTION 5 RESTORATION OF SURFACES

5.01 GENERAL

Restoration of surfaces shall consist of restoring the surfaces of all trenches, surfaces at or around structure sites, or any other surfaces damaged or disturbed by the work, to the condition existing prior to commencement of the work, or to such condition specified by the agency issuing the permit for the work, as shown on the Plans, in conformance with the provisions in the Specifications, and as directed by the Engineer. Surfaces shall include, but not be limited to, pavement of any kind, grass, shrubbery or other landscaping, gravel, treated or untreated soil.

5.02 EARTHWORK

Earthwork for restoration of surfaces shall conform to the provisions in Section 13, "Earthwork," of the Standard Specifications.

5.03 TEMPORARY RESURFACING

The Contractor shall furnish, place, maintain and finally remove cold-mix asphalt concrete having a minimum thickness of 2 inches (4 inches in unincorporated areas of the County), or a greater thickness if required by a permitting agency, as shown on the Plans, in conformance with the provisions in the Specifications, as required by permitting agencies, and as directed by the Engineer. Temporary resurfacing may be required by the Engineer wherever existing pavement is removed for trenches and other project excavations, and at certain street crossings, traffic crossings and access points.

Cold-mix asphalt concrete shall be mixed in a central plant and shall be approved by the Engineer.

Where temporary trench resurfacing is required, it shall extend across the full width of the existing pavement removed for trenches and other project excavations, unless otherwise directed by the Engineer. Temporary resurfacing shall be faithfully maintained by the Contractor during and after normal working hours and on weekends and holidays. The Contractor shall inspect the condition of the temporary surfacing at frequent intervals and make repairs as necessary. Temporary surfacing shall be removed by the Contractor prior to final resurfacing.

If the Contractor does not provide or adequately maintain temporary resurfacing in a timely manner, the Engineer may do so utilizing City personnel and resources. If so, the cost thereof will be deducted from monies due, or to become due, to the Contractor.

5.04 FINAL RESURFACING

The Contractor shall construct final resurfacing consisting of pavement structural sections of asphalt concrete, or aggregate base and asphalt concrete, or Portland cement concrete and asphalt concrete, as shown on the Plans, in conformance with the provisions in the Specifications, as required by permitting agencies, and as directed by the Engineer.

Aggregate subbase and base shall conform to the provisions in Section 17 "Aggregate Subbases" and Section 18 "Aggregate Bases" of the Standard Specifications, asphalt concrete shall conform to the provisions in Section 23, "Hot Mix Asphalt Pavement; Dikes," of the Standard Specifications, and Portland cement concrete shall conform to the provisions in Section 24, "Portland Cement Concrete; Pavement; Cement Mortar", of the Standard Specifications, unless otherwise required by permitting agencies. Pavement structural thicknesses shall be as shown on the Plans and Standard Drawings, or greater thicknesses if required by permitting agencies. The requirements of permitting agencies are incorporated herein by reference only; the Contractor shall undertake all efforts necessary to become completely informed as to such requirements.

Pavement replacement shall be accomplished as soon as possible and practicable, and within the time limits specified in these Technical Specifications. Pavement replacement shall be performed in a manner consistent with good construction practices and methods, shall be approved by the Engineer, and when completed, shall leave all areas requiring replacement of pavement with as neat an appearance as possible.

Areas to receive pavement replacement shall be completely cleaned by the Contractor of all debris, rubbish, dirt, temporary paving, or any other deleterious material which might affect the quality of the work in any way. Cleaning shall be accomplished to a minimum of 6 feet outside the edges of trenches or other areas to receive pavement replacement. This distance may be increased by the Engineer as necessary to prevent contamination of the new work. Street pavement or existing road surfacing shall be removed within the limits of all construction excavation prior to proceeding with excavation operations.

In preparation for final trench resurfacing in areas where a portion of the existing pavement is to remain, and where the entire street is not to be resurfaced or overlaid as part of the work, the pavement shall be sawcut by the Contractor outside the original removal area to a minimum depth of 3 inches (or the thickness of the existing pavement, whichever is less). The limits of sawcutting shall be as directed by the Engineer. All pavement cuts shall be neat and straight along both sides of the trench and parallel to the alignment of the pipe. Where large irregular surfaces are to be removed, all cutting or trimming shall be parallel or at

right angles to the roadway centerline. All cut and trimmed edges shall have clean, solid, vertical faces and shall be free of all loose material.

In areas where the entire street is not to be resurfaced or overlaid as part of the work under this contract, the edge of the resurfacing shall occur at the edge of a travel lane. This means that cutting into the pavement within a travel lane will require removal and replacement of the entire travel lane pavement, unless the entire street is to be resurfaced or overlaid. If during the Contractor's operations pavement is disturbed outside of this lane limit, the Contractor will be required to resurface an additional width to reach the specified limits. The minimum longitudinal distance for such additional widths is 50 feet. The minimum distance between these "50 foot" areas is 150 feet. If 2 adjacent "50 foot" areas occur closer than the 150 foot minimum separation requirement, then the entire distance between the areas shall be resurfaced at the additional width.

In areas where the entire street is to be overlaid as part of the work, the cuts made in the existing surface in preparation for final trench resurfacing shall be at a point not less than 6 inches outside the limits of the excavation or previous pavement cut, whichever limits are greater. The Contractor shall make such cuts to smooth lines. Such cuts may be made with pneumatic tools or other approved equipment.

All material between the edges of the original pavement removal and the pavement cuts made for the final resurfacing shall be trimmed by the Contractor from the existing surface at the edges of the proposed trench resurfacing, and shall be removed and disposed of by the Contractor. All edges of existing pavement, whether trimmed or sawcut, shall be protected from damage. Any edges damaged from any cause prior to or during paving operations, shall be re-cut or re-trimmed as directed by the Engineer, at the Contractor's expense.

When replacing pavement adjacent to existing pavement, the new pavement material shall not overlap the existing pavement edge. When compacted, the new pavement edge shall be flush with the existing pavement, and the surface shall be smooth, without humps or depressions.

5.05 REPLACING TRAFFIC STRIPING AND PAVEMENT MARKERS

All traffic stripes, traffic marking and pavement markers obliterated or removed due to trenching or pavement resurfacing shall be restriped or replaced by the Contractor as shown on the Plans and in accordance with Section 32 "Traffic Stripes, Signs, and Pavement Markings" of the Standard Specifications. Also included is all striping and marking adjacent to the work or on haul roads where the existing striping and marking is adversely affected by the construction.

Traffic striping shall match the existing striping that is being replaced, and shall be either paint or thermoplastic as required. All striping and marking material and pavement markers shall be provided by the Contractor. Where required by the permitting agency, the Contractor shall utilize standard marking stencils of the permitting agency.

City survey crews will provide a minimum of restriping and remarking survey control as needed for lane widths and lane locations, at no expense to the Contractor. The Contractor shall provide necessary layout for all other pavement striping and marking.

5.06 ADJUSTING EXISTING SURFACE FEATURES TO FINISHED GRADE

This work shall consist of adjusting all existing facilities including but not limited to manhole frames and covers, water valve boxes and covers, and other similar existing facilities which must fit or match final grade, as shown on the Plans, in conformance with the provisions in the Specifications, and as directed by the Engineer. The Contractor shall determine the number and type of facilities to be adjusted to finished grade.

Sewer and storm drain manhole frames and covers, and water valve boxes and covers shall be temporarily lowered below the grading plane and marked until paving has been accomplished. The manhole frames and covers, and valve boxes and covers shall then be raised to finished grade, concrete collars poured and asphalt concrete patch placed, in accordance with the construction details and as directed by the Engineer.

Other existing facilities shall be adjusted to finished grade in accordance with the utility or facility authority involved, and as directed by the Engineer. The Contractor shall be responsible for identifying the locations of existing facilities with a physical marker and for notifying and coordinating with the respective utility companies. All adjustments shall be done after paving operations. Where the utility or facility authority involved desires to do the work with their own forces and/or materials, the Contractor shall pay all the costs associated therewith.

5.07 RESTORATION OF MISCELLANEOUS SURFACE FEATURES

Restoration of miscellaneous surfaces shall consist of the Contractor's replacing or restoring in kind any surface damaged or disturbed by the work, including but not limited to, grass, landscaping of any kind, gravel, concrete, oiled earth not in street right-of-way, or soil.

Concrete pavement, including valley gutters, curbs and gutters, sidewalks, driveways, and any other concrete surfaces of whatever nature, disturbed by the work, shall be saw cut to a minimum depth of 1½" prior to removal. Said saw cut shall be made at a point approximately one foot beyond the edge of the trench and/or excavation. With the written permission of the Engineer, pneumatic tools or other approved equipment may be used to cut concrete pavement at the limits of the excavation prior to removal. In such an event, the saw cut, as provided in this section, shall be made after backfilling, and the additional concrete pavement shall be removed and disposed of by the Contractor prior to resurfacing. Such concrete shall be replaced in kind and as directed by the Engineer.

In unincorporated areas, where paved driveways or other bituminous surfaced driveways exist outside the paved roadway, and such driveways are disturbed or damaged by the Contractor's operations, they shall be restored to original condition or replaced in kind, or as required by the permitting authority, whichever requirements are stricter. In all other areas, such driveways shall be saw cut, removed and replaced in kind with asphalt concrete at least 4 inches thick.

Existing survey monuments located within the pavement area which cannot be protected by the Contractor will be replaced by the Engineer, at no cost to the Contractor.

The surfaces of all trenches, excavations or other areas damaged or disturbed by the work, upon completion of surface restoration, shall conform to the elevations and character of the areas which existed before work commenced, unless otherwise shown on the Plans, required by the Specifications, or directed by the Engineer. Excess trench or excavation material shall not be spread over any part of the project site, unless authorized by the Engineer, and shall be disposed of by the Contractor.

SECTION 6 POINT REPAIRS

This work shall consist of furnishing all materials and doing all work necessary for the repair of localized defects in sewer pipes, in advance of the placement of CIPP liner or other sewer rehabilitation materials or products. Unless otherwise directed or approved by the Engineer, or shown otherwise on the Plans, point repair shall consist of the removal and replacement in kind of the sewer pipe by open cut excavation and backfill methods.

Defects to be repaired shall include any sewer pipe defect which, in the opinion of the Engineer, or in the opinion of the manufacturer of the proposed sewer rehabilitation material or product, renders the sewer pipe unsuitable for the installation and serviceability of the proposed sewer rehabilitation material or product. Defects to be repaired shall also include any sewer main defect or irregularity which, in the opinion of the Engineer, does or may result in a localized deficiency in the hydraulic capacity of the sewer main, or in extraordinary sewer maintenance requirements.

Where point repair is required for a localized sewer pipe defect known prior to the preparation of the Plans, the approximate location and extent of the point repair is shown on the Plans. Whether or not point repairs are shown on the Plans, point repairs may also be required to remedy formerly unknown defects discovered during initial CCTV inspection conducted in advance of sewer rehabilitation efforts.

Should the Contractor determine during initial CCTV inspection that point repairs, in addition to those that may be shown on the Plans, are necessary or advisable, the Contractor shall prepare and submit written recommendations for point repair work to the Engineer as part of the submittal of initial CCTV inspection video discs. The Contractor's recommendations shall include the location and extent of the recommended additional point repair, and a detailed description of the means and methods the Contractor proposes to employ for point repair efforts. The Engineer will review the Contractor's recommendations and provide written direction as to the point repair work to be done, which may include some or all of the additional point repair work recommended by the Contractor, along with such other point repair work as the Engineer may deem necessary or advisable.

SECTION 7 SEWER SERVICE CLEANOUTS

This work shall consist of furnishing all materials and constructing sewer service cleanouts for existing sewer services, as shown on the Plans, in conformance with the provisions in the Specifications, and as directed by the Engineer. Sewer service cleanouts shall be constructed where existing sewer services are not fitted with existing cleanouts sufficient to support the Contractor's temporary handling of wastewater flows, in the opinion of the Engineer.

Where the need for sewer service cleanout construction is known prior to the preparation of the Plans, the approximate locations of the proposed sewer service cleanouts are shown on the Plans. Whether or not sewer service cleanout construction is shown on the Plans, sewer service cleanouts may also be required to remedy formerly unknown conditions where existing sewer service cleanouts are lacking, as may be discovered during the course of the Contractor's operations.

Should the Contractor determine that the construction of sewer service cleanouts, in addition to those that may be shown on the Plans, is necessary or advisable, the Contractor shall prepare and submit timely written recommendations for sewer service cleanout construction to the Engineer. The Contractor's recommendations shall include the locations of the recommended sewer service cleanout construction, and a detailed description of the means and methods the Contractor proposes to employ for sewer service cleanout construction. The Engineer will review the Contractor's recommendations and provide written direction as to the construction of sewer service cleanouts, which may include none, some or all of the sewer service cleanouts recommended by the Contractor, along with such other sewer service cleanouts as the Engineer may deem necessary or advisable. It is expected that the Engineer will require the construction of additional sewer service cleanouts to facilitate the handling of wastewater flows under the following conditions: a) neither the Plans nor the Contractor's temporary wastewater handling system plans provide for the construction of sewer service cleanouts where sewer service may not be interrupted, and there are no existing sewer service cleanouts or other features to facilitate the handling of wastewater flows, or b) the Contractor demonstrates an inability to comply with the provisions of Subsection 4.04, "Sewer Service Interruption," of the Technical Specifications, at locations where sewer service may be interrupted.

Sewer service cleanouts shall conform to the details shown on the Plans, and shall be constructed using Vac-A-Tee saddles, as manufactured by LMK Enterprises, Inc., www.lmkenterprises.com, or approved equal. They shall be installed in conformance with the manufacturer's recommendations, unless otherwise directed or approved by the Engineer in writing. PVC pipe for sewer service cleanouts shall conform to the provisions in Section 27, "Sewer and Storm Drain Pipe", of the Standard Specifications. Slurry cement backfill shall conform the provisions in Section 19-3.02E, "Slurry Cement Backfill," of the 2018 State Standard Specifications.

Sewer service cleanout construction shall be accomplished in such a manner as to result in the minimum practical extent of disruption to existing surfacing, landscaping and improvements, employing vacuum excavation or similar methods to minimize the size of required excavations. Should sewer cleanout construction necessitate operations conducted on private property, outside of the limits of existing rights-of-way and easements, the Contractor shall coordinate as necessary with affected property owners and tenants to secure prior written authorization for access to, and construction activities conducted on, such

private property, and the Contractor shall secure any and all appropriate building permits required by the local agency.

The Contractor shall repair, or replace in kind, all existing surfacing, landscaping and improvements damaged or destroyed by his operations, to the extent necessary to restore the facilities to a condition as good or better than that existing prior to construction.

Full compensation for sewer service cleanouts, including excavation and backfill, shall be considered as included in the contract lump sum prices paid for the temporary handling of wastewater flows bid item, and no separate payment will be made therefor.

SECTION 8 SEWER CLEANING AND DISPOSAL OF MATERIAL REMOVED FROM SEWERS

8.01 GENERAL

This work shall consist of sewer cleaning and disposal of material removed from sewers at a permitted landfill facility, as shown on the Plans, in conformance with the provisions in the Specifications, and as directed by the Engineer. If the Contractor so elects, this work shall include the optional establishment and operation of a temporary facility for containment, dewatering and air drying of material removed from sewers, transporting material to the temporary facility, spreading material at the temporary facility, removal and disposal of leachate, removal and disposal of dewatered and dried material, and removal of the temporary facility, as shown on the Plans, in conformance with the provisions in the Specifications, and as directed by the Engineer.

8.02 SEWER CLEANING

All internal debris, loose material and roots shall be removed from the existing sewer. The sewer shall be cleaned with high-velocity hydraulic (hydro-cleaning) equipment, supplemented with root cutters if necessary for root removal, in accordance with the applicable provisions of Greenbook 500-3. Sewer cleaning equipment and methods shall be approved by the Engineer prior to use.

All material resulting from cleaning operations shall be removed from the sewer at the downstream manhole of each reach cleaned. No such material shall be moved from sewer reach to sewer reach past a manhole, unless otherwise approved or directed by the Engineer.

The host pipe shall be cleaned immediately prior to CIPP liner installation for each continuous installation operation. No more than 24 hours may elapse between the completion of sewer cleaning operations and commencement of CIPP liner installation, unless otherwise approved or directed by the Engineer.

8.03 DISPOSAL OF MATERIAL REMOVED FROM SEWERS

All material resulting from sewer cleaning operations on a particular workday shall be removed from the site and disposed of on that same workday. The Contractor shall not allow such material to accumulate at the site of the work beyond a single workday, except in totally enclosed, leakproof containers, as may under special circumstances be approved in writing by the Engineer.

The Contractor shall transport material removed from sewers in vehicles or equipment which completely contain the material, to minimize objectionable odor and prevent dripping, spilling, scattering, leaking, blowing or any other loss of transported material. Should loss of transported material occur due to any cause, the Contractor shall retrieve the material and clean up any areas contaminated by it to the satisfaction of the Engineer or other authorities having jurisdiction. Transport vehicles shall not exceed maximum allowable load limits.

All material removed from sewers as a result of cleaning operations shall be removed from the site, and shall be transported to and legally disposed of at a landfill facility suitably permitted to receive such waste. The landfill facility, and the disposal of material removed from sewers, shall conform to all applicable federal and state rules and regulations. For landfill facilities in the State of California, particular reference is made to the requirements of the California Code of Regulations, Titles 22, 23 and 27. The Contractor shall research and obtain information on suitable landfill facilities, make all necessary contacts and arrangements

for disposal of the material, and pay all related fees and expenses. Information related to material disposal at landfill sites not owned by the City will not be provided by the Engineer or other City personnel.

Material removed from sewers shall not be disposed of at the Reedley Regional Wastewater Reclamation Facility. Material removed from sewers shall not be considered to be construction debris, and shall not be disposed of at a Class 3 landfill facility.

The Contractor shall retain a testing laboratory, which shall be approved by the Engineer, for the analysis of material removed from sewers. The approved testing laboratory shall conduct analyses of material removed from sewers, and shall develop a waste profile meeting the analytical requirements of the receiving landfill facility.

Except as hereinafter specified, material removed from sewers shall be disposed of at a Class 2 landfill facility in the State of California. If the waste profile is determined to be such that the material cannot be accepted for disposal at a Class 2 landfill facility, then the material shall be disposed of at an alternate landfill facility, approved by the Engineer, that is suitably permitted to receive the waste, whether in or out of the State of California. If the waste profile is such that the material can be accepted for disposal at a Class 1 landfill facility in the State of California, then the material may be so disposed of; however, fecal coliform limitations for Class 1 landfill facilities are generally prohibitive.

If the material must be disposed of at a landfill facility other than a Class 2 landfill facility in the State of California, the additional cost of such disposal, over and above the cost of disposal at a Class 2 landfill facility, will be paid for as extra work, in conformance with the provisions in Section 4.12, "Extra Work," of the Standard Specifications.

The material shall be sufficiently dewatered prior to weighing at the landfill as to be suitable for immediate disposal. The Contractor shall submit to the Engineer certified scale weigh tickets, including the name and location of the permitted facility used, to verify material disposal.

8.04 OPTIONAL TEMPORARY DEWATERING AND DRYING FACILITIES

If necessary or desirable to facilitate disposal of material removed from sewers, the Contractor may establish and operate a temporary facility for containment, dewatering and air drying of material removed from sewers, at a site designated by the Engineer at the Reedley Regional Wastewater Reclamation Facility (RWRF), 1701 W Huntsman Ave, Reedley, California. The temporary facility shall include provisions such as berms, an impermeable liner, a leachate collection and removal system (LCRS), vector and odor control, pumps and other items as necessary for the specified purposes. Signs shall be provided by the Contractor to clearly indicate the purpose and areal extent of the temporary facility. The temporary facility shall conform to the applicable requirements of the California Code of Regulations; particular reference is made to Title 27. The Contractor shall prepare, and submit to the Engineer for review, a plan showing the proposed temporary facility and describing its features and operation, and shall obtain the Engineer's approval of the plan. No sewer cleaning operations shall begin until the Engineer has approved the plan and the temporary facility is established and prepared to receive material removed from sewers.

The Contractor shall transport all material removed from sewers to the temporary containment, dewatering and air drying facility, and shall uniformly spread the material to drain and air dry. All resulting leachate shall be removed from the facility and discharged to the wastewater stream entering the RWRF at a location designated by the Engineer. The Contractor shall provide effective odor and vector control at all times during the operation of the temporary facility.

After the material removed from sewers has been sufficiently dewatered and dried, in the opinion of the Engineer, the Contractor shall remove the material from the temporary facility and dispose of the material at the landfill facility with which the Contractor has made arrangements for such disposal. Before the expiration of the contract time of completion, the Contractor shall remove and dispose of all remaining material from the temporary facility, shall remove the temporary facility, and shall restore the site to the condition existing prior to the Contractor's occupancy of the site.

The Contractor shall thoroughly coordinate operations conducted on RWRF grounds with the City of Reedley, Department of Public Utilities, Wastewater Management Division. The Engineer will provide contact information for a designated Wastewater Management Division representative, whom the Contractor shall contact as often as necessary to keep the division informed of the nature and schedule of the Contractor's operations.

SECTION 9 RECONSTRUCT MANHOLE

This work shall consist of removing the existing manhole cone, chimney, and frame and cover from existing manholes and furnishing all materials and installing a precast manhole barrel section, a precast manhole cone, constructing a new chimney, and installing a new manhole frame and cover, as shown on the Plans, in conformance with the provisions in the Specifications, and as directed by the Engineer. The manhole chimney is defined as the portion of the manhole from the top of the manhole cone to the bottom of the manhole frame.

Excavation and backfill shall conform to the provisions in Section 13, "Earthwork," of the Standard Specifications. Surface restoration shall conform to the provisions in Section 25, "Restoration of Surfaces," of the Standard Specifications.

Non-PVC-lined barrel sections and cone shall be installed, and then the chimney shall be constructed with new manhole adjustment rings in conformance with the provisions of Subsection 2.02D, "Manhole Adjustment Rings," of these Technical Specifications. New manhole frames and covers shall be furnished and installed in conformance with Standard Drawings S-4 and S-5, including the concrete collar as shown, to provide finished manholes matching the existing adjacent surface. The height of the barrel sections and cone to be installed shall be determined by the Contractor so that the height of the chimney of the finished manhole conforms to Standard Drawing S-4.

If the manhole to be reconstructed is shown on the Plans to be rehabilitated, then the manhole shall be rehabilitated after the reconstruction is complete.

SECTION 10 CLOSED CIRCUIT TELEVISION (CCTV) SEWER INSPECTION

10.01 GENERAL

This work shall consist of closed-circuit television (CCTV) sewer inspection, as shown on the Plans, in conformance with the provisions in the Specifications, and as directed by the Engineer.

All installed CIPP liner for sanitary sewer mains shall be inspected by closed circuit-television (CCTV) methods conforming to the provisions in Section 27.11, "Television Inspection of Interior of Installed Pipe," of the Standard Specifications as modified in these Technical Specifications. CCTV inspection data shall be provided to the Engineer in National Association of Sewer Service Companies (NASSCO) Pipeline Assessment and Certification Program (PACP) Standard Database format. The software used during data collection shall be PACP-certified, and proof of the certification shall be submitted to the Engineer for approval prior to the commencement of any CCTV work. The CCTV camera system shall employ a pan-and-tilt camera. CCTV inspections shall be recorded on digital versatile discs (DVDs), in a format compatible with City of Reedley DVD equipment. Audio and video content shall be of good quality, adequate in the opinion of the Engineer to evaluate sewer condition, determine the location of service and lateral connections, verify the successful completion of sewer cleaning operations, and verify the successful completion of sewer rehabilitation operations, as applicable.

The Contractor shall submit the following items to the Engineer for review and acceptance.

1. Labeling proposed for CCTV sewer inspection DVDs, submitted prior to the commencement of CCTV sewer inspection operations.
2. Original CCTV inspection reports and DVDs, immediately following successful completion of CCTV sewer inspection.

Unless otherwise directed or approved by the Engineer, CCTV sewer inspection shall be performed during the hours of 7:00 AM through 3:30 PM on normal City of Reedley work days. The Contractor shall notify the Engineer at least one full working day in advance of the date and time scheduled for commencement of CCTV sewer inspection. The Contractor shall begin CCTV sewer inspection at the scheduled date and time. If the Contractor is not prepared to begin, or does not begin, CCTV sewer inspection at the scheduled date and time, the Engineer may order that CCTV sewer inspection be rescheduled, in which case the Contractor shall reschedule CCTV inspection accordingly. CCTV sewer inspections shall meet the following requirements:

1. Sewer pipe shall be free of flowing water and debris during CCTV sewer inspection.
2. The camera shall have adequate light for review, be centered within the pipe, remain in focus, and have a lens that is free of debris.
3. Maximum camera speed shall not exceed 30 feet per minute.
4. The camera operator shall stop to inspect all laterals (house branches).
5. All video inspections shall be referenced by City of Reedley manhole numbers (e.g. MH 163 to MH 150).
6. There shall be a fixed target mounted in front of the camera with a height of 2% of the pipe diameter that shall run along the pipe invert and be visible at all times.
7. If a flow-through plug is used to discharge bypassed wastewater into the sewer system during CCTV inspections, the plug shall be placed at least one manhole downstream from the reach being inspected. A flow-through plug shall not be placed in the manhole directly downstream of the reach being inspected.

If any of the preceding criteria are not met during final CCTV inspection, the City will direct the Contractor to stop the CCTV inspection, and not restart it until all requirements are met. Submittal of a CCTV inspection that does not meet the above requirements will result in rejection of the CCTV inspection, and will require re-inspection at the Contractor's expense.

All post-inversion and final CCTV inspection reports shall be submitted to the City for review within 24 hours from the completion of the CCTV inspections. The City will review the CCTV inspection reports, and provide comments back to the Contractor within 3 working days from receipt of the CCTV inspection reports. The Contractor shall maintain the bypass system in operable condition during the review period.

10.02 INITIAL CCTV SEWER INSPECTION IN ADVANCE OF SEWER REHABILITATION

The Contractor shall conduct initial CCTV sewer inspection in advance of sewer rehabilitation. Prior to the date and time scheduled for initial CCTV sewer inspection, the Contractor shall complete implementation of temporary wastewater bypass pumping or diversion systems, sewer cleaning, necessary point repairs, trimming of protruding laterals, and any other pre-rehabilitation work, and shall perform inspections as necessary to verify the successful completion of pre-rehabilitation work. The Contractor shall submit original initial CCTV sewer inspection DVDs to the Engineer.

If during the course of initial CCTV sewer inspection, or during subsequent viewing of inspection records, it is observed that pre-rehabilitation work is not complete, in the opinion of the Engineer, the Engineer may immediately reject initial CCTV sewer inspection. In that event, the Contractor shall forthwith complete pre-rehabilitation work, and shall reschedule initial CCTV sewer inspection for a subsequent date and time.

10.03 FINAL CCTV SEWER INSPECTION FOLLOWING SEWER REHABILITATION

The Contractor shall conduct final CCTV sewer inspection following sewer rehabilitation. Prior to the date and time scheduled for final CCTV sewer inspection following sewer rehabilitation operations, the Contractor shall complete sewer rehabilitation and service connection reinstatement. A City representative must be on site during the final CCTV inspection.

If during the course of a final CCTV sewer inspection, or during subsequent viewing of inspection records, it is observed that sewer rehabilitation and service connection reinstatement work is not complete, in the opinion of the Engineer, the Engineer may immediately reject final CCTV sewer inspection. In that event, the Contractor shall forthwith complete sewer rehabilitation and service connection reinstatement work, and shall reschedule final CCTV sewer inspection for a subsequent date and time.

If repairs are required or the installed CIPP liner is rejected by the City, the bypass system shall be reinstalled, if necessary, at no additional cost to the City, and the Contractor shall perform final CCTV sewer inspection again. All of the requirements of Subsection 10.01 of these Technical Specifications shall be met during any and all subsequent inspections.

SECTION 11 JUNCTION STRUCTURE REHABILITATION

This work shall consist of the rehabilitation of the existing junction structure, as shown on the Plans, in conformance with the provisions in the Specifications, and as directed by the Engineer.

Unless otherwise directed or approved by the Engineer, junction structure rehabilitation shall consist of surface preparation, the application of a manhole coating to the entire inside surface of the junction structure, including the concrete manhole adjustment rings, and field quality control and testing. Junction structure rehabilitation shall conform to the applicable provisions in Section 12, "Manhole Rehabilitation," of these Technical Specifications. The detail on the Plans is based on design drawings for the existing junction structure, and may not match actual field conditions.

SECTION 12 MANHOLE REHABILITATION

12.01 GENERAL

This work shall consist of the rehabilitation of existing manholes, as shown on the Plans, in conformance with the provisions in the Specifications, and as directed by the Engineer.

Unless otherwise directed or approved by the Engineer, manhole rehabilitation shall consist of the following:

1. Removal of any existing steps
2. Cleaning and surface preparation
3. Application of a manhole coating
4. Field quality control and testing

12.02 STEP REMOVAL

Any and all steps in existing manholes to be rehabilitated shall be removed by one of the following methods:

1. The step may be pulled from the manhole wall. The void in the manhole wall resulting from the removal of the step shall be filled with a mortar or an epoxy filler compound.
2. A portion of the wall surface sufficient to free the step may be removed. The void in the manhole wall shall be filled with a mortar or an epoxy filler compound.
3. The step shall be neatly cut flush with the manhole wall. When the manhole is fully prepared and ready for the manhole coating, any portion of the step that remains embedded in the concrete shall not protrude above the surface of the concrete.

The mortar or epoxy filler compound shall be compatible with and approved by the manufacturer of the manhole coating that is to be applied. The Contractor shall submit documentation from the manhole coating manufacturer verifying that the mortar or the epoxy filler compound is compatible with manhole coating.

12.03 CLEANING AND SURFACE PREPARATION

Cleaning and preparation of interior manhole surfaces shall conform in all respects to the manhole coating manufacturer's recommendations. The cleaning methods or combination of methods, which shall include pressure washing, shall be chosen by the Contractor to remove oils, grease, incompatible existing coatings,

waxes, or other contaminants. The cleaning and surface preparation shall be performed in a manner that provides a uniform, sound, clean, neutralized surface suitable for manhole coating.

Debris from the cleaning and surface preparation shall be removed from the manhole, and shall not be allowed to fall into flowing wastewater. Means such as the construction of a false bottom, or other means approved by the Engineer, shall be used. Debris shall be disposed of as specified in Subsection 8.03, "Disposal of Material Removed from Sewers," of these Technical Specifications.

Any voids and depressions in the manhole wall shall be filled with a mortar or epoxy filler compound compatible with and approved by the manufacturer of the manhole coating that is to be applied. The Contractor shall submit documentation from the manhole coating manufacturer verifying that the mortar or the epoxy filler compound is compatible with manhole coating.

12.04 MANHOLE COATING

A. MATERIALS

1. Epoxy

Epoxy coating shall be an ultra-high-build, 100% solids epoxy coating specifically formulated and intended for such use and approved by the Engineer. Epoxy coating shall be Raven 400 or Raven 405, products of RLS Solutions, Inc., www.rlssolutions.com; Neopoxy 5300 Series, products of Neopoxy International, www.neopoxy.com; or Quadex Structure Guard, a product of Quadex, Inc., www.quadexonline.com; no substitutions accepted. Cured and finished epoxy coating shall meet the chemical resistance requirements of Greenbook 211-2. Prior to application of the epoxy coating, a water-borne, low viscosity penetrating primer/sealer compatible with the approved epoxy coating shall be applied, if recommended by the epoxy manufacturer.

2. Rigid Polyurethane

Rigid polyurethane shall be a 100% solids, volatile organic compounds (VOC) free polyurethane coating. The polyurethane shall provide structural enhancement to the manholes to which it is applied, and shall have an initial flexural modulus of at least 700,000 psi when tested in conformance with ASTM D790 (Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials), and a maximum elongation of 4% at breakage when tested in conformance with ASTM D638 (Standard Test Method for Tensile Properties of Plastics). Cured and finished rigid polyurethane coating shall meet the chemical resistance requirements of Greenbook 211-2.

B. APPLICATION

After the interior surfaces of the manhole have been adequately prepared, the manhole coating shall be applied by spraying, and shall have a minimum thickness of 125 mils. The coating shall cover the manhole flow channel (if not CIPP-lined), the bench, the barrel, the cone, and the concrete grade rings. The manhole coating shall overlap a minimum of 6 inches onto any PVC or CIPP liner that may exist in any pipes that enter the manhole.

A key shall be cut near the top of the topmost grade ring as shown on the Plans, and the manhole coating shall be sprayed up to and into the key, but it shall not overlap onto the manhole frame. The key that was cut shall then be filled with Sika 1A, or an approved equal, to seal the space between the concrete grade rings and the manhole frame to prevent the intrusion of corrosive liquids.

12.05 FIELD QUALITY CONTROL AND TESTING

A. GENERAL

All costs associated with the following tests, including repeat tests as required, and all costs associated with related removal and replacement of manhole coating, shall be borne by the Contractor.

B. MANHOLE COATING FILM THICKNESS

After application of the manhole coating, the thickness of the applied coating shall be measured in conformance with ASTM D4414 (Standard Practice for Measurement of Wet Film Thickness by Notch Gages). A gage appropriate to measure the specified thickness shall be used, and a minimum of three measurements are required per manhole. Measurements shall be reported to the Engineer in conformance with ASTM D4414.

C. MANHOLE COATING ADHESION TESTING

The Engineer will perform acceptance testing of all rehabilitated manholes. After all project manholes have been coated and are ready for adhesion testing in the opinion of the Contractor, the Contractor shall notify the Engineer at least 4 working days in advance that the work is ready for acceptance testing.

The Engineer, through a third party testing firm or by its own forces, will test the installed manhole coatings for adequate adhesion to the concrete substrate. The test will be performed in-place and in conformance with ASTM D7234 (Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers), using a loading fixture with a diameter of 20 mm. 25% of all rehabilitated manholes will be tested, rounded up to the nearest whole number of manholes, and the Engineer will select the particular manhole(s) to be tested. Each manhole to be tested will be tested in a minimum of two locations: one in the cone, and one in the barrel. The pull test shall meet or exceed 200 psi, and shall include substrate (concrete) attached to the back of the plug of removed material, and there shall be no visual signs of coating in the test hole. A pull test with results between 150 and 200 psi may be acceptable if more than 50% of the substrate in the test area is adhered to the dolly, at the discretion of the Engineer. If a test fails, then an additional test will be performed in the vicinity of the failed test. If the retest fails, then the Contractor shall remove and replace any and all loosely adhered or unadhered liner as directed by the Engineer.

The Contractor shall assist in adhesion testing by providing the necessary tools, equipment, labor, adequate ventilation, ladders for access, and barricades or other traffic control devices to allow the Engineer and/or its third party testing firm safe access to the work. The Contractor shall likewise provide all tools, equipment, materials, and labor necessary to comply with confined space entry requirements, and shall be responsible for opening and closing entrances and exits.

Adhesion testing is a destructive test, and after testing, the Contractor shall repair the test area. Repairs shall be made by abrading the surface of the adjacent manhole coating for a distance of a minimum of 1 inch around the test hole, thoroughly cleaning the surface, and hand applying manhole coating material to fill the test hole and overlap onto the adjacent manhole coating. The thickness of the manhole coating applied at the repair shall be at least as thick as the thickness of the adjacent manhole coating. Repairs shall conform to the manhole coating manufacturer's recommendations.

The cost of the initial tests in each of the tested manholes will be paid for by the City, except the Contractor shall pay for all labor and equipment to allow safe access for testing as specified. The costs of subsequent required tests shall be paid for by the Contractor.

D. MANHOLE COATING SPARK TESTING

All surfaces that are covered with a manhole coating shall be tested for holidays with high-voltage holiday detection equipment. The test shall be performed as described in NACE SP0188-2006 [Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates]. Any detected holidays shall be repaired in conformance with the manhole coating manufacturer's recommendations.

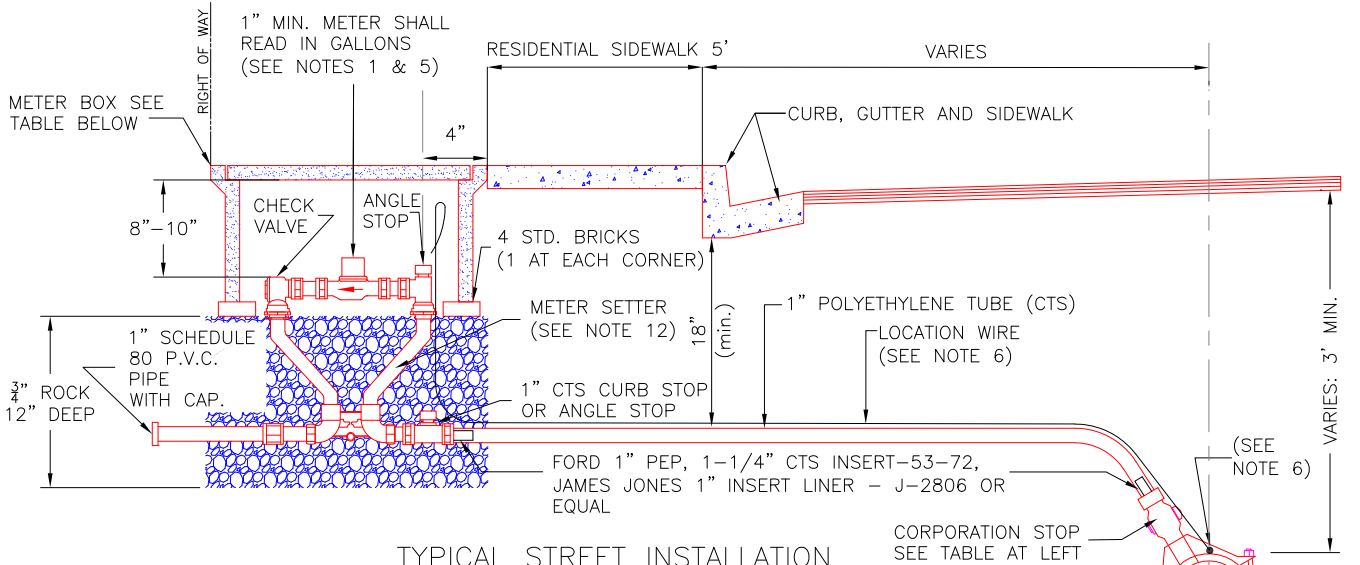
E. VISUAL INSPECTION

The Engineer will inspect the finished manhole, and the Contractor shall repair any deficiencies noted to the satisfaction of the Engineer. The Engineer may require photographs of portions of the manhole or the entire manhole, and the Contractor shall provide the photographs to the Engineer at no cost to the City.

12.06 PAYMENT

Full compensation for coating of manhole benches and flow channels, including surface preparation and application, shall be considered as included in the contract unit prices paid per linear foot for the Cured-In-Place Pipe bid item(s), and no separate payment will be made therefor.

Full compensation for coating of manhole barrel and cone sections and concrete manhole adjustment rings, including surface preparation and application, shall be considered as included in the contract unit price paid for the manhole rehabilitation bid item, and no separate payment will be made therefor.



TYPICAL STREET INSTALLATION

NON-TRAFFIC AREAS

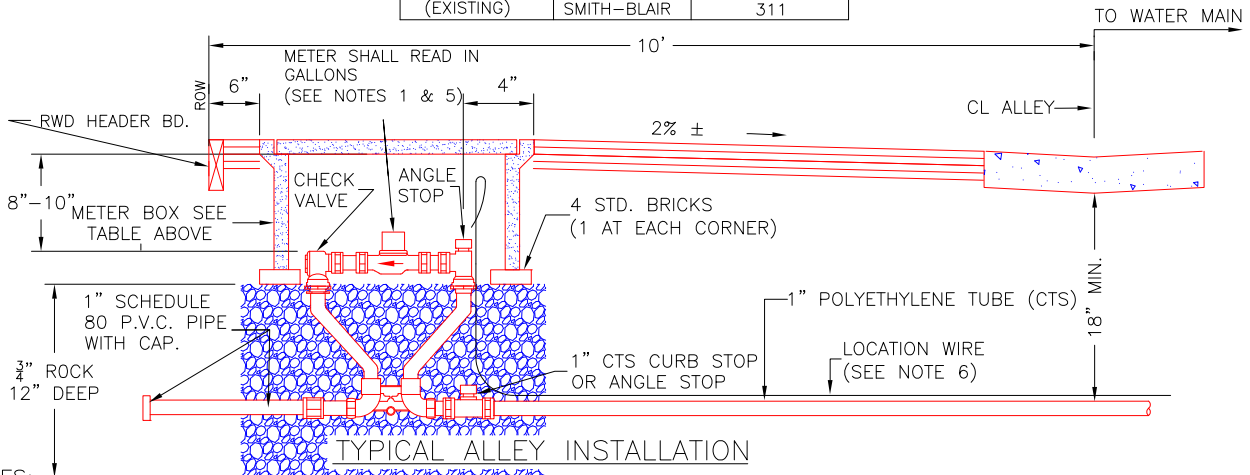
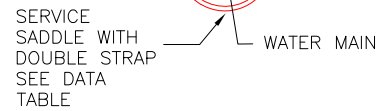
MANUFACTURER	METER BOX	LID
CHRISTY	B 16 D	D30

MANUFACTURER	CURB STOP	CORP. STOP
JONES	J - 1927W	J - 3403

TRAFFIC AREAS AND DRIVEWAYS
(SEE NOTE 11)

MANUFACTURER	METER BOX	LID
CHRISTY	B 16 C	C30

WATER MAIN	MANUFACTURER	SERVICE SADDLE
ASTM C900 PVC PIPE	ROMAX	1015
	SMITH-BLAIR	315
AC PIPE (EXISTING)	JONES	J-996R w/ I.P. THREADS
	SMITH-BLAIR	J - 940



TYPICAL ALLEY INSTALLATION

NOTES:

- METERS SHALL BE PURCHASED FROM THE CITY OF REEDLEY BUILDING DEPARTMENT AND INSTALLED BY THE CONTRACTOR.
- VALVE BOXES SHALL BE BROUGHT TO FINISH GRADE PRIOR TO ACCEPTANCE OF WORK.
- THE INSIDE OF THE VALVE BOXES SHALL BE CLEANED SUCH THAT THE METER AND METER STOPS ARE ACCESSIBLE AND OPERATIONAL PRIOR TO THE ACCEPTANCE OF THE WORK. DIRT & DEBRIS SHALL BE REMOVED 2" BELOW WATER METER.
- TRADE NAMES ARE SPECIFIED AS A STANDARD OF ACCEPTABLE QUALITY. EQUIPMENT OF EQUAL QUALITY MAY BE USED AFTER APPROVAL BY THE CITY ENGINEER.
- NO GALVANIZED PIPE FITTINGS ARE TO BE USED IN METER ASSEMBLY INSTALLATION.
- SINGLE STRAND 14 GAUGE COPPER WIRE TO BE LAID ALONG TOP OF NON-METALLIC PIPE AND HELD IN PLACE AT 5 FT. INTERVALS BY DUCT OR PLUMBERS TAPE AND CONNECTED TO ALL VALVES AND FITTINGS.
- IN A RESIDENTIAL SUBDIVISION THE WATER SERVICE ASSEMBLY SHALL BE LOCATED AT THE CENTER OF THE LOT.
- NO PLUMBING PUTTY ALLOWED ON ANY FITTING.
- TOP OF METER MUST BE 8"-10" BELOW BOTTOM OF METER BOX LID.
- THE CITY'S RESPONSIBILITY FOR A WATER SERVICE ENDS AT THE WATER METER COUPLING. THE CITY IS NOT RESPONSIBLE FOR THE CUSTOMER SHUT-OFF VALVE, OTHER VALVES OR PIPING LOCATED ON THE CUSTOMER'S SIDE OF THE METER.
- METER BOXES LOCATED IN THE DRIVEWAY MUST FIRST BE APPROVED BY THE CITY ENGINEER.
- 1" METER SETTER WITH FULL PORTED BALL TYPE METER STOP. 12" FORD 40 SERIES RESETTER VBH44-12W-NL OR APPROVED EQUAL.
- ALL METALLIC PIPES AND FITTINGS SHALL BE ENCASED WITH 8 MIL POLYETHYLENE TAPE SO THAT NO SOIL IS IN CONTACT WITH THE PIPES OR FITTINGS.



SCALE:
NOT TO SCALE

REVISED:
AUG. 2020

REF. STD. DWG.:
N/A

ONE INCH WATER SERVICE
& ASSEMBLY

CITY OF REEDLEY

W-4