



GS-23001

General Supplemental Specifications for Highway and Bridge Construction

**Effective Date
October 17, 2023**

THE STANDARD SPECIFICATIONS, SERIES 2023, ARE AMENDED BY THE FOLLOWING MODIFICATIONS, ADDITIONS, AND DELETIONS. THESE ARE GENERAL SUPPLEMENTAL SPECIFICATIONS AND SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

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Division 11. General Requirements and Covenants.

Section 1102

1102.19, E, 5, a, Placement of EEO/AA Notices and Posters.

Replace the Article:

The Contractor shall place the following notices and posters on a bulletin board at the project site in areas readily accessible to employees and potential employees.

- 1) Notice provided by the Iowa DOT listing the names, addresses, and phone numbers of the Contractor and all approved subcontractors.
- 2) EEOC P/E-1 Publication OFCCP 1420, stating "Equal Employment Opportunity is THE LAW". Know Your Rights: Workplace Discrimination is Illegal.
- 3) Mandatory Supplement to EEOC P/E-1 "EEO is the Law" Mandatory Poster Supplement. Conozca sus Derechos: La Discriminacion en el Lugar de Trabajo es Ilegal (Know Your Rights Spanish language version).
- 4) Form FHWA-1022, regarding any false statement, false representation, false report, or false claim made in connection with any Federal or Federal-aid highway or related project.
- 5) Form WH-1321, Employee Rights Under the Davis-Bacon Act, required only if Davis/Bacon predetermined wage rates apply to the project.
- 6) All wage rate decisions required by the contract. The wage rate decision shall be arranged on a bulletin board so that all wage rate and classification information is visible.
- 7) Form 70-8025 Job Safety and Health.
- 8) WH-1420 Your Rights Under the FMLA Act of 1993.
- 9) WH-1462 Notice: Employee Polygraph Protection Act.
- 10) Pay Transparency Nondiscrimination Provision.
- 11) USERRA Poster, "Your Rights Under USERRA".
- 12) WH-1321 SPA (Spanish language version of Form WH-1321) stating "DERECHOS DEL EMPLEADO BAJO LA LEY DAVIS-BACON" recommended only if Davis/Bacon predetermined wage rates apply to the project.*
- 13) Form EEOC P/S-1 (Spanish version of form EEOC P/E-1), stating "La Igualdad de Oportunidades De Empleo Es LA LEY".*

* ~~These forms are~~ This form is not required, but it is strongly recommended that ~~these two~~ this Spanish language notices be posted whenever the company employs and/or anticipates receiving applications from those who speak Spanish.

Division 21. Earthwork, Subgrades, and Subbases.

Section 2116

2116.02, C, 1, Mineral Stabilizing Agents.

Replace the Article:

Portland cement meeting ASTM C 150, Type I or Type II.

Division 22. Base Courses.

Section 2213

2213.03, C, Removal of Curb.

Replace the Article:

1. When specified in the contract documents or directed by the Engineer, ~~remove integral curb by methods which will not damage the concrete that is to remain~~ remove curb according to Section 2514.
2. ~~Remove curb by grinding (or other methods approved by the Engineer) to provide complete removal of curb extending above the pavement surface and a safe and smooth surface to accommodate traffic. Other curb removal methods may include sawing and breaking, or chipping. If removal is done by sawing~~

and breaking, complete the work as shown in the contract documents and as follows:

- a. ~~Make a vertical saw cut along the edge of the curb nearest the center line of pavement.~~
- b. ~~At the end of the curb section, extend the saw cut to the extreme end of the curb.~~
- c. ~~At this point, make a saw cut at a right angle extending to the pavement edge.~~
- d. ~~Where flumes occur in curb sections, extend the saw cut across the throat of the flume.~~
- e. ~~On resurfaced pavement, locate the saw cut 7 1/2 inches from the pavement edge. Cut to a depth of 3 inches below the surface of the resurfacing.~~
- f. ~~Immediately before breaking the curb, clean the sawed groove and ensure it is free of dirt, stones, or foreign matter to a depth of at least 1 inch below the pavement surface.~~
- g. ~~Remove concrete (including resurfacing concrete and concrete across the throats of flumes) to comply with the dimensions shown. Cut off loosened and exposed reinforcement.~~

3. ~~Clean up broken concrete according to Article 1104.08. This broken concrete becomes the property of the Contractor.~~

2213.04, Method of Measurement.

Replace the Article:

A. Removal of Curb.

~~Stations to the nearest foot shown in the contract documents~~ According to Article 2514.04, A.

B. Removal of Flumes.

~~Shown in the contract documents~~ According to Article 2514.04, B.

2213.05, Basis of Payment

Replace the Article:

A. Removal of Curb.

~~Per station~~ According to Article 2514.05, A.

B. Removal of Flumes.

~~Per unit~~ According to Article 2514.05, B.

Division 23. Surface Courses.

Section 2301

2301.02, B, 6, Use of Supplementary Cementitious Materials.

Replace the third sentence:

The total mineral admixture substitution rate shall not exceed ~~40~~ 50%.

Section 2303

2303.02, E, 1, Tack Coat.

Add to the end of the Article:

The cement mixing test will be waived for tack coat emulsions.

2303.02, E, 2, a, 1, Anti-strip Agent.

Replace the Article:

Mixtures for Interstate and Primary highways designed for Very High Traffic (VT), ~~and~~ or

2303.03, D, 6, b, 1, d, 2.

Replace the first sentence:

For all other areas of Class I compaction, determine PWL as defined in Materials I.M. 501. The PWL limits shall be between 91.5% of G_{mm} (8.5% voids) and ~~96.5%~~ 100% of G_{mm} (~~3.5%~~ 0% voids).

2303.05, A, 3, a, 1.

Replace the Article:

Payment when PWL is used for acceptance:

PWL	Pay Factor
100.0	1.060
95.1 - 100.0 90.1 - 99.9	0.006000*PWL + 0.430 0.4600
80.0 - 95.0 90.0	1.000
50.0 - 79.9 89.9	0.008333*PWL + 0.3333 0.00625*PWL + 0.4375
Less than 50.0	0.750 maximum

2303.05, A, 3, b, 1.

Replace the Article:

Payment when PWL is used for acceptance:

PWL	Pay Factor
100.0	1.060
95.1 - 100.0 90.1 - 99.9	0.008000*PWL + 0.240 0.00600*PWL + 0.4600
80.0 - 95.0 90.0	1.000
50.0 - 79.9 89.9	0.008333*PWL + 0.3333 0.00625*PWL + 0.4375
Less than 50.0	0.750 maximum

Division 24. Structures.

Section 2416

2416.03, D, 5, c.

Replace the Article:

For pipe with an internal diameter of more than 24 inches, ensure maximum joint openings on the outside or inside of the bottom half of the pipe do not exceed ~~1/8~~ 1/2 inch per foot of internal diameter, with a maximum allowable joint opening of 5/8 inch.

Section 2433

2433.02, B, 8.

Replace the Article:

Limit total mineral admixture substitution rate to 40%. Between October 15 and March 15, do not substitute GGBFS with Type I or Type II IL cement; or fly ash with Type IP, or IS, or IT cement. Refer to Table 2433.02-3 for the maximum allowable substitution rates:

Table 2433.02-3: Maximum Allowable Substitution Rates.

Cement Type	Maximum Allowable Substitution ^(a)	Time Period
Type I, II, IL	35% GGBFS 20% Fly Ash	March 16 through October 15
Type IS, IP, IT	0% GGBFS 20% Fly Ash	March 16 through October 15
All	0% GGBFS 0% Fly Ash	October 16 through March 15
^(a) Maximum total mineral admixture substitution is 50%.		

Division 25. Miscellaneous Construction.**Section 2503****2503.03, D, 2, c.**

Replace the Article:

Place pipe such that joint openings on the outside or inside of the pipe do not exceed ~~1/8~~ 1/2 inch ~~at the bottom and 5/8 inch at the top.~~

Section 2505**2505.03, D, 1, c.**

Replace the first sentence:

When a roadway is open to traffic during construction, complete guardrail installations ~~(including removal and replacement)~~ within 5 working days from the day the structure, barrier rail, pavement, or shoulder (whichever is the controlling item of work) is sufficiently completed to allow guardrail installation.

Section 2514**2514.04, Method of Measurement.**

Replace the Article:

A. Removal of Curb.

~~According to Article 2213.04, A~~ Stations to the nearest foot shown in the contract documents.

B. Removal of Flumes.

~~According to Article 2213.04, B~~ Shown in the contract documents.

2514.05, Basis of Payment.

Replace the Article:

A. Removal of Curb.

~~According to Article 2213.05, A~~ Per Station.

B. Removal of Flumes.

~~According to Article 2213.05, B~~ Per unit.

Section 2528**2528.03, F, 2, Remote Communications.**

Replace the Article:

When using an Arrow Board for stationary work zones on Interstate or Primary roadways, remote communication capabilities meeting requirements of Article ~~4188.10, F~~ 4188.11 are required.

2528.03, G, 2, a, Trailer, Span Wire, or Flagger Station Mounted Systems.

Replace the title:

~~Trailer, Portable or Span Wire, or Flagger Station Mounted Systems.~~

2528.03, G, 2, b, Trailer Mounted Systems.

Replace the title and Article:

~~Trailer Mounted Systems~~ **Portable Traffic Signals.**

1) Provide a system consisting of two or more self-contained trailer or pedestal mounted units ~~each containing two signal heads.~~ Two signal heads shall be visible for each approach.

a) Trailer systems shall have one signal head mounted on a mast capable of extending over the center of the travel lane and the other signal head mounted on the same trailer.

- b) Pedestal systems shall have a signal head mounted on each side of the roadway. Pedestal systems may only be used up to 3 continuous days.
- 2) When using portable traffic signals for stationary work zones on Primary roadways for contracts let in October 2024 or later, remote communication capabilities meeting requirements of Article 4188.11 are required.

2528.03, G, 2, d, Flagger Station Systems.

Delete the Article:

~~d. Flagger Station Systems.~~

~~Provide a traffic signal system, for one-lane/two-way operation in conjunction with a flagger and/or pilot car operation in order to provide greater advance visibility to the flagging operations.~~

- ~~• Two or more self-contained trailer mounted units each consisting of one or two signal heads.~~
- ~~• Single signal head systems shall have a signal head mounted on each side of the roadway.~~
- ~~• Two signal head systems shall have one signal head mounted on a mast arm capable of extending over the center of the travel lane and the other signal head mounted on the same trailer.~~

2528.03, O, 9.

Replace the first bullet:

Orange with black lettering using Type VIII (lowe) sheeting.

Section 2529

2529.03, G, 3.

Replace the Article:

After the concrete has been finished and surface water has disappeared, cure the concrete. Place curing materials no later than 20 minutes after completing finishing operations. Cure concrete by completely covering it with an insulating blanket-type cover consisting of a layer of closed cell polystyrene foam protected by at least one layer of plastic film, rated by the manufacturer with a minimum R-value of 0.5. Cover the blanket-type cover completely with insulation board having the following properties: cellulosic fiber sheathing with a minimum nominal 3/4 inch thickness. The board may be wrapped with plastic film to protect it from rain. ~~Two~~ An insulating blankets with a minimum R-value of ~~0.5~~ 3.0 may be substituted for the blanket and the insulation board. Place the board or blankets over the patch and adjacent surface and hold it tightly in place with weights to retain all possible heat in the concrete. If the ambient temperature is 75°F or greater for at least half of the cure period, patches may be cured with two coats of white pigmented curing compound in accordance with Article 2301.03, K, 2. Apply second coat when first coat is dry or within 30 minutes.

Section 2549

2549, Pipe and Manhole Rehabilitation.

Replace the title and the Section:

Section 2549. Pipe, Culvert, and Manhole Rehabilitation

2549.01 DESCRIPTION.

This section was developed in conjunction with Sections 4050 and 6020 of the SUDAS Standard Specifications, with modifications to suit the needs of the Department.

A. Cured-in-place Pipe (CIPP) Lining:

1. ~~Mainline~~ Sewer Main or Culvert.
2. Service (Lateral) Repair.
3. Point Repair.

B. Pressure Testing and Grouting of Sewer Joints.

- C. **Pipe Sewer pipe** spot repairs.
- D. Pre-rehabilitation cleaning and inspection is light **sewer** cleaning including an unlimited number of passes with a hydraulic flusher. Does not include root cutting or removal of deposits or protruding service connections.
- E. Additional **sewer** cleaning is heavy **sewer** cleaning including an unlimited number of passes with high velocity hydro cleaning equipment / hydraulic spinner nozzle, cutting roots, removing deposits of attached encrustation (DAE), and removing deposits of attached grease (DAGS). Does not include lateral cuts.
- F. Rehabilitate existing manholes to waterproof and to prevent inflow and infiltration, to prevent corrosion, or to reestablish the structural integrity of the manhole. Includes construction of structural liners, protective liners, and infiltration barriers.

2549.02 MATERIALS.

A. **Pipe and Culvert Rehabilitation.**

1. Apply Article 4147.01.
2. **Submittals.**
 - a. **CIPP Rehabilitation.**
 - 1) **Thickness Design:** Submit design calculations for CIPP wall thickness based upon ASTM F 1216, prepared and signed by a licensed Professional Engineer in the State of Iowa.
 - 2) **Resin:** Certificate of compliance with ASTM F 1216 or D 5813.
 - 3) **Tube:** Certificate of compliance with ASTM F 1216 or F 2019. If glass fiber reinforcement is used, CIPP strain corrosion testing according to ASTM D 3681.
 - 4) **Wet Out and Curing:** Complete description of the manufacturer's recommended wet out procedure and curing method for the type of lining proposed.
 - 5) **Safety Procedures:** Submit documentation of National Institute of Occupational Safety and Health (NIOSH) testing, health hazard evaluation, and recommended safety procedures for CIPP workers and public. The safety plan is to include emission stacks a minimum of 6 feet tall and a method to establish a safe perimeter around manholes/emission stacks a minimum of 15 feet in diameter. Based on active air monitoring, workers must wear suitable Personal Protection Equipment (PPE) when initially opening and entering the transport truck or storage unit holding the liner.
 - b. **Grouting Sewer Joints and Service Connections (For Sewer Pipe Only).**
 - 1) **Grout:** Description of chemical grout materials to be used.
 - 2) **Additives:** Description of additives to be used including strengthening agents, shrinkage reducers, dye, viscosity modifiers, gel time modifier, freeze/thaw inhibitor, or others.
 - 3) **Root Inhibitor:** Description of chemical root deterrent.
 - 4) **Procedures:** Manufacturer's published recommendations for storing, mixing, testing, and handling chemical grouts.
 - c. **Installer Information:** When requested by the Contracting Authority, submit the following prior to the preconstruction meeting.
 - 1) Installer name.
 - 2) Completed project list for last 5 years including for each project and year completed, client name/address/contact person/phone number, footages installed by pipe diameter, and number of lateral reinstatements.
 - 3) Detailed installation procedures, including estimated times for each task, lateral reinstatement methods, number of required excavations, and other items unique to each product.
 - 4) Video of installation process, if available.
 - 5) Evidence of properly trained personnel.
 - 6) Related ASTM standards or any nationally recognized standards for product installation.
 - 7) Available equipment list.
 - 8) Detailed procedures for repairing the product in the event of future damage or failure and for tapping future service connections, including and required specialized equipment or training.
 - 9) Videos of two rehabilitated sewer sections showing before and after conditions.
 - d. Additional information may be required. The submittal of prequalification information in no way implies that the product, manufacturer, or installer will be deemed to be qualified. The Contracting Authority,

in its sole discretion, will determine whether a product, manufacturer, or installer does or does not qualify as an approved equal.

3. The Engineer may allow substitutions. Provide as a minimum the following information for evaluation:
 - a. **Product Information.**
 - 1) Product name.
 - 2) Year product first available in the United States.
 - 3) Total footage or number of line segments installed in the United States.
 - 4) Results of all available product testing, including but not limited to leakage, physical properties, pipe stiffness, chemical resistance, strain-corrosion, external loading, flow characteristics, infiltration/inflow reductions, structural capacity, and external hydrostatic loading capacity.
 - 5) Samples of before and after product.
 - 6) Design method.
 - 7) Typical lining thickness for pipe sizes included in the project.
 - b. **Manufacturer Information.**
 - 1) Manufacturer name.
 - 2) Years of experience manufacturing the product.
 - 3) Country of manufacture of all product components.
 - 4) Quality control procedures for product manufacture, including inspection requirements, testing procedures, and allowable tolerance levels.
 - 5) Related ASTM standards, or other nationally recognized standards for product manufacturing.

B. Manhole Rehabilitation.

Apply Article 4147.02

2549.03 CONSTRUCTION.

A. Pipe and Culvert Rehabilitation.

1. Public Relations Program (For Sanitary Sewer Only).

Establish a Public Information and Notification Program for contacting each home or business connected to the affected sanitary sewer, informing them of the work to be done and when the sewer will be off line. The following specific steps are part of the Public Information and Notification Program:

- a. Provide written notice to be delivered to each affected home or business describing work, schedule, how the work affects them, and a local telephone number of the Contractor they can call to discuss the project or their problems.
- b. Personally contact each home or business on the day lateral verifications using closed circuit video inspection are to be performed. The homeowner or business will be asked to run water down their drain to verify each lateral. If the homeowner is unavailable, attempt other arrangements (cleanouts) to drain water through the lateral to verify each connection.
- c. Provide written notice and personally contact the home or business the day prior to beginning inversion of the section of sewer to which they are connected.
- d. Personally contact all homes or businesses that cannot be reconnected within the time stated in the written notice.
- e. Furnish and service portable toilets for use by the home or business occupants if so required by any affected served business or homeowner.

2. Special Requirements.

- a. Prior to start of work, notify all affected parties 24 hours in advance as to the length of time their sanitary sewer service will be blocked.
- b. Unless specified otherwise, the Contracting Authority will provide water at no cost for cleaning and installation of cured-in-place sewer pipe lining. Utilize an approved double check backflow assembly or open gap.
- c. Water for cleaning and installation of cured-in-place culvert pipe lining will be the responsibility of the Contractor.

3. Sewer Cleaning and Inspection for Rehabilitation.

a. General.

- 1) Provide equipment specifically designed and constructed for sewer pipe cleaning and inspection or otherwise approved by the Engineer.

- 2) Use sewer pipe cleaning equipment manufacturer's recommended size tools for various pipe sizes.
 - 3) Utilize equipment recommended by the manufacturer to protect the manhole and pipe during cleaning and inspection operations.
 - 4) Perform all cleaning and removal operations under CCTV observation to monitor the progress of the work and to monitor the sewer pipe line for damage. Continue until the condition of the host pipe meets the requirements of the liner manufacturer.
 - 5) Flush all debris to downstream manhole or end of culvert. Screen, collect, and remove debris from sewer pipe.
 - 6) Dispose of all sanitary sewer debris and material at a location directed by the Contracting Authority. If specified in the contract documents, pay for all disposal fees.
- b. Pre-Cleaning Inspection.**
- 1) Complete CCTV inspection of sewer prior to initiating cleaning.
 - 2) Inspect each pipe segment between manholes or access points in a single, continuous run where possible.
 - 3) If line is impassable due to debris or obstructions, reverse setup and inspect from opposite manhole or access point.
- c. Pre-Rehabilitation Sewer Pipe Cleaning.**
- 1) Perform light cleaning with hydraulic flusher or high velocity cleaning equipment to remove loose debris.
 - 2) Complete up to three passes in an attempt to remove all debris from line pipe.
 - 3) If the pre-rehabilitation light cleaning fails to leave the sewer line pipe in a condition ready for lining, contact Engineer for authorization to proceed with additional sewer cleaning.
- d. Additional Sewer Cleaning.**
- 1) Notifying Engineer prior to performing heavy cleaning as required to remove obstructions, grease, rock, sticks, deposits settled (DS), deposits attached grease (DAGS), deposits attached encrustation (DAE), and roots, so the sewer is ready for lining. This item does not include cutting/grinding protruding service lines.
 - 2) Utilize rotating nozzles, saws or cutters, or high velocity hydro-cleaning equipment.
 - 3) Notify Engineer prior to use of mechanical/hydraulic spinner nozzle, chain flail, or other devices that may damage pipe or service connections.
 - 4) If deposits and obstructions cannot be removed by tools normally used in the sewer pipe cleaning industry, notify Engineer immediately.
 - 5) Maintain a log of time spent performing additional pipe cleaning on each line pipe segment.
- e. Remove Protruding Service Connection (For Sewer Pipe Only).**
- 1) Grind or cut services that protrude more than 1/2 inch into the sewer main.
 - 2) Utilize a remote grinding/cutting device specifically designed to remove concrete, vitrified clay, PVC, and other types of pipe materials.
 - 3) Notify Engineer if ductile iron, steel, cast iron, or other non-typical service materials are encountered to review the ability and risks of removing the protruding services.
 - 4) Grind or cut protruding service flush to the main sewer pipe without scouring or damaging the main sewer or service connection.
 - 5) Notify the Engineer immediately if the sewer main or service pipe are not structurally sound.
- f. Post-Cleaning CCTV Inspection.**
- Complete inspection according to Section 2504 and the following:
- 1) Complete CCTV inspection of sewer upon completion of all sewer cleaning, obstruction removal, and protruding service removal activities.
 - 2) Inspect each pipe segment between manholes or access points in a single, continuous run.
 - 3) Inspect all service connections at right angles utilizing pan and tilt capabilities of the camera.
 - 4) Identify active and inactive service connections by the following:
 - a) Observe each service connection and identify active connections by active sewage flow or evidence of recent sewage flow.
 - b) If the status of the connection is inconclusive, run water down adjacent services to verify the location of each service.
 - c) Dye test connections if necessary to verify active status.
 - d) b. Accurately measure and log the location and clockwise position of all active service connections.
- g. Groundwater.**
- If significant groundwater infiltration is present, which could result in resin loss, resin contamination, reduction in CIPP thickness, or inadequate curing, notify the Engineer prior to installing CIPP liner.

h. Inspection Reporting.

- 1) Provide a copy of the pre-cleaning and post-cleaning video inspections. Include on-screen continuous footage, pipe diameter, direction of viewing, manhole number, and street location reference in the recording. Affix labels to the recording media to include the name of the project, the date, and the location of the inspection.
- 2) Provide a written report of the inspections. Include true to scale drawings of all sewer defects and observation locations. Reference the time stamp on each line item entry on the written report.

4. Bypassing Sewage (For Sewer Pipe Only).

- a. Submit a bypassing plan to the Engineer for review.
- b. When sewer line flows exceed the values in Table 2549.03-1, or the depth recommended by the manufacturer of the sewer rehabilitation practice being implemented, reduce flows to acceptable levels.
 - 1) Plug the line at a point upstream of pipe to be rehabilitated if bypassing is required.
 - 2) Pump flow to a downstream point or adjacent system as directed by the Engineer.
 - a) Provide pump and bypass lines of adequate capacity to handle all flows.
 - b) Provide adequate reserve pumps on-site for emergency use and for storm flows.
- c. Rehabilitation and inspection work may be completed without bypassing in certain situations including low flow conditions, adequate upstream storage, use of a flow-through packer, or other situations approved by the Engineer. If proposed work will be completed without bypassing, have equipment and plan of action available to implement bypass pumping in the event the work is delayed or sewage levels in the upstream line are in danger of causing backups.

Table 2549.03-1: Maximum Depth of Flow During Inspection, Testing, and Rehabilitation

Main Diameter	CCTV Inspection	Joint Testing/Sealing
6" to 10"	20% of pipe diameter	25% of pipe diameter
12" to 24"	25% of pipe diameter	30% of pipe diameter
27" and up	30% of pipe diameter	35% of pipe diameter

5. CIPP Sewer Main and Culvert Lining.

- a. **General.**
 - 1) Clean, prepare, and inspect the repair point according to Article 2549.03, A, 3.
 - 2) Install liner according to the manufacturer's published recommendations, ASTM F 1216, and ASTM F 2019.
- b. **Resin Impregnation.**
 - 1) Vacuum impregnate tube with resin (wet-out) at manufacturer's plant under quality controlled conditions or on-site in mobile wet-out unit.
 - 2) Fill all voids in the tube material, adding 5% to 10% excess resin to allow for migration of resin into the voids and cracks.
- c. **Insertion.**
 - 1) **General.**
 - a) Perform pre-lining video inspection immediately prior to insertion of the wet-out tube.
 - b) Insert the wet-out tube through an existing manhole or approved access.
 - c) Ensure the tube is continuous between manholes with no joints. A single tube may span several manhole reaches as allowed by the equipment, properties of the CIPP, and time limits imposed by sewage flows to the host pipe.
 - d) Insertion of CIPP indicates acceptance of the host pipe conditions and the suitability of the liner inserted into the host pipe. Repair any failure of CIPP liner due to inadequate cleaning, groundwater infiltration, or defects in the liner system at no additional cost to the Contracting Authority.
 - 2) **Inverted Heat-Cured Liner.**
 - a) Prior to installation of the liner, place a temperature sensor on the bottom of the host pipe to monitor the temperature of the outside of the liner during the curing process. Place sensor at the termination point or location most distant from the heat source.
 - b) Insert the wet-out tube into the inversion device or standpipe with the impermeable plastic liner on the outside of the tube.
 - c) Turn back the end of the liner to form a cuff and secure the cuff to the inversion device or standpipe.
 - d) Apply air pressure or hydrostatic head as required to invert the tube into the host pipe with

- the impermeable liner on the inside of the pipe.
- e) Apply lubricant directly to the tube or pour lubricant into the standpipe during the inversion process to reduce friction.
 - f) Maintain and adjust pressure as necessary to invert the tube from the point of insertion to the point of termination and to hold the tube tight against the wall, producing dimples at service connections.
- 3) Pull-In UV Light Cured Liner.**
- a) If CIPP manufacturer recommends the use of a sliding foil for the existing pipe conditions, provide sliding foil which covers the lower third to lower half of the pipe circumference. Pull sliding foil into place.
 - b) Fold the wet-out liner in half and pull into place through an existing manhole. Monitor pulling speed and tension to avoid exceeding the manufacturer's recommendations.
 - c) Pull 1 to 2 feet of excess liner into the termination manhole.
 - d) If the product is sensitive to elongation, measure the overall elongation of the tube after pull-in. Ensure the elongation of the tube is less than 2% of the overall length of the segment specified by the manufacturer.
 - e) Expand the resin-impregnated tube as necessary to hold the tube tight against the wall, producing dimples at service connections.
 - f) Perform CCTV inspection of the inflated liner prior to initiating cure. Confirm alignment and fit prior to initiating cure. Make corrections as necessary to provide a finished liner free of wrinkles and defects.
- d. Curing.**
- 1) Heat Cured.**
 - a) Maintain consistent pressure, as recommended by the liner manufacturer, until curing is complete. Increase pressures to compensate for external ground water, if present.
 - b) Cure liner using circulating heated water or steam. Ensure the temperature is sufficient to affect a cure in all sections of the pipe.
 - c) Monitor and log the temperature from the sensor placed between the impregnated tube and the host pipe.
 - d) Initial cure will occur during heat up and is achieved when exposed portions of the new pipe appear to be hard and sound and the temperature sensor indicates the liner has reached the temperature necessary to effect a cure in the resin.
 - e) After initial cure is reached, raise the temperature to post-cure temperatures and hold for a period of time as recommended by the resin manufacturer.
 - f) Cool the new pipe to a temperature of 100°F for water cure and 113°F for steam cure before relieving the internal pressure within the section.
 - 2) UV Light Cured.**
 - 1) Automatically record the time, rate of travel of the ultraviolet assembly, pressures, and amount of lamps in operation for each CIPP segment as documentation of correct curing of the fabric tube.
 - 2) Maintain consistent pressure, as recommended by the liner manufacturer, until curing is complete.
 - 3) Draw the multi-lamp ultraviolet curing assembly through the pipe at a consistent, predetermined, speed that allows for cross-linking/polymerization of the CIPP resin.
 - 4) Adjust air pressure during curing as necessary to hold liner tight to the wall. Maintain pressure by adjustment of the outlet valve.
 - 5) Remove the temporary internal calibration hose installed by the manufacturer after curing is complete.
- e. CIPP End Seal Installation (For Sewer Pipe Only).**
- 1) Hydrophilic Gasket Sleeve.**
Install sleeve according to ASTM F 3240, sleeve manufacturer's published recommendations, and the following:
 - a) Do not install sleeve in host pipe more than 24 hours prior to CIPP lining.
 - b) Clean the first 6 inches of the main pipe to remove debris and visible grease deposits.
 - c) Install metal retaining clip at the leading edge of the sleeve. The metal clip may be held in place with adhesive tape if desired.
 - d) Install the sleeve in the main pipe so the leading edge is no more than 6 inches inside the end of the main pipe as measured from the manhole wall.
 - e) If the main pipe has a diameter of 18 inches or larger, utilize anchor screws to hold the sleeve in place.

- 2) **Expansion Band System.**
Install system according to manufacturer's published recommendations and the following:
 - a) After installation of the CIPP liner, trim the end of the liner squarely a distance of 2 to 6 inches from the inside face of the manhole.
 - b) Clean the exposed face of the main pipe to remove debris and loose resin.
 - c) Slide the rubber gasket into the pipe, centering it over the end of the liner. Ensure one expansion band will seat against the liner and the other will seat against the main pipe.
 - d) Expand the expansion bands using a hydraulic expansion tool approved by the band manufacturer.
 - f. **Service Reinstatement (For Sewer Pipe Only).**
 - 1) Do not leave sanitary service blocked for more than 24 hours.
 - 2) Reinstatement active service lines from within the main with a CCTV camera and remote cutting tool. Do not reinstate inactive service connections.
 - 3) Machine the opening to full size of the service connection opening area. Ensure the bottom of the liner opening and service line are flush.
 - 4) Ensure the opening does not have pipe fragments or CIPP fragments that may obstruct flow or snag debris.
 - 5) In the event that service reinstatement results in a liner opening greater than 100% of the service connection opening, or damage to the service connection occurs, install a CIPP service repair to cover the over-cut service connection at no additional cost to the Contracting Authority.
 - 6) If service connection cannot be reinstated remotely and requires excavation complete according to the local plumbing code at no additional cost to Contracting Authority.
 - g. **Inspection.**
Complete inspection according to Section 2504 and the following:
 - 1) Perform CCTV video inspection of completed CIPP lining, including observance of reinstated service connections. Provide copy of video inspection to Jurisdiction.
 - 2) Ensure the tube is free of dry spots, lifts (spots cured away from the sewer), and delaminations. Remove and replace deficient sections.
 - 3) If the CIPP does not fit tight against the original pipe at its termination point, seal the space between the pipes by filling with a resin mixture or hydrophilic seal compatible with the CIPP.
6. **CIPP Point Repair (For Sewer Pipe Only).**
 - a. **Preparation:** Clean, prepare, and inspect the repair point according to Section 4050, 3.01 Article 2549.03, A, 3.
 - b. **Bypass Pumping:** Develop a plan for flow diversion or stoppage. Review with Engineer prior to initiating repair.
 - c. **Installation.**
 - 1) Bypass mainline flow according to the submitted bypass plan.
 - 2) Install CIPP point repair according to system manufacturer's published recommendations.
 - 3) Wet-out the liner with the entire volume of resin recommended by the manufacturer.
 - 4) Load the wet-out liner onto the packer and secure in place. Ensure the ends of the packer extend beyond the ends of the liner.
 - 5) Pull the packer into position within the pipe. Verify position with CCTV observation.
 - 6) Apply air pressure to the packer to expand the CIPP point repair liner against the host pipe.
 - 7) Maintain consistent pressure for the duration of the curing period.
 - d. **Inspection.**
 - 1) Perform CCTV video inspection of completed CIPP point repair. Provide copy of video inspection to Jurisdiction.
 - 2) Ensure the tube is free of foreign inclusions, dry spots, pinholes, wrinkles greater than 2% of the pipe diameter, and delamination. Remove and replace deficient sections.
 7. **CIPP Service Repair (For Sewer Pipe Only).**
 - a. **Preparation.**
 - 1) Prior to installation of the system, clean and prepare the interior of the host and service pipe in accordance to the manufacturer's written instructions.
 - 2) Remove all debris and obstructions.
 - 3) Perform a post cleaning CCTV inspection in preparation for installation of the lining system.
 - 4) If any obstructions, joint misalignments, broken or collapsed pipe, or other conditions are identified that will prohibit proper installation of the system, notify the Engineer immediately.
 - b. **Installation.**

- 1) Install CIPP service repair according to system manufacturer's published recommendations and to the length specified in the contract documents.
- 2) Bypass main line flow according to the submitted bypass plan. Coordinate installation with service owner to prevent service line flows.
- 3) Wet-out the entire liner, including lateral and mainline portions, using vacuum impregnation.
- 4) Load the lining system inside or on a pressure apparatus and move into position in the mainline pipe at the service connection.
- 5) Align and verify the position of liner and service line via CCTV prior to initiating installation.
- 6) Apply air pressure to invert or expand the resin impregnated CIPP into the lateral pipe and push the main-line portion of the system against the main pipe. Maintain pressure until the curing process is complete.
- 7) Apply heat or UV light as required by the manufacturer to property cure the liner.
- 8) If liner is heat cured, follow manufacturer's recommendations for cool-down before relieving pressure.
- 9) If liner is ambient cured, maintain pressure according to the manufacturer's recommendations before relieving pressure.
- 10) Remove frayed ends of the system.

c. Inspection and Documentation.

Complete inspection according to Section 2504 and the following:

- 1) Provide Engineer with video documentation of pre-installation conditions and post-installation conditions showing the repair.
- 2) Ensure the finished CIPP service repair is free of any leakage and visual defects including foreign inclusions, dry spots, lifts, pinholes, major wrinkles, and delamination. Repair any defects that could affect the structural integrity of the system or allow leaks.
- 3) Maintain a written log of installation conditions according to system manufacturer's recommendations. At a minimum, include time of wet out, time and location of insertion, time of inflation, bladder pressure requirements, required cure time, actual cure time, and cool down duration.
- 4) Submit documentation of results for CIPP liner material to Engineer.

8. Pressure Testing and Grouting of Sewer Joints (For Sewer Pipe Only).

a. General.

- 1) Clean, prepare, and inspect the repair point according to Article 2549.03, A, 3.
- 2) Complete sewer joint and service connection testing and grouting according to the grout supplier and equipment manufacturer's published recommendations, ASTM F 2304, and ASTM F 2454.

b. Equipment.

- 1) **Joint Testing Device:** Provide a joint testing device (packer), with means for introducing air under pressure into the void area created by the expanded ends of the packer against the host pipe and a means of continuously measuring, viewing, and recording the static pressure of the test medium and grout within the void area only. Provide packer constructed in a manner to allow a limited amount of sewage to flow through at all times.
- 2) **Service Connection Testing Device:** Provide a service connection testing device with inflatable mainline end elements and a service line grouting plug that creates a void area extending beyond the main connection. Use a service line grouting plug sized to match the diameter of the service being grouted with an effective sealing length of at least 18 inches, unless otherwise specified in the contract documents.
- 3) **Pumping Equipment.**
 - a) Provide positive displacement metering grout pump and hose delivery system capable of supplying a mixed volume of grout at a minimum of 3 gallons per minute and 30 gallons of uninterrupted flow within 10 minutes.
 - b) Ensure pump system has sufficient discharge pressure (in excess of system pressure losses and groundwater) to deliver grout volume to fill void space within the gel set time of the chemical grout.
- 4) **Grout Tanks:** When using non-soluble additives, ensure grout tanks have mechanical mixing devices to keep additives in suspension.
- 5) **Measuring Equipment:** Provide means of measuring and recording the volume of mixed grout pumped for each grouted joint or service connection.

c. Control Tests.

- 1) Prior to beginning testing and grouting, perform a demonstration test in an above ground 8 inch nominal diameter test cylinder suitable to contain the full length of the packer and sustain the void

test pressure. For service line testing, provide an 8 inch test cylinder with 6 inch service tee to receive the lateral bladder.

- 2) Equip the test cylinder with a pressure gauge to monitor internal pressure and a release valve to exercise a controlled release of pressurized air from the void area to test the packer under both sound and leaking conditions.
 - a) With the void release valve closed, inflate the packer and air test the void at 7 to 10 psi. Ensure the observed void pressure at the test cylinder pressure gauge is within + 1/2 psi of the test monitoring equipment.
 - b) Crack open the release valve to simulate a small leak. Ensure the pressure drop of the cylinder gauge is within + 1/2 psi of the test monitoring equipment.
 - 3) After entering each pipeline segment, but prior to commencement of joint testing, position the packer on a section of sound and clean sewer between two consecutive pipe joints and perform a pressure test. Pressurize packer to between 7 and 10 psi and hold for a period of 15 seconds with a pressure drop of less than 1.0 psi. Deflate packer and ensure that void pressure monitoring equipment drops + 1/2 psi of initial reading.
 - 4) If any of the control tests are unsuccessful, clean equipment of excess grout or make necessary repairs and retest.
- d. Sewer Main Joint Pressure Testing.**
- 1) Test joints at a target pressure equal to 1/2 psi per vertical foot of pipe depth plus 2 psi (not exceeding 10 psi).
 - 2) Position the packer within the pipe so the packer straddles the pipe joint to be tested. Verify location via CCTV monitoring.
 - 3) Expand the packer ends to isolate the joint from the remainder of the pipe and to create a void area between the pipe joint and testing device.
 - 4) Pump air into void space until the pressure reaches the required test pressure.
 - 5) Stop the flow of air into the void space and observe the void pressure for 15 seconds.
 - 6) If the pressure is maintained with a drop of less than 1 psi, the joint will be considered as having passed the test.
 - 7) If the pressure drops more than 1 psi during the test period, the joint will be considered as having failed and sealing will be required.
 - 8) Deflate packer and verify the void pressure monitor drops to within + 1/2 psi of 0 psi. Clean equipment if pressure fails to return to 0 psi.
- e. Service Line Pressure Testing.**
- 1) Test service lines at a target pressure equal to 1/2 psi per vertical foot of pipe depth plus 2 psi (not exceeding 10 psi).
 - 2) Position the testing device within the line segment to straddle the service connection. Verify location via CCTV.
 - 3) Align the service bladder with the service connection.
 - 4) Apply air pressure to invert or inflate the bladder from the mainline assembly into the service pipe.
 - 5) Expand the packer ends to isolate the section of the service connection to be tested.
 - 6) Introduce air into the void area until a pressure equal to or up to 10% greater than the required test pressure is observed.
 - 7) Stop the flow of air into the void space and observe the void pressure for 15 seconds.
 - 8) If the pressure is maintained, with a pressure drop of less than 2 psi, the connection will be considered as having passed the test.
 - 9) If the pressure drops more than 2 psi during the test period, the connection will be considered as having failed and sealing will be required.
 - 10) Deflate packer and bladder and verify the void pressure monitor drops to within + 1/2 psi of 0 psi. Clean equipment if pressure fails to return to 0 psi.
- f. Sewer Main Joint Sealing by Injection Grouting.**
- Perform joint sealing according to ASTM F 2304, equipment manufacturer, grout supplier, and the following:
- 1) Position packer over the faulty joint and expand packer ends, isolating the joint with a tight seal.
 - 2) Pump two-part chemical sealant material into the ratio specified by the grout supplier.
 - 3) Continue to pump grout, in stages if necessary, until "refusal" is achieved.
 - a) Refusal indicates the grout has flowed throughout the void, into the surrounding soil, forming a cohesive seal stopping further flow of grout.
 - b) Under pumping conditions, void pressure will slowly rise as grout is forced into the surrounding soil and begins to set. When void pressure spikes an additional 8 psi or more in a short pumping period of 1 to 5 seconds, the point of refusal is achieved.

- c) If a quantity of grout equal to 1/2 gallon per inch diameter of pipe size is pumped without reaching the point of refusal, staging may be required. Staging is accomplished by repetitive cycles of pumping and curing until refusal is achieved. Notify Engineer for approval before staging is attempted.
 - d) If joint cannot be sealed by staging, abandon sealing operations at that joint and notify Engineer.
 - 4) Upon reaching refusal, stop grout pumps and allow grout to cure for 30 to 40 seconds.
 - 5) Deflate packer to break away the ring of gel formed in the void and move at least one packer length away from the joint in either direction.
 - 6) Ensure pressure gauge reads zero pressure + 1/2 psi. If gauge does not return to zero clean equipment.
 - 7) Reposition packer over joint and retest at a pressure equal to the initial test pressure.
 - 8) If joint fails pressure test, repeat grouting and pressure testing procedure until the joint is sealed or Engineer determines grout consumption is too high and continued attempts to seal joint are abandoned.
 - 9) Remove residual sealing materials that extend into the pipe or restrict the flow. Ensure sealed joint surfaces are left flush with existing pipe surface. Remove residual grout material from manhole; do not allow grout to be flushed down the sewer.
- g. Service Connection Sealing by Injection Grouting.**
Perform service sealing according to ASTM F 2454, equipment manufacturer, grout supplier, and the following requirements.
- 1) Pump two-part chemical sealant material at the ratio specified by the grout supplier.
 - 2) Continue to pump grout, in stages if necessary, until refusal is achieved.
 - a) Under initial pumping conditions, the void pressure will slowly rise to a range of approximately 2 to 4 psi.
 - b) Continue pumping until there is a sudden increase to over 8 psi in a few seconds, indicating refusal.
 - c) If a quantity of grout equal to 1 gallon per foot of service line bladder plus 3 gallons is pumped without reaching the point of refusal, staging may be required.
 - d) Stage grouting by pumping additional grout equivalent to 1 gallon plus 0.25 gallons per foot of bladder, waiting 1 full minute and retesting. Do not exceed two stages unless approved by Engineer.
 - 3) Upon reaching refusal, stop grout pumps and allow grout to cure for 1 full minute.
 - 4) Deflate service packer, re-inflate, and repeat service line pressure testing.
 - 5) If the service connection test fails, repeat injection grouting and pressure testing procedures until service is sealed or Engineer determines grout consumption is too high and continued attempts to seal service are abandoned.
 - 6) Confirm flow after sealing of each service. If a grout blockage exists, immediately clear the service of the blockage.
 - 7) A thin film of residual grout inside the service, which does not significantly impede flow, is a normal result of sealing and is not considered a blockage.
- h. Inspection and Reporting.**
Comply with ASTM F 2304 Section 12.9, Section 2504, and as noted below.
- 1) **Inspection:**
 - a) Perform CCTV observation and recording of initial pressure testing, sealing operations (if required), and final pressure testing (if required) for each joint or service.
 - b) Perform final CCTV video inspection of sewer main rehabilitated by injection grouting after all grouting work is completed. Provide copy of video to the Jurisdiction.
 - 2) **Reporting.**
Upon completion of each pipe segment, submit a report showing the following information for each joint and service connection tested, grouted or both.
 - a) Identification of sewer pipe section tested.
 - b) Type of pipe material, diameter, and depth of pipe to surface at manholes.
 - c) Length of pipe sections between joints.
 - d) Test pressure used before and after sealing and duration of test.
 - e) Location of each joint or service connection tested and any joints or service connections not tested with and explanation for not testing.
 - f) Pass/fail results for each joint or service connection tested.
 - g) Volume of grout material used on each joint or service connection.
 - h) Grout mix record of the batches mixed including amount of grout and catalyst, additives,

temperature of the grout solution in the tanks, and gel set time used.

9. Spot Repairs by Pipe Replacement (For Sewer Pipe Only).

- a. Excavate trench according to Section 2552.
- b. Remove existing pipe to the extent required and disconnect affected sewer services.
- c. Install replacement pipe of the same nominal size as the existing pipe.
 - 1) Use the same materials as specified in the contract documents that comply with Section 2504.
 - 2) Place bedding material according to Section 2552.
- d. Install pipe repair coupling.
 - 1) Cut pipes to length require allowing no more than a 1/2 inch gap between butted pipe ends at coupling location. Cut pipes perpendicular to centerline.
 - 2) Clean the outside surface of the existing and replacement pipes as required to provide a positive seal with the pipe repair coupling.
 - 3) Wrap coupling around pipes, centered on butt joint, and tighten bolts according to manufacturer's recommendations.
- e. Reconnect sewer services.
- f. Place backfill material in trench according to Section 2552.

10. Cleanup and Closeout.

- a. Verify that the services are reconnected and fully operable, with at least 90% of original capacity.
- b. Submit initial and final video tapes, CDs, or DVDs to the Engineer.
- c. Remove all equipment and debris.

B. Manhole Rehabilitation.

1. Submittals.

- a. Concrete mix design, if required by the Engineer.
- b. Catalog cuts of all mortar mixes, sealants, and liners.

2. Infiltration Barrier.

Apply Article 2435.03, A.

3. Urethane Chimney Seal.

- a. Prepare the surface according to the manufacturer's recommendations, including sandblasting, pressure washing, sealing leaks or gaps, and drying the surface.
- b. Apply primer, prepare product, and brush-apply the seal to a minimum thickness of 175 mils, covering 2 inches above the bottom of the frame and the entire adjustment ring area to 3 inches below the bottom adjustment ring.

4. In-Situ Manhole Replacement, Cast-in-place Concrete.

a. Preparation.

Prepare according to the forming system manufacturer's recommendations, including the following:

- 1) Clean the existing surface to remove loose material and debris.
- 2) Remove existing steps that might interfere with the erection of the forms.
- 3) Control infiltration that may affect placement of concrete.

b. Installation.

Install and test according to the forming system manufacturer's recommendations, including the following:

- 1) Place pipe extensions through the structure to maintain flow during installation.
- 2) Erect forms inside the manhole. Secure the assembled internal forms to prevent shifting and to provide sufficient stiffness and strength to prevent collapse.
- 3) Install a plastic liner when specified.
- 4) Seal the forms at the bottom of the manhole to ensure the concrete does not enter the sewer.
- 5) Carefully place concrete between the forms and the existing manhole walls. Place concrete from the bottom up to prevent segregation of concrete.
- 6) Consolidate concrete as required to fill all pockets, seams, and cracks within the existing manhole wall.
- 7) Remove the forms when the concrete has cured sufficiently.
- 8) Weld and test joints if a plastic liner is installed.

- 9) Apply a sealing strip around the circumference of the invert top where it meets the vertical wall and around all pipe penetrations to form a waterstop.
- 10) Overlay the invert top with concrete or high-strength mortar. Vary thickness from 3 inches at the wall to 1/2 inch at the edge of the channel.
- 11) Apply an epoxy lining to the invert top. Apply clean sand to the epoxy to create a non-slip surface.
- 12) Seal the plastic liner to the manhole casting and existing pipe stubs as recommended by the manufacturer.
- 13) Install a new casting.

5. Centrifugally Cast Cementitious Mortar Liner with Epoxy Seal.

a. Surface Preparation.

Prepare according to the manufacturer's recommendations, including the following:

- 1) Wash the interior with a high pressure washer.
- 2) Plug active leaks with the appropriate sealing material.

b. Mortar Application.

Apply according to the manufacturer's recommendations, including the following:

- 1) Apply with a rotating centrifugal casting applicator, beginning at the bottom of the manhole.
- 2) Retrieve the applicator head at the manufacturer's recommended speed to achieve the desired thickness.
- 3) Apply to the full required thickness utilizing multiple passes as necessary. Minimize the time between passes so subsequent passes are cast against fresh mortar.
- 4) Verify thickness with a wet gage at several locations to ensure proper depth.
- 5) Hand-apply high-strength mortar to the invert surface. Vary thickness from 3 inches at the wall to 1/2 inch at the edge of the channel.

c. Epoxy Seal Application.

Seal according to the manufacturer's recommendations, including the following:

- 1) Apply with a rotating centrifugal casting applicator or airless sprayer onto the fresh mortar liner.
- 2) If the epoxy seal is applied more than 24 hours after application of the mortar liner, or if the mortar liner is contaminated, clean the liner and then apply the epoxy.

d. Finishing.

Install a new casting.

2549.04 METHOD OF MEASUREMENT.

A. Pipe and Culvert Cleaning and Inspection for Rehabilitation.

1. Pre-Rehabilitation Cleaning and Inspection.

Measurement will be made for each diameter range of sewer main or diameter of culvert cleaned and inspected prior to rehabilitation. ~~Diameter ranges: 4 to 12 inch, 15 to 24 inch, and 27 to 30 inch.~~

2. Additional Sewer or Culvert Cleaning.

Measurement will be made on an hourly basis for additional pipe cleaning for each diameter range of sewer main or diameter of culvert. ~~Diameter ranges: 4 to 12 inch, 15 to 24 inch, and 27 to 30 inch.~~

B. Remove Protruding Service Connections.

Each protruding service connection removed will be counted. Quantity will be based on number of protruding service connections identified in the pre-rehabilitation CCTV inspection and removed from the post-rehabilitation CCTV inspection.

C. Cured-in-Place Pipe Lining.

1. Cured-in-Place Pipe Main Lining.

Each diameter of main pipe lining will be measured in linear feet along the centerline of the pipe lining from center of manhole to center of manhole.

2. Cured-in-Place Culvert Lining.

Each diameter of Cured-in-Place Culvert Pipe Lining will be measured in linear feet along the centerline of the culvert.

2 3. Building Sanitary Sewer Service Reinstatement.

Each active sanitary sewer service reinstated, including those reinstated by excavation, will be counted.

3 4. Cured-in-Place Pipe End Seal.

Each size of CIPP end seal installed will be counted.

D. Cured-in-Place Pipe Point Repair.

Each diameter of CIPP point repair will be counted. Repairs in excess of 10 feet in length will be counted as multiple repairs.

E. Cured-in-Place Pipe Service Repair.

1. Cured-in-Place Pipe Service Pipe, Connection.

Each size combination of main and service connection diameters repaired will be counted.

2. Cured-in-Place Pipe Service Repair, Partial Pipe.

Each size combination of main and service diameters and specified service length lined will be counted.

F. Pressure Testing and Grouting of Sewer Joints and Service Connections.

1. Pressure Testing of Mainline Sewer Joints.

Each mainline sewer joint tested will be counted. Separate measurement will be made for each diameter of sewer main. Visually leaking joints, whether tested or not, will be counted if they are grouted.

2. Injection Grouting of Mainline Sewer Joints.

Each mainline sewer joint grouted will be counted. Separate measurement will be made for each diameter of sewer main.

3. Pressure Testing of Service Connections.

Each sewer service connection tested will be counted. Separate measurement will be made for service connections on each diameter of sewer main.

4. Injection Grouting of Service Connections.

Each service connection grouted will be counted. Separate measurement will be made for service connections on each diameter of sewer main.

5. Chemical Grout.

Each gallon of chemical grout used for sealing mainline sewer joints and service connections will be counted.

G. Bypass Pumping.

Lump sum item, no measurement will be made.

H. Spot Repairs by Pipe Replacement.

Both of the following methods will be specified for measurement of spot repairs by pipe replacement:

1. Spot Repairs by Count.

Each spot repair location will be counted.

2. Spot Repairs by Linear Foot.

Measurement will be in linear feet along the centerline of the replacement pipe.

I. Infiltration Barrier.

Each infiltration barrier installed on an existing manhole will be counted.

J. Urethane Chimney Seal.

Each urethane chimney seal installed on an existing manhole will be counted.

K. In-Situ Manhole Replacement, Cast-in-place Concrete.

Measurement of the vertical dimension of in-situ manhole replacement will be in feet from the lowest flowline to the top of the rim.

L. In-Situ Manhole Replacement, Cast-in-place Concrete with Plastic Liner.

Measurement of the vertical dimension of in-situ manhole replacement with plastic liner will be in feet from the lowest flowline to the top of the rim.

M. Manhole Lining with Centrifugally Cast Cementitious Mortar Liner with Epoxy Seal.

Measurement for depth of the vertical dimension of manhole lining will be in feet from the bottom of the lining to the top of the lining for each liner thickness specified.

2549.05 BASIS OF PAYMENT.**A. Pipe and Culvert Cleaning and Inspection for Rehabilitation.****1. Pre-Rehabilitation Cleaning and Inspection.**

- a. Payment will be made at the unit price per linear foot for each diameter of pre-lining rehabilitation cleaning and inspection.
- b. Payment is full compensation for pre-cleaning CCTV inspection, light sewer cleaning, debris removal and transport, post cleaning CCTV inspection for Engineer review, and identification and logging of active service taps (if applicable). If specified in the contract documents, unit price also includes disposal and associated costs for all debris removed from sewer pipe.

2. Additional Sewer or Culvert Cleaning.

- a. Payment will be made at the unit price per hour for additional pipe cleaning.
- b. Payment is full compensation for heavy sewer pipe cleaning; root cutting; deposit cutting; and removing, transporting, disposing, paying associated costs for all debris removed from sewer, and post cleaning CCTV inspection for Engineer review.

B. Remove Protruding Service Connections.

1. Payment will be made at the unit price for each protruding service connection removed.
2. Payment is full compensation for removal of protruding service connections and debris removal.

C. Cured-in-Place Pipe Lining.**1. Cured-in-Place Pipe Main Lining.**

- a. Payment will be made at the unit price per linear foot for each diameter of pipe lining.
- b. Payment is full compensation for furnishing and installing the liner and appurtenances, CCTV inspection immediately prior to lining, bypass pumping unless otherwise specified, sliding foil, post-lining CCTV inspection, and all costs associated with the public information and notification program.

2. Cured-in-Place Culvert Lining.

- a. Payment will be made at the unit price per linear foot for each diameter of Cured-In-Place Culvert Lining.
- b. Payment is full compensation for furnishing and installing the liner and appurtenances, CCTV inspection immediately prior to lining, and post-lining CCTV inspection.

3. Building Sanitary Sewer Service Reinstatement.

- a. Payment will be made at the unit price for each active sewer service reinstated.
- b. Payment is full compensation for reinstating sanitary sewer service connections, removal of debris, and coordination with service owners.

3.4. Cured-in-Place Pipe End Seal.

- a. Payment will be made at the unit price for each CIPP end seal installed.
- b. Payment is full compensation for end seal and installation.

D. Cured-in-Place Pipe Point Repair.

1. Payment will be made at the unit price for each diameter of CIPP point repair.

2. Payment is full compensation for furnishing and placing point repair liner, bypass pumping unless otherwise specified, sewer cleaning, removal of obstructions, debris removal, pipe preparation, and pre and post repair CCTV inspection.

E. Cured-in-Place Pipe Service Repair.

1. Cured-in-Place Pipe Service Pipe, Connection.

- a. Payment will be made at the unit price for each size combination of CIPP service pipe, connection.
- b. Payment is full compensation for furnishing and placing service connection liner, bypass pumping unless otherwise specified, documentation, and all costs associated with the public information and notification program.

2. Cured-in-Place Pipe Service Repair, Partial Pipe.

- a. Payment will be made at the unit price for each size combination of CIPP service repair, partial pipe.
- b. Payment is full compensation for furnishing and installing service repair liner, bypass pumping unless otherwise specified, documentation, and all costs associated with the public information and notification program.

F. Pressure Testing and Grouting of Sewer Joints and Service Connections.

1. Pressure Testing of Mainline Sewer Joints:

- a. Payment will be made at the unit price for each sewer joint tested.
- b. Payment is full compensation for by-pass pumping unless otherwise specified, control testing, and documentation.

2. Injection Grouting of Mainline Sewer Joints:

- a. Payment will be made at the unit price for each sewer joint grouted.
- b. Payment is full compensation for bypass pumping unless otherwise specified, material testing, pressure testing after grouting, re-grouting of failed joints, and documentation. Unit price does not include the quantity of chemical grout used.

3. Pressure Testing of Service Connections.

- a. Payment will be made at the unit price for each service connection tested.
- b. Payment is full compensation for bypass pumping unless otherwise specified, and documentation.

4. Injection Grouting of Service Connections.

- a. Payment will be made at the unit price for each service connection grouted.
- b. Payment is full compensation for bypass pumping unless otherwise specified, material testing, pressure testing after grouting, and documentation. Unit price does not include the quantity of chemical grout used.

5. Chemical Grout:

- a. Payment will be made at the unit price for each gallon of chemical grout used.
- b. Payment is full compensation for grout additives; root inhibitor; and supplying, mixing, and measurement of chemical grout.

G. Bypass Pumping.

1. Payment will be made at the lump sum price for bypass pumping.
2. Payment is full compensation for development and submittal of the bypassing plan, all staffing, equipment, and appurtenances necessary to accomplish the approved bypassing plan, including reserve equipment.

H. Spot Repairs by Pipe Replacement.

Both of the following methods will be specified for payment of spot repairs by pipe replacement:

1. Spot Repairs by Count.

- a. Payment will be made at the contract unit price for each spot repair.

- b. Payment is full compensation for uncovering and removing existing pipe, placing backfill material for replacement pipe, and restoring the surface.

2. Spot Repairs by Linear Foot.

- a. Payment will be made at the contract unit price per linear foot of spot repair.
- b. Payment is full compensation for furnishing and installing replacement pipe and connections.

I. Infiltration Barrier.

- 1. Payment will be made at the contract unit price for each infiltration barrier.
- 2. Payment is full compensation for all necessary compression or expansion bands and extension sleeves as necessary to complete infiltration barrier.

J. Urethane Chimney Seal.

Payment will be at the contract unit price for each urethane chimney seal.

K. In-Situ Manhole Replacement, Cast-in-place Concrete.

- 1. Payment will be at the contract unit price per vertical foot.
- 2. Payment is full compensation for handling of sewer flows as required to properly complete the installation, invert overlay as recommended by the manufacturer, replacement of existing casting with a new casting, and testing the manhole upon completion.

L. In-Situ Manhole Replacement, Cast-in-place Concrete with Plastic Liner.

- 1. Payment will be at the contract unit price per vertical foot.
- 2. Payment is full compensation for handling of sewer flows as required to properly complete the installation, invert overlay as recommended by the manufacturer, replacement of existing casting with a new casting, sealing at the frame and cover, sealing pipe penetrations as recommended by the manufacturer, and testing the manhole upon completion.

M. Manhole Lining with Centrifugally Cast Cementitious Mortar Liner with Epoxy Seal.

- 1. Payment will be at the contract unit price per vertical foot for each liner thickness properly installed.
- 2. Payment is full compensation for the handling of sewer flows during lining operations as required to properly complete the installation, and replacement of the existing casting with a new casting.

Division 26. Roadside Development.

Section 2601

2601.03, H, 2, a, 2.

Renumber Table 2601.03-7 and **renumber** and **replace** Table 2601.03-8:
Table 2601.03-7 8: Ditches - Outside Shoulder Adjacent to Native Grass Seedings

Oats	25 lbs/Acre
Grain Rye	25 lbs/Acre
Switchgrass (Panicum virgatum)	3 lbs PLS/Acre
Side-oats grama (Bouteloua curtipendula)	4 lbs PLS/Acre
Canada wildrye (Elymus canadensis)	9 lbs PLS/Acre
Virginia wildrye (Elymus virginicus)	5 lbs PLS/Acre
Partridge pea (Chamaecrista fasciculata)	4 lbs PLS/Acre
Note: Canada wildrye shall be debarbed or equal to facilitate the application.	

Table 2601.03-8 9: Medians and Ditches - Outside Shoulder Adjacent to Rural Seedings

Fescue, Tall ¹ (Fawn)	100 lbs. per acre
Ryegrass, Perennial ² (Linn)	75 lbs. per acre
Bluegrass, Kentucky	20 lbs. per acre
1. All tall fescue shall be endophyte free.	
2. Perennial ryegrass shall be cultivars Linn, Amazon, Norlea, or Nui, or a combination thereof.	

Division 41. Construction Materials.

Section 4101

4101.01, B, 4.

Replace the Article:

Limit total replacement of Type IT to no more than ~~40~~ 50 weight percent.

4101.01, C, 2.

Replace the Article:

Limit total replacement to no more than ~~40~~ 50 weight percent.

Section 4118

4118.03, Quality.

Replace Table 4118.03-1:

Table 4118.03-1: Coarse Aggregate Quality (Virgin Material)

Coarse Aggregate Quality	Maximum Percent Allowed	Test Method
Abrasion	50	AASHTO T 96
C – Freeze ^(a)	20	Iowa DOT Materials Laboratory Test Method No. 211, Method C
A – Freeze ^(a)	6	Iowa DOT Materials Laboratory Test Method No. 211, Method A
Alumina ^(a)	0.5	Iowa DOT Materials Laboratory Test Method No. 222
(a) Meet at least one of the C – Freeze, A – Freeze, or Alumina requirements.		

Section 4153

4153.06, A, 3.

Replace the first sentence:

Where galvanized fasteners are specified, zinc is applied by hot dipped galvanizing to meet the requirements of ASTM F 2329 ~~with a zinc bath temperature not exceeding 850°F.~~

Section 4156

4156.01, Description.

Replace the Article:

Dowels consisting of a single uncoated non-metallic material, glass fiber reinforced polymer. Use only in load transfer assemblies for CD joints and individual dowels for dowel bar retrofits or patches on non-Interstate PCC pavements ~~with 20 year design truck traffic of less than 1000 per day, as approved by the Engineer.~~

Section 4169

4169.07, B, 2, c, 1.

Replace the Article:

Contain non-toxic tackifiers that upon drying become insoluble and non-dispersible to eliminate direct raindrop impact on soil according to ASTM D 7101 and EPA 2021.0-1 ~~or ASTM D 8151.~~

4169.07, B, 3, c, 1.

Replace the Article:

Contain non-toxic tackifiers that upon drying become insoluble and non-dispersible to eliminate direct raindrop impact on soil according to ASTM D 7101 and EPA 2021.0-1 ~~or ASTM D 8151.~~

4169.12, A, General.

Add the Article:

6. Use wire staples meeting the requirements of special ditch control and slope protection staples in Article 4169.10, A.

Section 4171

4171.04, Cast Iron Detectable Warning Panels.

Replace the second bullet:

Impact resistance - Resistance to impact from Falling Tub ~~NCHRP Report 670: Draft T4-33, Part II per AASHTO T388-22 section 10. No Substantial damage or damage to surface texture and coating only.~~

4171.05, Steel Detectable Warning Panels.

Replace the second bullet:

Impact resistance - Resistance to impact from Falling Tub ~~NCHRP Report 670: Draft T4-33, Part II per AASHTO T388-22 section 10. No Substantial damage or damage to surface texture and coating only.~~

Section 4183

4183.06, A, 3, Retroreflectance.

Replace Articles b and c:

- b.** Measure and report wet retroreflectance values under a "condition of wetness" according to ASTM E 2177. ~~Test may be performed with marking installed on road. Perform laboratory measurements using a 3 to 5 degree lateral slope. Use wetting agent to improve wetting of pavement marking with water. Use of a 0.1% (by volume) liquid soap solution is recommended. Report measurements as an average for each roll tested, in a minimum of three locations.~~
- c.** Measure and report wet retroreflectance values under a "condition of continuous wetting" (simulated rain) according to ~~ASTM E 2176~~ ASTM E 2832 ~~in a controlled laboratory environment while the marking is positioned with a 3 to 5 degree lateral slope. Use wetting agent to improve wetting of pavement marking with water. Use of a 0.1% (by volume) liquid soap solution is recommended. Report measurements as an average for each roll tested, in a minimum of three locations.~~

Section 4186

4186.03, A, 3.

Replace Table 4186.03-1:

Table 4186.03-1: Retro Reflective Sheeting Classification

Type IV	A high intensity retroreflective sheeting. This sheeting is typically an unmetallized microprismatic retroreflective element material.
Type VI (Iowa)	A flexible, very high intensity retroreflective sheeting for use on roll-up signs. This sheeting is typically a vinyl microprismatic retroreflective material.
Type VIII (Iowa)	A prismatic, very high intensity retroreflective sheeting. This sheeting is typically a unmetallized cube corner microprismatic retroreflective material.
Type XI	A prismatic, very high intensity retro reflective sheeting having highest retro reflective characteristics at wide range of distances.

4186.03, A, 4.

Replace the Article:

For Type VI (Iowa) and Type VIII (Iowa) sheeting, meet the requirements of Materials I.M. 486.03.

4186.03, B, 2, a, Interstate and Primary Highways.

Replace the Article:

Meet the following requirements:

- 1) Type VIII (Iowa) or Type XI sheeting is used for all rigid signs with orange backgrounds. The legend is fabricated using black nonreflective sheeting that is applied directly or by silk screening with black opaque ink.
- 2) Type VI (Iowa) sheeting is used for all flexible roll-up signs with orange backgrounds. The legend is fabricated by silk screening with black opaque ink.
- 3) Type VIII (Iowa) or Type XI sheeting is used for STOP/SLOW paddles. The black legend is fabricated using black nonreflective sheeting that is applied directly or by silk screening with black opaque ink on orange Type VIII (Iowa) sheeting. The white legend is fabricated using transparent red ink that is reverse silk screened on white Type VIII (Iowa) sheeting.
- 4) Type VIII (Iowa) non-fluorescent or Type XI sheeting is used for barricades, vertical panels, and all other work zone traffic control devices that use premanufactured barricade sheeting.
- 5) Type VIII (Iowa) fluorescent orange and Type IV white sheeting is used for drums, 42 inch channelizers, tubular markers, and all other work zone traffic control devices that use horizontal sheeting.
- 6) For reboundable traffic control devices, Type IV or Type VIII (Iowa) sheeting designed for this application is used.

Section 4188

4188.04, B, 1.

Replace the Article:

Minimum of two orange 6 inch bands of Type VIII (Iowa) reflective sheeting and two white 6 inch bands of Type IV reflective sheeting.

4188.10, F, GPS and Remote Communications (When Required).

Renumber, Retitle, and Replace the Article:

F. 4188.11 GPS and Remote Communications (When Required).

- 1 A. Arrow board** When specified, device shall have the ability to receive and transmit its GPS coordinates (latitude and longitude) within a 30 foot diameter of its true location.

2 B. Electronic communications between ~~arrow board~~ device or ~~arrow board's~~ device's central server and the Department shall follow communication protocol defined in Materials I.M. 486.12 or Materials I.M. 488.01.

3 C. ~~Arrow boards~~ Device shall transmit status and location as follows:

a 1. Mode change within 2 minutes.

b 2. Location (if moved more than 500 feet) within 2 minutes.

c 3. Health check every 30 minutes.

4188.10, G, Portable Dynamic Message Signs as an Arrow Board.

Renumber the Article:

G F. Portable Dynamic Message Signs as an Arrow Board.

Section 4189

4189.01, B, 3, a, 1.

Replace the Article:

PVC Schedule 40 plastic conduit and fittings complying with NEMA TC-2 (pipe), NEMA TC-3 (fittings), and UL 651 for Schedule ~~40 heavy wall type~~ 80.

Appendix.

Appendix.

Replace the Aggregate Gradation Table:

Grad. No.	Section No.	Std. Sieve Sz. Intended Use	TABLE 4109.02-1: AGGREGATE GRADATION TABLE											Notes			
			1 1/2"	1.00"	3/4"	1/2"	3/8"	Percent Passing			4	8	30		50	100	200
1	4110, 4125, 4133, 4134	PCC FA, Cover Agg.						100	90-100	70-100	10-60					0-1.5	1
2	4112	PCC Intermediate				95-100				0-10							
3	4115 (57, 2-8), 4118	PCC CA	100	95-100		25-60			0-10	0-5						0-1.5	2, 10
4	4115 (2-8)	PCC CA	100	50-100	30-100	20-75		5-55	0-10	0-5						0-1.5	10
5	4115 (67, 2-8)	PCC CA		100	90-100			20-55	0-10	0-5						0-1.5	10
6	4115.96 05 (Repair & Overlay)	PCC CA			100	90-100		40-90	0-30							0-1.5	10
7	4116 (Class V)	PCC FA & CA	100						80-92	60-75	20-40						
8	4116.03 (Class V)	Fine Limestone						100	90-100							0-30	
9	2556	Grout Aggregate				100		85-100		0-10						0-1.5	
10	4119, 4120.02, 4120.03 (C gravel)	Granular Surface			100				50-80	25-60							3, 11
11	4119, 4120.02, 4120.04, 4120.05, 4120.07, (A, B Cr. St.)	Granular Surface & Shoulder		100	95-100	70-90			30-55	15-40						6-16	4, 5, 11
12a	4121 (Cr. St.)	Granular Subbase	100			40-80				5-25						0-6	6, 11
12b	4121 (Cr. Gravel)	Granular Subbase	100			50-80				10-30					5-15	3-7	7, 11
13a	4122.02 (Cr. St.)	Macadam St. Base	3" nominal maximum size screened over 3/4" or 1.00" screen.														
13b	4122.02	Macadam Choke St.	100													6-16	11
14	4123	Modified Subbase	100		70-90					10-40						3-10	5, 7, 11
18	4117 (No. 4 Cr. Gr., Cr. St., or Nat. Sand)	Leveling Aggregate						100	95-100	50-80					0-15	0-4	11
19	4117, 4125 (1/2" Cr. Gr. or Cr. St.)	Cover Aggregate			100	97-100		40-90	0-30	0-15						0-1.5	11
20	4125 (1/2" Scr. Gr.)	Cover Aggregate			100	95-100		40-80	0-15	0-7						0-1.5	11
21	4117, 4125 (3/8" Cr. Gr. or Cr. St.)	Cover Aggregate				100		90-100	10-55	0-20	0-7					0-1.5	11
22	4124	Fine Slurry Mixture						100	85-100	40-95	20-60	14-35				5-25	9, 11
23	4124 (Cr. St.)	Coarse Slurry Mixture						100	70-90	40-70	19-42					5-15	11
29	4131	Porous Backfill			100	95-100		50-100	0-50	0-8							11
30	4132.02 (Cr. St.)	Special Backfill	100							10-40						0-10	5, 11, 14
31	4132.03 (Gravel)	Special Backfill		100	90-100	75-100				30-55						3-7	11
32	4133 (Sand/Gr./Cr. St.)	Granular Backfill	100% passing the 3" screen														
35	4134 (Natural Sand/Gr.)	Floodable Backfill	100							10-100						0-10	8, 11
36	4134 (Natural Sand)	Floodable Backfill							100	20-90						0-4	11
37	2320 (Quartzite/Granite/Slag)	Polymer-Modified Microsurfacing						100	90-100	65-90	30-50	18-30				5-15	12, 13
38	2320 (limestone/Dolomite)	Polymer-Modified Microsurfacing						100	70-90	45-70	15-35	10-25				5-15	12, 13

Notes: (Gradations No. 15, 16, 17, 24, 25, 26, 27, 28, 33, and 34 have been deleted)

1. For Section 4110, when the fine aggregate is sieved through the following numbered sieves - 4, 8, 16, 30, 50, and 100 - no more than 40% shall pass one sieve and be retained on the sieve with the next higher number.
2. When used in precast and prestressed concrete bridge beams, 100% shall pass the 1.00" sieve. When used for pipe bedding the No. 200 restriction does not apply.
3. When compaction of material is a specification requirement, the minimum percent passing the No. 200 sieve is 6%.
4. See specifications for combination of gravel and limestone.
5. Unwashed air dried samples of crushed composite material shall be tested for gradation compliance except that no gradation determination will be made for material passing the No. 200 sieve.
6. The gradation requirement for the No. 8 sieve shall be 5% to 20% when recycled material is supplied.
7. For Section 4121 gravel, one fractured face on 30% or more of the particles retained on the 3/8 inch sieve. For Section 4123 gravel, one fractured face on 75% or more of the particles retained on the 3/8 inch sieve.
8. Crushed stone shall have 100% passing the 1 1/2" sieve.
9. Gradation limitations for the 30, 50, and 100 sieves shall not apply when slurry mixture is applied by hand lutes, such as for slurry leveling.
10. Maximum of 2.5% passing the No. 200 sieve allowed if for crushed limestone or dolomite when documented production is 1% or less.
11. When Producer gradation test results are used for acceptance, test results representing at least 90% of the material being produced shall be within the gradation limits and the average of all gradation results shall be within the gradations limits. Stockpiled material not meeting the criteria may, at the District Materials Engineer's discretion, be resampled using Materials I.M. 301 procedures. One hundred percent of the stockpile quality control and verification test results shall be within the gradation limits.
12. For Quartzite/Granite/Slag: 45% to 70% passing No. 16 Sieve; for Dolomite/Limestone: 25% to 50% passing No. 16 Sieve.
13. Percent passing shall not go from the high end to the low end of the range for any two consecutive screens.
14. If the material meets the quality requirements of Article 4120.04, a maximum of 14% passing the No. 200 sieve will be allowed.