"2014 Consent Decree Defendants"
City of Alameda
City of Albany
City of Berkeley
City of Emeryville
City of Oakland
City of Piedmont
East Bay Municipal Utility District (EBMUD)
Stege Sanitary District

REGIONAL STANDARDS

for Sanitary Sewer System Installation, Rehabilitation and Repair

June 30, 2016

June 30, 2021 (revised)

Prepared under Consent Decree Case. Nos. C09-00186-RS & C09-05684-RS

this page intentionally blank

Table of Contents

List of Abbreviations

1. Introduction 1
2. Background Information 1
3. Regional Standards Development 2
4. Future Standards Revisions and Reporting 3

Figures

Figure 1. EBMUD Service Area, Satellite Boundaries, and Facilities 2

List of Attachments

Attachment A. Best Management Practices (BMPs) 5
Attachment B. Amendment to Green Book Standard Specifications 19

List of Abbreviations

AMIP	Asset Management Implementation Plan
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
BMP	Best Management Practice
CCTV	Closed Circuit Television
CD	Consent Decree
CDD	2014 Consent Decree Defendants
CIPP	Cured-In-Place Pipe
CLSM	Controlled Low Strength Material
EBMUD	East Bay Municipal Utility District
EPA	United States Environmental Protection Agency
GB	Green Book
HDPE	High Density Polyethylene
I/I	Inflow and Infiltration
LF	Linear Feet
MH	Maintenance Hole ("Manhole" in Green Book)
MWWTP	Main Wastewater Treatment Plant
PE	Polyethylene
PSL	Private Sewer Lateral
RTSP	Regional Technical Support Program
SSO	Sanitary Sewer Overflow
UPC	Uniform Plumbing Code
VCP	Vitrified Clay Pipe
WWF	Wet Weather Facility

1. Introduction

East Bay Municipal Utility District (EBMUD) and seven Satellite Agencies (the Cities of Alameda, Albany, Berkeley, Emeryville, Oakland, and Piedmont, plus Stege Sanitary District, which serves El Cerrito, Kensington, and Richmond Annex) entered into a Consent Decree in United States, et al. v. East Bay Municipal Utility District (Case Nos. CV 09-00186 and CV 09-05684, N.D. Cal.) with the United States Environmental Protection Agency (EPA), state and regional water boards, San Francisco Baykeeper, and Our Children's Earth Foundation. The Consent Decree, approved by the court on September 22, 2014, requires EBMUD and the Satellites to eliminate discharges from EBMUD's three wet weather facilities (WWFs) by 2036 in all storms not exceeding the magnitude of the storm event specified in the Consent Decree.

The Consent Decree (CD) requires EBMUD and the Satellites, jointly referred to as the 2014 CD Defendants (CDD), to create Regional Standards for sewer installation, repair, and rehabilitation, to assist inflow/infiltration (I/I) reduction in the regional wastewater collection system. The CD further states that a group report of the recommended Regional Standards is to be submitted for EPA's review and approval by June 30, 2016 and every five years thereafter.

These Regional Standards have been developed as required pursuant to the Satellites' and EBMUD's I/I Reduction Program requirements in Paragraphs 33, 43c, 54c, 64c, 73c, 83d, 96c, and 107c of the Consent Decree.

2. Background Information

EBMUD conveys and treats wastewater generated by the seven Satellites. Each Satellite owns and operates its own sanitary sewer system that collects wastewater generated in their respective communities and conveys the flows to EBMUD's Interceptor System. The Interceptor System then conveys the flows to the Main Wastewater Treatment Plant (MWWTP) where it is treated. Treated effluent from the MWWTP is discharged through an outfall located near the eastern span of the San Francisco-Oakland Bay Bridge. During significant precipitation events, excessive amounts of rain and groundwater enter the collection system through multiple avenues, such as deteriorated and defective pipes or illicit storm drain connections, causing an increase in I/I. Currently, during certain significant wet weather events, the MWWTP is relieved by, and primary treatment is provided at EBMUD's WWFs, located at Point Isabel, Oakport, and San Antonio Creek.

During wet weather events, flows related to I/I are dominant compared to flows during dry weather conditions. Peaking factors, calculated as a ratio of peak flow to dry weather flow (i.e., base sanitary flow plus groundwater infiltration), are approximately 13:1 on a system-wide average, with some locations having ratios determined to be as high as 40:1. Comparatively, designs for new separated sanitary sewer collection systems assume peaking factor ratios of 3:1, while older systems have ratios in the 7:1 range.

Figure 1 shows EBMUD's service area, the boundaries of the Satellites, and the location of conveyance and treatment facilities. EBMUD's Interceptor System includes approximately 29 miles of gravity sewers, 8 miles of force mains, and 15 pump stations; the Satellite collection systems include approximately 1,600 miles of sewers (gravity and force mains) and numerous pump stations.

Figure 1. EBMUD Service Area, Satellite Boundaries, and Facilities

3. Regional Standards Development

These Standards have been developed as the result of a joint, collaborative effort of the 2014 CD Defendants (CDD). Meetings to review construction standards, specifications and other details were conducted between June 2015 and June 2016. A standards committee (committee), consisting of representatives from the eight agencies, attended these meetings and were active participants in the review, discussion, and decisions made regarding the standards.

Best Management Practices (BMPs)

The committee decided that in addition to construction specifications, preferred practices regarding important I/I related sewer system construction issues should be identified. The committee considered many issues and developed practices in the major categories of: maintenance holes, laterals, connections, construction and rehabilitation, and construction inspection. The developed BMPs are included in Attachment A.

Specifications

The specifications are based on the 2015 edition of the "Standard Specifications for Public Works Construction", commonly referred to as the Green Book. The Green Book was originally developed in 1967 by a 400-person task force made up of representatives of public agencies and contractors. It is now reviewed and revised every three years by a 15-person committee comprised of public works officials and contractors; more than 200 cities, counties, and special agencies have adopted it as their standards for public works construction. Revisions to the Green Book specifications have been made by the CDD standards committee in the form of an "Amendment to Green Book Standard Specifications" (Attachment B). The amendment includes additions, deletions, and revisions to the Green Book that are to be used by the CDD in their sewer system projects, and focuses on specifications that will assist in reduction of I/I. Consequently, many Green Book specification sections were not revised because they are not significantly related to or impact I/I reduction. Therefore, most General Provisions, and procedural issues in contracts such as payment details and paving have been excluded from the Amendment. As a result, this document focuses on pipe materials, maintenance holes, cleanouts, appurtenances and their installation, and rehabilitation of sewers.

Additional review of specifications and research was accomplished through numerous contacts and calls to other agencies previously surveyed during CD negotiations and manufacturers and product suppliers, as well as internet searches of related issues.

4. Future Standards Revisions and Reporting

The Consent Decree requires the CDD to submit a group report for EPA's review and approval every five years subsequent to June 30, 2016. An ongoing effort by CDD is required to address the review of current practices, materials and methods of construction, and the CD requirement for updates and revisions to these Regional Standards.

The CDD standards committee will meet quarterly to review and discuss results of construction efforts, both successes and failures, and to review current and new materials, methods, products, and techniques that may potentially benefit the CDD in their effort to reduce I/I and make the sewer systems as watertight as is feasible. Additionally, CDD agencies will pilot new products and practices that may be included as future specifications or BMPs; these results will be presented to the committee when available. Therefore, these Standards will be in a state of continuous analysis and improvement, so the CDD can adapt to an ever-changing industry regarding I/I. Some of these efforts to try new and different practices for work on collection system components such as maintenance holes, and service and maintenance hole connections will be monitored and analyzed as part of the RTSP.

As required by the CD, each CDD agency will continue to include a section in their respective annual reports that describes the extent of their compliance with the Regional Standards.

ATTACHMENT A

2014 CONSENT DECREE DEFENDANTS (CDD)
REGIONAL STANDARDS
BEST MANAGEMENT PRACTICES (BMP)

Maintenance Holes

- ☐ New, Replacement, and Rehabilitation
- ☐ Covers

Laterals

- ☐ General
- ☐ Abandoned

Connections

- ☐ Laterals to Main Lines
- ☐ Main Lines to Maintenance Holes

Lamp Holes (or Rodding Inlets)

Construction/Rehabilitation

- ☐ Prohibited Rehabilitation Methods and Materials
- ☐ Acceptance and Testing
- ☐ Contractor Licensing

Inspection Coverage

CDD
REGIONAL STANDARDS
BEST MANAGEMENT PRACTICES (BMPs)

(6/30/16)

MAINTENANCE HOLES - NEW, REPLACEMENT, AND REHABILITATION

Objective Ensure the short and long-term integrity of maintenance holes through the use of appropriate rehabilitation standards, so I/I is minimized as a result.

Explanation Maintenance holes can be a significant source of I/I and ones in poor condition can also lead to a cause of sanitary sewer overflows (SSOs). The installation of new maintenance holes and/or the use of proper materials and rehabilitation methods as part of pipeline rehabilitation projects can help to prevent future maintenance hole problems and failures that may also cause I/I.

Practices

- Maintenance holes will be replaced as a part of rehabilitation and replacement projects unless there are localized, specific conditions that dictate rehabilitation of maintenance holes is needed rather than replacement with a new maintenance hole. Maintenance holes may not necessarily need to be replaced depending upon specific circumstances - e.g., a maintenance hole may have been replaced within the recent past using materials and methods that are consistent with the Regional Standards, do not show any evidence of I/I, and therefore would not need replacement. A statistically representative sample of brick maintenance holes that have been coated with epoxy rather than replaced or lined will be inspected at a frequency not to exceed five years.

- If new maintenance holes are lined, coated, or waterproofed, it will be done with products as specified in CDD's Amendment to the Green Book (GB) (201-10.6.1).

- Testing and acceptance will be done as described in the testing and acceptance BMP and as specified in CDD's amendment to the GB (303-9.2).

- Any rehabilitation of maintenance holes will be in accordance with the CDD amendments to the GB section on Maintenance hole Rehabilitation (500-2). Epoxy coatings will usually be the means of rehabilitation, and the mortar and epoxy coatings used will be

products as specified in CDD's amendment to the GB (201-10.6 and 500-2.3).

- CDD will replace covers and frames, as needed depending upon specific conditions, as part of maintenance hole rehabilitation.

- CDD will reform maintenance hole bases and channels as part of rehabilitation, as determined necessary.

CDD
REGIONAL STANDARDS
BEST MANAGEMENT PRACTICES (BMPs)

(6/30/16)

MAINTENANCE HOLES - COVERS

Objective Ensure that maintenance hole covers in areas that are prone to flooding are watertight so that I/I is minimized as a result.

Explanation Maintenance hole covers that are prone to being submerged during storms or other events can be a significant source of I/I and can also lead to a cause of sanitary sewer overflows (SSOs). The use of proper cover types can help to prevent SSOs and excessive I/I.

Practices

- CDD will install watertight maintenance hole covers on any maintenance holes it finds that may be submerged during storms and wet weather events.

- CDD will identify maintenance holes that are prone to vandalism, or in areas where vandalism or the unauthorized removal of their covers could result in significant SSO or I/I issues, and install locking maintenance hole covers on those maintenance holes.

CDD
REGIONAL STANDARDS
BEST MANAGEMENT PRACTICES (BMPs)

(6/30/16)

LATERALS - GENERAL

Objective Ensure the short and long-term integrity of laterals through the use of appropriate standards for materials and practices used for the installation, repair, and rehabilitation of laterals, so I/I is minimized as a result.

Explanation Laterals are often a source of significant I/I and may contribute to main line sanitary sewer overflows (SSOs). The use of proper materials and construction methods can help to prevent the occurrence of defects in laterals that may compromise their integrity and lead to SSOs and I/I. Although all or some portions of laterals are privately owned, agencies should regulate them as part of their overall program for I/I and SSO control and reduction.

Practices

- All work on private laterals, or building sewers, will be done in accordance with the current versions of the Uniform Plumbing Code and California Plumbing Code (Chapter 7, Part II, Building Sewers).

- Connections to sewer mains will adhere to the GB and CDD amendments to the GB.

- Materials used for laterals will also be in accordance with the materials used for public facilities in the GB and CDD amendments to the GB.

- CDD will have the ability to inspect laterals and require replacement or rehabilitation of defective laterals.

- Testing of laterals will be done per EBMUD's PSL Program requirements for laterals. (Note: Berkeley has their own program with similar requirements)

CDD
REGIONAL STANDARDS
BEST MANAGEMENT PRACTICES (BMPs)

(6/30/16)

LATERALS - ABANDONED

Objective Ensure the short and long-term integrity of main lines and laterals through the use of appropriate acceptance testing standards after the installation, repair, and rehabilitation of collection system facilities, so I/I is minimized as a result.

Explanation Abandoned laterals that are still connected to other laterals or main lines can be a significant source of I/I & can cause sanitary sewer overflows (SSOs) due to excessive flows through voids or defects. Disconnection and capping or plugging of abandoned laterals can help to prevent SSOs and I/I.

Practices

- All abandoned laterals discovered through CCTV and video work will be plugged and capped at the main line, in accordance with the California Plumbing Code, Chapter 7 (722.0), and within five feet of the building drain.

- The approved manner of capping and plugging will include the disconnection of the abandoned lateral such that the lateral is definitely separated from the main line or other lateral to which it is connected. Low strength concrete, or CLSM (section 201-6 in CDD's amendment to the GB), may also be placed in the area of the plug or cap to ensure no connection still exists.

- Agencies will actively look for abandoned laterals as a part of construction of new pipe, rehabilitation of pipe, review of redevelopment or infill projects, or in the process of inspections in regards to lateral inspections. This may include additional video work or dye testing to verify or confirm whether or not laterals are active or abandoned.

- CDD and EBMUD will look for abandoned laterals as part of EBMUD's lateral and RTSP programs. Similarly, Berkeley will look for abandoned laterals as part of their lateral program.

CDD
REGIONAL STANDARDS
BEST MANAGEMENT PRACTICES (BMPs)

(6/3016)

CONNECTIONS - LATERALS TO MAIN LINES

Objective Provide service connections that are in accordance with common, current practices and technology that will minimize I/I, in both the near and long term time frames.

Explanation Service connections, or the connections of laterals to main lines, are often a significant source of I/I. The use of current, common practices and technology can help to prevent connection problems and failures that may cause SSOs and I/I.

Practices

- Rehabilitation projects - Re-establishment of external service connections will be made with the use of polyethylene saddles and stainless steel bands, and flexible couplings, according to CDD amendments to the GB (500-1.1.7(a)). Alternatively, shear-band couplings, TapTite and Inserta-Tee connections may be used.

- Rehabilitation projects - The materials used for service connections to main lines when HDPE pipe is used for rehabilitation will be according to CDD amendments to the GB (500-1.6.6), use of electrofusion saddles.

CONNECTIONS - MAIN LINES TO MAINTENANCE HOLES

Objective Provide maintenance hole connections that are in accordance with current, common practices and technology that will minimize I/I, in both the near and long term time frames.

Explanation Maintenance hole connections are often a significant source of I/I. The use of current, common practices and technology can help to prevent connection problems and failures that may cause SSOs and I/I.

Practices

- Connection to existing maintenance holes - connections will be made per CDD amendments to the GB (303-9.1.o in CDD's amendment to the GB).

- Rehabilitation projects - connections will be made in accordance with CDD amendments to the GB, either by waterstop gasket and grout or HDPE thermal-fused pipe restraints (500-1.6.7 in CDD's amendment to the GB).

- This BMP also pertains to larger diameter lateral lines that may be connected directly to manholes (City of Oakland).

LAMPHOLES or RODDING INLETS

Objective Provide for the integrity of lampholes or, alternatively, for the integrity of what is utilized to replace them so I/I is minimized as a result.

Explanation Lampholes can be a contributing cause of sanitary sewer overflows (SSOs) and a significant source of I/I. The use of proper materials and methods for their replacement or removal can help to prevent SSOs and I/I. Rodding inlets which utilize a 45-degree connection to the main line places less impact on the connection to the main line and should be used when replacing with rodding inlets.

Practices

- Lampholes will be replaced as part of rehabilitation work by either small maintenance holes, terminating the main line, or by new "rodding inlets", depending upon their location, accessibility, and need in future operations as determined by the local agency. They may also be replaced independent of rehabilitation efforts when there's a need to do so, as determined by the local agency.

- Lamphole replacements will be done in accordance with EBC's amendments to the GB, the GB, and other EBC BMPs. Lampholes replaced by rodding inlets in Stege Sanitary District will be done in accordance with Stege's standard detail for rodding inlets.

CDD
REGIONAL STANDARDS
BEST MANAGEMENT PRACTICES (BMPs)

(6/30/16)

CONSTRUCTION/REHABILITATION - PROHIBITED REHABILITATION METHODS AND MATERIALS

Objective Ensure the short and long-term integrity of sewer infrastructure through the use of appropriate rehabilitation methods and materials standards, so I/I is minimized as a result.

Explanation Rehabilitation methods and materials used in sewer rehabilitation projects vary, have changed significantly since the 1980s, and there very likely will be developments and changes in the future. The use of proper materials and rehabilitation methods can help to prevent future mainline problems and failures that may also cause SSOs and increased I/I. Consequently, certain methods and materials should be prohibited for use by CDD.

Practices

- **Materials** that shall not be used -
  Non-reinforced concrete pipe
  Cast iron soil pipe
  Corrugated steel pipe and arch pipe
  Structural steel plate pipe and arch
  Corrugated aluminum pipe and pipe arch
  Structural aluminum plate pipe and arch
  ABS pipe

- **Methods** that should not be used -
  PVC Pipe lining systems
  External in-place wrap
  Folded and re-formed PVC pipe liner
  PVC closed profile liner pipe
  Machine spiral wound PVC pipe liner

CDD
REGIONAL STANDARDS
BEST MANAGEMENT PRACTICES (BMPs)

(6/30/16)

CONSTRUCTION/REHABILITATION - ACCEPTANCE AND TESTING

Objective Ensure the short and long-term integrity of main lines and laterals through the use of appropriate acceptance and testing standards after the installation, repair, and rehabilitation of collection system facilities, so I/I is minimized as a result.

Explanation Inadequate construction can be a cause of sanitary sewer overflows (SSOs) and a significant source of I/I. The use of proper acceptance and testing standards can help prevent substandard construction that may lead to SSOs and I/I.

Practices

- All new installations of gravity main lines will be pressure and leak tested (either water or air) in accordance with Green Book specifications (306-7.8.2 in CDD's amendment to the GB).
- All new and rehabilitated gravity lines will be cleaned prior to acceptance (500-1.1.4 in CDD's amendment to the GB).
- All pipeline rehabilitation and replacement work will undergo leakage testing and acceptance standards as established in the CDD amendments to the GB for pipeline rehabilitation (500-5).
- All new and rehabilitated maintenance holes will be vacuum tested as specified in the CDD amendments to the GB (303-9.2).
- All pipe installed by pipe bursting will be inspected by CCTV or video inspection prior to acceptance, per CDD amendments to the GB for pipe bursting (500-1.6.13).
- Completion, acceptance, and warranty items will be handled according to the GB (Part 1, 6-8 in CDD's amendment to the GB).

CDD
REGIONAL STANDARDS
BEST MANAGEMENT PRACTICES (BMPs)

(6/30/16)

CONSTRUCTION/REHABILITATION - CONTRACTOR LICENSING

Objective Enhance the likelihood that there is a high quality of all work on sanitary sewer facilities by requiring licensing of contractors that will perform the work.

Explanation California law and code sections require that contractors performing certain work shall be licensed by the state in regards to the specific type of work to be performed. The use of contractors with the applicable licenses enables conformance with California law as well as helping to ensure that work will be of good quality and help the CDD attain the I/I reductions required by the CD and help attain the required I/I reductions.

Practices

- CDD will use or permit contractors to perform sewer infrastructure work that have at least one or more of the following State contractors licenses, depending upon the type of work to be done:

  A General Engineering
  C-34 Pipeline
  C-36 Plumbing
  C-42 Sanitation System

- The work that that a C-36 licensed contractor may perform is restricted to laterals, excluding the connections to public main lines.

CDD
REGIONAL STANDARDS
BEST MANAGEMENT PRACTICES (BMPs)

(6/30/16)

INSPECTION COVERAGE

Objective Ensure that work on pipeline projects is of high quality and in accordance with specifications by providing adequate construction management, inspection, and oversight.

Explanation Poor construction and construction that doesn't conform to specifications can occur if proper construction inspection and oversight is not provided. This can result in facilities that degrade and perhaps even fail earlier than their expected useful life, and significant I/I may result. Proper inspection will help to prevent pipeline, maintenance hole, and other problems and failures that may cause SSOs and I/I.

Practices

- CDD will assign construction inspectors to every sewer infrastructure project under their respective jurisdictions.
- CDD inspectors will witness as many main line connections to maintenance holes and lateral reconnections to newly installed main lines in sanitary sewer or I/I projects as is practically possible.
- An inspector will witness acceptance testing processes that include the extent of the entire project.
- A record or log of witnesses, inspections, and acceptance testing on sewer infrastructure projects will be maintained.

this page intentionally blank

ATTACHMENT B

2014 CONSENT DECREE DEFENDANTS AMENDMENT TO THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION (GREEN BOOK)

2015 edition (6/30/16)

For Collection System Construction, Rehabilitation and Repair in Agencies Located in Special District No. 1, East Bay Municipal Utility District (EBMUD)

This Amendment to the Standard Specifications for Public Works Construction applies to the construction, rehabilitation, and repair of the Consent Decree Defendants (CDD) wastewater collection and transmission systems, including agency sewer mains and interceptors, laterals, force mains, and maintenance holes. This amendment is the "Regional Standards" referred to in the 2014 Consent Decree (CD) - the CD defines them thusly: Regional Standards shall mean a collection of details, specifications, and practices prescribing how the Work on Sewer Mains, Maintenance holes and Sewer Laterals is to be performed so as to optimize the I&I reductions resulting from the Work. This Amendment was developed for the on-going asset management construction and activities ("Work") of the East Bay Communities. The amendment was prepared for the Cities of Albany, Alameda, Berkeley, Emeryville, Oakland, Piedmont, the Stege Sanitary District, and EBMUD (individually referred to as "Agency" in CDD's amendment to the GB specifications). This Amendment modifies the Standard Specifications for Public Works Construction (Green Book), 2015 Edition, and its provisions take precedence over those Standard Specifications. This Amendment incorporates only the amended sections and not the entire Green Book.

this page intentionally blank

AMENDMENT - TABLE OF CONTENTS

PART 1 – GENERAL PROVISIONS

2-5.2 Precedence of Contract Documents

PART 2 – CONSTRUCTION MATERIALS

201-6 CONTROLLED LOW STRENGTH MATERIAL (CLSM)
201-6.1 General and Quality Assurance
201-6.1.1 Cementitious Material
201-6.1.2 Mix Proportions
201-6.1.3 Strength and Density
201-6.1.4 Mixture
201-6.1.5 Native and Imported Soils
201-6.2 Mix Design
201-6.2.1 Submittals-Mix Design and Testing
201-6.3 Materials
201-6.4 Execution - Batching and Mixing, and Installation
201-6.4.1 Batching and Mixing
201-6.4.2 Installation

201-10 MAINTENANCE HOLES, CLEANOUTS AND APPURTENANT MATERIALS
201-10.1 Materials
201-10.1.1 Rock Base
201-10.1.2 Cement Mortar.
201-10.2 Maintenance Holes
201-10.2.1 Cast-In-Place Concrete Maintenance holes
201-10.2.2 Pre-cast Maintenance hole Sections
201-10.2.3 Maintenance hole Bases
201-10.2.4 Plastic Pipe Connections
201-10.2.5 Maintenance hole Extensions
201-10.2.6 Jointing Maintenance hole Sections
201-10.3 Cleanouts
201-10.4 Lampholes
201-10.5 Appurtenant Materials
201-10.5.1 Pipe and Fittings
201-10.5.2 Pipe Stubouts for Future Sewer Connections
201-10.6.1 Sealing Maintenance hole Walls
201-10.6.1 (a) Cement-Epoxy Mixtures
201-10.6.1 (b) Chemical Grout
201-10.6.1 (c) Polyurethane Coatings
201-10.6.1 (d) Modified Polyester/Polymorphic Coatings

201-10.6.1 (e) Epoxy Coating
201-10.6.1 (f) Fiberglass Liners
201-10.6.1 (g) HDPE Liners
201-10.6.1 (h) Cementitious Crystalline Waterproofing

207-19 POLYETHYLENE (PE) SOLID WALL GRAVITY PIPE
207-19.1 General

207-25 POLYETHYLENE (PE) LARGE DIAMETER (36 INCH DIAMETER OR GREATER) PROFILE WALL PIPE
207-25.1 General
207-25.2 Material Composition
207-25.3 Test Requirements
207-25.4 Marking
207-25.5 Dimensions

PART 3 – CONSTRUCTION METHODS

303-9 INSTALLATION OF MAINTENANCE HOLES, CLEANOUTS AND APPURTENANCES
303-9.1 General
303-9.1.a Structure Excavation and Backfill
303-9.1.b Rock Base
303-9.1.c Concrete Maintenance hole Base
303-9.1.d Placing Precast Maintenance hole Sections
303-9.1.e Maintenance hole Channels
303-9.1.f Drop Maintenance holes/Drop Connection Maintenance holes
303-9.1.g Flexible Joints
303-9.1.h Pipe Stubouts for Future Sewer Connections
303-9.1.i Permanent Plugs.
303-9.1.j Maintenance hole Extensions
303-9.1.k Maintenance hole Frames and Covers
303-9.1.l Maintenance hole over Existing Sewers
303-9.1.m Connection to Existing Maintenance holes
303-9.1.n Special Maintenance holes.
303-9.1.o Sewer Cleanouts
303-9.2 Structure Testing
303-9.2.a Vacuum Testing.
303-9.2.b Hydrostatic Testing

306-3 TRENCH EXCAVATION
306-3.1 General
306-3.5 Maximum Length of Open Trench
306-7 Prefabricated Gravity Pipe
306-7.4 Vitrified Clay Pipe (VCP)
306-7.4.4 Special Joints

306-7.8.2.1(e) Pressure Testing and Leakage Inspection

306-16 BUILDING SEWERS
306-16.1 General
306-16.1.1 Records to be Kept
306-16.2 Material

PART 5 – PIPELINE SYSTEM REHABILITATION

500-1 PIPELINE REHABILITATION.
500-1.1.5 Television Inspection
500-1.1.6 Sampling, Testing and Installation
500-1.1.7 Miscellaneous
500-1.1.7 a) Service Connections
500-1.2.6 Installation and Field Inspection
500-1.3 High Density Polyethylene (HDPE) Solid Wall Liner
500-1.3.1 General
500-1.4 Cured-in-Place Pipe Liner (CIPP) Liner
500-1.4.1 General
500-1.4.2 Material Composition and Testing

TABLE 500-1.4.2 (A)
CIPP Liner Minimum Flexural Requirements for Polyester Resin

500-1.4.4 Chemical Resistance
500-1.4.5 Installation
500-1.4.8 Repair and Rejection
500-1.4.9 Material Testing
500-1.4.10 Spill Prevention in Curing Process

500-1.5 Polyvinyl Chloride (PVC) Pipe Lining System

500-1.6 Pipe-Bursting Method
500-1.6.1 General
500-1.6.1.1 Preliminary Surface Inspection
500-1.6.2 Contractor Qualifications
500-1.6.2.1 Field Supervisory Qualifications
500-1.6.3 Contractor Submittals
500-1.6.3.1 Contractor Qualifications
500-1.6.3.2 Drawings and Documents

500-1-6-4 Materials
500-1.6.4.1 High Density Polyethylene (HDPE) Pipe
500-1.6.5 Pipe Joining for Sections of HDPE Pipe
500-1.6.6 Service Connection Materials

500-1.6.7 Sealing Connections at Maintenance holes
500-1.6.8 Pipe Bursting Equipment
500-1.6.9 Execution of Work - General
500-1.6.10 Preparation of Work
500-1.6.11 Insertion of the HDPE Pipe
500-1.6.12 Service Reconnections
500-1.6.13 Testing and Acceptance

500-1.7 Deformed/Reformed HDPE Liner

500-1.9 External In-Place Wrap

500-1.10 Folded and Re-formed PVC Pipe Liner

500-1.12 Polyvinyl Chloride (PVC) Closed Profile Liner Pipe

500-1.13 Machine Spiral Wound Polyvinyl Chloride (PVC) Pipe Liner

500-2 MAINTENANCE HOLE AND STRUCTURE REHABILITATION.
500-2.1 General
500-2.2 Leakage at Frames and Covers
500-2.2.1 Replace Cover
500-2.2.2 Adjust Frame and Cover
500-2.2.3 Replace Frame and Cover
500-2.3 Sealing Maintenance hole Walls
500-2.4 Remove and Replace Existing Sewer Structure
500-2.5 Testing

500-5 ACCEPTANCE TESTING
500-5.1 General
500-5.2 Leakage Testing
500-5.3 Miscellaneous Testing
500-5.4 Acceptance

Part 1 – GENERAL PROVISIONS

Section 2 – Scope and Control of Work

REPLACE SUBSECTION 2-5.2 WITH THE FOLLOWING:

2-5.2 Precedence of Contract Documents.

The principal contract specifications for this project are the "Standard Specifications for Public Works Construction, 2015 edition", commonly referred to as the Green Book. The Contractor shall note that the Green Book is not reproduced in this document, but is self-contained under separate cover and the Contractor shall obtain it separately.

The East Bay Communities Amendment to the Standard Specifications for Public Works Construction, 2015 edition contains modifications and additions to the Green Book that are specific to collection system work. These provisions shall take precedence over the Green Book.

If there is a conflict between any of the Contract Documents, the document highest in the order of precedence shall control. The order of precedence from highest to lowest, shall be as follows:

a) Permits issued by jurisdictional/regulatory agencies
b) Change Orders and Supplemental Agreements; whichever occurs last
c) Contract/Agreement
d) Addenda
e) Bid/Proposal
f) Special Provisions
g) Plans (Project)
h) East Bay Communities Amendment to the Standard Specifications for Public Works Construction, 2015 edition (Green Book) and 2015 edition of the Green Book (if Agency uses the Green Book as its Standards specifications)
i) Standard Plans and Details (Agency)
j) Standard Specifications (Agency)
k) Reference Specifications

Part 2 – CONSTRUCTION MATERIALS

REPLACE SECTION 201-6 WITH THE FOLLOWING:

201-6 CONTROLLED LOW STRENGTH MATERIAL (CLSM).

201-6.1 General and Quality Assurance.

201-6.1.1 Cementitious Material. CLSM shall be composed of a cementitious material, water and suitable native or imported soils as described in this section.

The cementitious materials shall be Portland cement. Fly ash may be substituted for cement provided the requirements of this section are met.

201-6-1.2 Mix Proportions. The appropriate CLSM mix proportions shall be determined by preparing test batches and testing trial cylinders in accordance with 201-6.2.

201-6.1 Strength and Density. CLSM shall have an unconfined compressive 28 day strength from 50 psi to a maximum of 150 psi and a density of 110 to 130 pounds per cubic foot.

201-6.1.4 Mixture. The mixture shall have a consistency such that the CLSM completely fills the space between the pipe and the excavated trench walls without bleeding or segregation of soil materials.

The CLSM mixture shall contain no particles larger than 3 inches.

201-6.1.5 Native and Imported Soils:

The soil shall be free of organic impurities.

The amount of material passing a #200 sieve shall not exceed 30 percent.

The plasticity index of the soil shall not exceed 3. The sand equivalent of the soil shall be at least 15. For native material with a sand equivalent between 10 and 15, approval shall be dependent on production and successful testing of a sample batch of CLSM.

During full-scale CLSM placement, the Engineer will take samples and perform tests to determine compliance with the specified unconfined compressive strength requirements.

201-6.2 Mix Design. The design of the CLSM mix shall be the responsibility of the Contractor, and shall be subject to review and approval by the Engineer before a full-scale field mix is used. Mix shall result in a final product that meets the requirements of this section.

201-6.2.1 Submittals - Mix Design and Testing. CLSM mix shall be designed, in accordance with ASTM D4832-02 Standard Test Method for Preparation and Testing of Controlled Low Strength Material Test Cylinders. The CLSM used in test cylinders shall be prepared using the same equipment proposed for full-scale batching and mixing.

The testing laboratory shall submit certified copies of all laboratory trial mix reports to the Engineer.

CLSM shall not be used prior to the Engineer's review of test reports and approval of the mix design.

The minimum cement content for the mix design shall be 3 percent by dry mass of the soil.

Cementitious fly ash (Class C or F) may be used in the mix provided the strength and consistency requirements in 201-6.1 are met.

Air entraining admixtures may be used in the mix provided the strength and consistency requirements in 201-6.1 are met.

The CLSM shall be sampled according to ASTM D5971.

The following tests shall be conducted on the native soils proposed for use in preparing CLSM: ASTM D422 and ASTM D4318.

The following tests shall be conducted for each CLSM trial batch: ASTM D4832, ASTM D6023, ASTM D6024.

The Contractor shall submit the results of the laboratory testing program and the selected design mix for full-scale field production for review and approval by the Engineer. After

acceptance, the batch and mix process or native soil source material shall not be changed without submitting new test information.

The Contractor shall provide a submittal showing the proposed methods to support the pipe during CLSM placement.

The Contractor shall provide a submittal showing the proposed methods to prevent pipe flotation during CLSM placement.

The Contractor shall provide a submittal detailing the proposed batching and mixing process including the following:

The proposed equipment and methods to process native soils into source material in compliance with 201-6.1.

The proposed staging and batch plant mixing areas relative to the work areas where the CLSM will be placed.

The proposed means of transport for mixed CLSM material from the batching and mixing area to the work where the CLSM will be placed.

201-6.3 Materials.

Cement shall conform to ASTM C150, Type II.

Cementitious fly ash (Class F or C) may be used in the mix provided that the strength and consistency requirements in 201-6.1 are met. The fly ash shall conform to ASTM C618 and shall not contain more than 3% carbon (low).

Air entraining admixtures may be used in the mix provided that the strength and consistency requirements in 201-6.1 are met.

Native soils used in the CLSM mix shall be predominantly granular and meet the requirements of 201-6.1.

Water shall be free from oil, salts and other impurities that would have an adverse effect on the quality of the CLSM.

201-6.4 Execution - Batching and Mixing, and Installation.

201-6.4.1 Batching and Mixing: Batch and mix the CLSM in the field with the processed native soils similar to that used in the trial mix program.

201-6.4.2 Installation:

Use sufficient shores or other supports to prevent soil from caving onto pipe. Remove soil fallen into trench before placing CLSM.

CLSM shall be placed on one side of the pipe and allowed to flow under until it is seen on the other side.

The CLSM shall be brought uniformly to the elevation as shown on the drawings.

Place CLSM between the trench bottom and 0.15 D above the bottom of the pipe as part of a single lift, where D is the diameter of the pipe.

The CLSM shall be placed so there is complete contact between the pipe and excavated pipe trench walls.

Prevent CLSM from entering bell holes before joint coating and testing are complete.

If CLSM is placed near a joint before application and testing of joint coating, place a blanket or cover over joint to prevent CLSM spatter onto joint area.

The support materials used to haunch the pipe and contain the CLSM during placement shall not exceed the compressive strength of the CLSM.

The Contractor shall take the necessary measures to prevent flotation of the pipe during CLSM placement.

CLSM shall not be placed when the air temperature is below 4°C (40°F).

Allow CLSM to set before placing backfill above CLSM.

No equipment or traffic shall be allowed on the CLSM until the surface of the CLSM will withstand the weight of the equipment or traffic without displacement or damage. Suitability for load applications shall be determined by ASTM D6024.

If necessary to prevent displacement or damage, provide steel trench plates that span the trench or other means that prevent equipment or traffic contact with CLSM.

ADD NEW SUBSECTION 201-10 TO READ AS FOLLOWS:

201-10 MAINTENANCE HOLES, CLEANOUTS AND APPURTENANT MATERIALS.

Material quality, the manufacture process, and the finished sections shall be subject to the Engineer's inspection and approval. Such inspection may be made at the manufacture place and/or on the job site after delivery. The materials shall be subject to rejection at any time for failure to meet any of the Specification requirements even though samples may have been accepted as satisfactory at the manufacture place. Materials rejected after delivery to the job site shall be marked for identification and shall be removed at once from the job site. All materials damaged after delivery and prior to project acceptance by City shall be rejected, even if installed. The Engineer's judgment on the materials shall be final. The Contractor may attempt to make acceptable repairs on installed material(s), if the Engineer so agrees. However, the Engineer's judgment on the repairs' acceptability will be final. Unsatisfactory material shall be removed and replaced with satisfactory material entirely at the Contractor's expense. The Engineer may accept a certification indicating compliance with the specifications in lieu of inspection.

201-10.1 Materials.

201-10.1.1 Rock Base. Rock base shall conform to the requirements of 200-1.2 and shall be the ¾" inch mix according to Table 200-1.2 (A).

201-10.1.2 Cement Mortar. Cement mortar shall conform to the requirements of 201-5.

201-10.2 Maintenance holes

201-10.2.1 Cast-In-Place Concrete Maintenance holes. Materials used in cast-in-place concrete maintenance holes shall be as shown on the plans and in accordance with the applicable requirements of 201.

201-10.2.2 Pre-cast Maintenance hole Sections. Pre-cast maintenance hole sections, where not otherwise modified in the Plans, shall conform to ASTM C478 and meet the following requirements:

a. The wall thickness shall not be less than 5 inches.
b. All sections shall be fully cured and shall not be shipped nor subjected to loading until the design compressive strength has been reached.
c. Pre-cast base sections shall have the base slab integral with the sidewalls. Pre-cast base sections may only be used if the invert plan and base alignment of the sewer connections exactly match the field-measured angles between the connecting sewers.

201-10.2.3 Maintenance hole Bases. Materials used in cast-in-place concrete maintenance hole bases shall be in accordance with the applicable requirements of Section 201. At the Contractor's option and with the Engineer's approval, pre-cast base sections with integral floor conforming to ASTM C478 may be used.

201-10.2.4 Pipe Connections. Pipe connections to maintenance holes shall have a rubber waterstop tightly banded to the pipe and cast into the maintenance hole base. Banding materials shall be 316 stainless steel or other approved corrosion resistant materials secured with Type 316 stainless steel nuts and bolts. See Section 500-1.6.7, Sealing Connections at Maintenance holes, for HDPE pipe.

201-10.2.5 Maintenance hole Extensions. Concrete grade rings for extensions shall be a maximum of six inches thick. In general, maintenance hole extensions will be used on all maintenance holes in roads, streets or other locations where a subsequent change in existing grade may be likely. Extensions will be limited to a maximum height of 12inches.

201-10.2.6 Jointing Maintenance hole Sections. Male and female joints of maintenance hole sections shall be sealed with a round rubber "O" ring gasket or a preformed flexible joint sealant. The "O" ring shall conform to ASTM C443. The preformed flexible joint sealant shall conform to Federal Specifications SS-S00210, and shall be Kent Seal No. 2 as manufactured by Hamilton-Kent; Ram-Nek as manufactured by K. T. Snyder Company; or equal. The size of the preformed joint sealant shall be as recommended by the manufacturer of the pre-cast maintenance hole sections

201-10.3 Cleanouts. Cleanouts shall be as shown on the Plans or the Standard Details and shall be the same material type as approved for use in main or building sewer construction.
201-10.4 Lampholes. Lampholes shall be as shown on the Plans or the Standard Details and shall be the same material type as approved for use in main sewer or building connection sewer construction.

201-10.5 Appurtenant Materials.
201-10.5.1 Pipe and Fittings. Pipefittings, including material for drop connections at the maintenance hole, shall be the type and dimensions as shown on the Plans or Agency Standard Details, as applicable, or as specified in these specification amendments.
201-10.5.2 Pipe Stubouts for Future Sewer Connections. Pipe stubouts shall be the same type as approved for use in lateral, main, or trunk sewer construction. Strength classifications shall be same class as in adjacent trenches. Where there are two different pipe classes at a maintenance hole, the higher strength pipe will govern strength classification. Rubber-gasketed watertight plugs shall be furnished with each stub-out and shall be adequately braced against all hydrostatic or air pressures.
201-10.6.1 Sealing Maintenance hole Walls. Maintenance hole walls shall be sealed where shown or specified, or as directed by the Engineer. Sealing of the maintenance hole walls shall be accomplished by any of the methods specified below:
201-10.6.1.a Cement-Epoxy Mixtures. Openings, cracks, and deteriorated joints in maintenance hole walls shall be repaired and sealed by utilizing cement-epoxy mixtures manufactured for this purpose, such as those manufactured and/or supplied by Standard Dry Wall Products; Water-Wastewater Products & Systems, Inc.; IPA Systems, Inc.; Stonehard, Inc.; or approved equal.
201-10.6.1.b Chemical Grout. Openings, cracks, and deteriorated joints in maintenance hole walls shall be repaired and sealed using chemical grout and applicable procedures specified for sewer system rehabilitation.
201-10.6.1.c Polyurethane Coatings. Sprayable polyurethane coating shall be used to seal maintenance hole walls. The coating shall be a high-build polyurethane specifically formulated for use in a sewer system environment. The minimum thickness of the dry coating shall be 125 mils.
201-10.6.1.d Modified Polyester/Polymorphic Coatings. Spray-applied modified polyester/polymorphic resin shall be used to seal maintenance hole walls. The coating shall be a two-component, 100% solids system. Prior to applying the prime coat, the maintenance hole surface shall be sandblasted or hydroblasted and properly dried.
201-10.6.1.e Epoxy Coating. Sprayable or brushable epoxy coatings may be used to seal maintenance hole walls. The coating shall be a high-build epoxy, Mainstay DS-5 or approved equal, specifically formulated for use in the sewer system and applied in accordance with manufacturer's recommendations and guidelines and at 50-125 mils thickness in one or two coats. Prior to coating, the maintenance hole walls shall be thoroughly sandblasted or hydroblasted and cleaned as recommended by the manufacturer to ensure complete coverage and bonding. Openings and cracks larger than 1/8 inch in the maintenance hole walls shall be filled with mortar, Mainstay ML-72 or ML-72F, or approved equal, at one-half to one inch thickness, prior to trimming and applying the epoxy coating.
201-10.6.1.f Fiberglass Liners. Existing maintenance hole walls shall be thoroughly sandblasted and cleaned or primed as recommended by the materials manufacturer to ensure complete coverage and bonding. Openings and cracks larger than 1/8 inch in the maintenance hole walls shall be filled with mortar prior to priming and applying the fiberglass.

i) Factory-Manufactured Fiberglass Liners. Maintenance hole liners shall be made of fiberglass reinforced plastic (FRP), having an inside diameter of not less than 42 inches. Maintenance hole liners shall meet the requirements of ASTM D3753. The liner shall be installed in accordance with manufacturer's recommendations including removal of the existing cone, grouting of the annular space between the liners and existing maintenance hole walls, rebuilding or replacing the cones, backfilling, installing steps, and installing cast iron frames and covers.

ii) Field-Fabricated Fiberglass Liners. Maintenance hole liners shall be field-fabricated by applying glass fibers and resin to the maintenance hole walls. The completed lining thickness shall be not less than 1/4 inch at any location.

201-10.6.1.g HDPE Liners. Lining manufacturer shall be GSE "Studliner", GU-International AGRU "Suregrip" or equal. Polymer mortar shall consist of a primer if recommended by the manufacturer and a liquid binder and a dry aggregate mixed together to make a mortar of consistency as required for the application. The mortar shall be designed for application to vertical or overhead surfaces and must be accepted by the lining manufacturer. The liquid binder shall be chemical and oil resistant, stress relieved, low modulus, moisture insensitive, two-component epoxy-resin compound. The consistency shall be similar to lightweight oil for proper mixing with aggregate. Material shall conform to ASTM C881, type 3, Grade 1, Sika Corporation Sikadur 22 Lo-Mod Series or equal.

i) HDPE lining, joint strips and angle strips (hereinafter collectively referred to as "lining") shall be made from minimum 97 percent virgin high density polyethylene (HDPE). Color shall be gray.

ii) Lining shall be impermeable to sewage gases and liquids and shall be nonconductive to bacterial or fungal growth. All linings shall be factory checked to ensure freedom from porosity.

iii) Lining shall have good impact resistance, shall be flexible, and shall have elongation sufficient to bridge up to ¼ inch settling crack.

iv) Once cast into the concrete of the maintenance hole wall, lining shall be permanently and physically attached to the concrete by the lining studs and shall not rely on an adhesive bond unless otherwise specified at a specific location.

v) Locking studs shall be made of the same material as the lining and integrally extruded with the sheet. Stud spacing shall be on approximately 1.25-inch centers, such that there are approximately 110 studs per square foot.

vi) Plasticizer shall not be added to the resin formation.

vii) Lining shall be free of holes, pinholes, bubbles, blisters, excessive contamination by foreign matter, and nicks and cuts on roll edges.

viii) Adhesive to bond HDPE lining to metal shall be in accordance with the recommendations of the HDPE lining manufacturer.

ix) All work shall be in strict conformity with all applicable specifications, instructions, and recommendations of the lining manufacturer.

x) Prior to shipping lined precast maintenance hole sections and then again after field welding is complete, the lining shall be spark tested in the presence of the Engineer. The spark test shall be done with an approved electrical holiday detector (Turnhert Rasor, model AP-W with power pack or equal) with the instrument set at a minimum of 20,000 volts. Any imperfection shall be repaired in accordance with the manufacturer's recommendations and with the approval of the Engineer.

201-10.6.1.h Cementitious Crystalline Waterproofing. Waterproofing manufacturer shall be Xypex Chemical Corporation, Xypex Concentrate, Modified, Patch'n Plug or equal. Application shall be in accordance with Xypex recommended specifications.

i) For use in new maintenance holes, the Xypex materials Admix C-500, Admix C-1000, Admix C-2000 or equal shall be used.

207-19 POLYETHYLENE (PE) SOLID WALL GRAVITY PIPE.

207-19.1 General.

ADD THE FOLLOWING TWO SENTENCES TO THE END OF THE SUBSECTION:

HDPE pipe used for direct burial shall be a minimum of SDR 17. HDPE pipe used for the pipe-expanding method of Subsection 500-1.6 shall be SDR 17.

ADD NEW SUBSECTION 207-25 TO READ AS FOLLOWS:

207-25 POLYETHYLENE (PE) LARGE DIAMETER (36 INCH DIAMETER OR GREATER) PROFILE WALL PIPE.

207-25.1 General. Polyethylene (PE) profile wall pipe and fittings for use in gravity flow sanitary sewers and storm drains, and for use as liners for sanitary sewers shall comply with ASTM F894.

207-25.2 Material Composition. Pipe fittings shall be made from a plastic compound meeting the requirements of type III, class C, category 5, grade P 34 as defined in ASTM D1248 and with established hydrostatic design basis (HDB) of not less than 1250 psi for water at 73.4 degrees F determined in accordance with method ASTM D2837. Materials meeting the requirements of cell classification PE 334433 C or higher cell classification in accordance with ASTM D3350 are also suitable.

Materials other than those specified above may be used as part of the profile construction (for example, as a core tube to support the shape of the profile during the processing, provided that these materials are compatible with the PE material, are completely encapsulated in the finished product, and in no way compromise the performance of the PE pipe product in the intended use.

Materials shall meet the chemical resistance tests of 210-2.3.3.

207-25.3 Test Requirements. Pipefittings shall meet the requirements of the section titled "Requirements" of ASTM F894. The Engineer will require certification by the manufacturer that the test results comply with specifications requirements. Sampling and inspection shall meet the requirements of the section titled "Sampling, Inspection, and Retest" of ASTM F894.

207-25.4 Marking. Each standard and random length of pipe shall be clearly marked with the following information: the nominal pipe size (in inches); the legend “PE sewer and drain pipe”; the RSC classification; the material designation: P-34 grade or cell classification; the manufacturer's name; the production code and plant location; and manufacture date.

207-25.5 Dimensions. Pipe dimensions shall comply with dimensions given in Table I of ASTM F894. Pipe shall have a RSC as shown on the Plans. RSC is defined in ASTM F894.

Part 3 – CONSTRUCTION METHODS

ADD NEW SUBSECTION 303-9 TO READ AS FOLLOWS:

303-9 INSTALLATION OF MAINTENANCE HOLES, CLEANOUTS AND APPURTENANCES.

303-9.1 General.

303-9.1.a Structure Excavation and Backfill. Structure excavation and backfill shall conform to the applicable requirements of 300-3 and 306-1.

303-9.1.b Rock Base. Prior to placing the concrete maintenance hole base, a minimum of six inches of rock base or crushed rock approved by the Engineer shall be placed upon the earth subgrade and compacted to 90 percent (90%) relative compaction by mechanical means.

303-9.1.c Concrete Maintenance hole Base. Concrete maintenance hole base shall be constructed as shown on the Plans and Agency Standard Details, as applicable, and shall conform to the applicable requirements of Section 303. The concrete shall be vibrated to density and screened so that the first precast maintenance hole section will be placed on a level uniform bearing surface for the full circumference. An approved metal forming ring shall be used to form a level joint groove in the fresh concrete of the maintenance hole base to receive the first precast maintenance hole section. Sufficient mortar or Ram-Nek shall be deposited on the base to assure a watertight seal between base and maintenance hole wall or the first precast maintenance hole section shall be placed on the concrete base before the concrete has set. The first section shall be properly located and plumbed.

303-9.1.d Placing Precast Maintenance hole Sections. Precast maintenance hole sections shall be carefully inspected prior to installation. Sections with chips or cracks in the tongue shall not be used. The ends of precast maintenance hole sections shall be cleared of foreign materials.

The precast sections shall be installed in a manner that will result in a watertight joint. Rubber "O" Ring gaskets or preformed flexible joint sealant shall be installed in strict conformance with the manufacturer's recommendations. Only pipe primer furnished by the gasket manufacturer shall be used. If leaks appear in the maintenance holes, the inside joint shall be caulked with non-shrink epoxy mortar to the satisfaction of the Engineer.

303-9.1.e Maintenance hole Channels. Maintenance hole channels shall be constructed as shown on the Plans and Agency Standard Details, as applicable, and with smooth transitions to ensure unobstructed flow through the maintenance hole. All sharp edges or rough sections that tend to obstruct flow shall be removed. Where a full section of pipe is laid through a maintenance hole, a neatly cut half pipe shall be laid to form the channel. The exposed edge of the pipe shall be completely covered with mortar. All mortar surfaces shall be troweled smooth. Breaking out the top half section of pipe after installation is not acceptable.

303-9.1.f Drop Maintenance holes/Drop Connection Maintenance holes. Drop maintenance holes and drop connection maintenance holes shall be constructed at locations indicated and as shown on the plans. The drop assembly shall be connected to the sewer pipe with an adapter approved by the Engineer. The lower elbow shall be supported by concrete poured monolithically with the maintenance hole base.

303-9.1.g Flexible Joints. Flexible joints shall be provided not more than 1-1/2 feet from maintenance hole walls. Pipes entering maintenance holes shall be installed on firmly compacted base rock or crushed rock approved by Engineer.

303-9.1.h Pipe Stubouts for Future Sewer Connections. Maintenance hole stubouts for future sewer connections shall be installed as shown on Plans or required by the Engineer. Maximum and minimum length outside the maintenance hole wall shall be as shown on the Agency's Standard Details, as applicable. Pipes in precast walls or maintenance hole base shall be constructed in accordance with details shown on the Plans. Compacted base rock or crushed rock approved by Engineer as specified herein before shall be placed upon the earth under all stubouts.

Semi-permanent plugs shall be installed in the stubout ends with gasket joints similar to the sewer pipe being used. Plugs shall be capable of withstanding all internal or external pressures without leakage and remain watertight. All plugs shall be adequately braced to prevent blowoffs.

303-9.1.i Permanent Plugs. Interior contact surfaces of all pipes to be cut off or abandoned shall be cleaned. Concrete plugs shall be constructed in the end of all pipe 18 inches or less in diameter. Minimum length of concrete plugs shall be 8 inches. All plugs shall be watertight and capable of withstanding all internal and external pressures without leakage, as approved by the Engineer.

303-9.1.j Maintenance hole Extensions. Extensions shall be installed in conformance with the details shown on the Plans and to a height to match finished grade. Grade rings shall be lined in mortar with the sides plumb and tops level. Joints shall be sealed as specified for maintenance hole sections. Extensions shall be watertight.

303-9.1.k Maintenance hole Frames and Covers. Frames and covers shall be installed on top of maintenance holes to prevent all infiltration of surface water or groundwater into maintenance holes. Frames shall be set in a bed of mortar with mortar carried over the flange of the ring as shown on the Plans. Frames shall be set so cover tops are flush with surface of adjoining pavement or ground surface, unless otherwise shown or directed. Concrete maintenance hole collars shall be provided and installed as shown on the Plans and Agency's Standard Details, as applicable. Maintenance hole covers and frames for maintenance holes identified as ones likely to be periodically submerged in wet weather events shall be prevented from blowing off during sewer surcharging by installation of maintenance hole frames with bolted lids, and bearing surfaces shall be sealed with a neoprene gasket, if shown on plans.

303-9.1.l Maintenance hole over Existing Sewers. Maintenance holes shall be constructed over existing operating sewer lines at locations indicated. Excavation shall be as specified. Flow through existing sewer lines shall be maintained at all times. New concrete and mortar work shall be protected for a period of seven days after concrete has been placed. The Contractor shall advise Engineer of plans for diverting sewage flow and obtain the Engineer's approval before starting. The Engineer's approval shall not relieve the Contractor of the responsibility for maintaining adequate flow capacity at all times and adequately protecting new and existing work.

The new maintenance hole base shall be constructed under and around the existing sewer as specified herein. The top half of the existing pipe shall be neatly removed within the new maintenance hole, the edges covered with mortar, and troweled smooth.

303-9.1.m Connection to Existing Maintenance holes. Sewers shall be connected to existing maintenance holes at locations indicated. The Contractor shall provide all diversion facilities and perform all work necessary to maintain sewage flow in existing sewers during connection to the maintenance holes. The Contractor shall break out existing maintenance hole bases or grouting as necessary and regrout to provide smooth flow into and through existing maintenance holes.

303-9.1.n Special Maintenance holes. Special maintenance holes shall be constructed in conformance with the applicable requirements of Section 303 and as shown on the Plans.

303-9.1.o Sewer Cleanouts. Cleanout construction shall be as shown on the Plans and Agency's Standard Details, as applicable. The cleanout shall be the same material as the main line sewer unless approved otherwise by the Engineer.

303-9.2 Structure Testing.

303-9.2.a Vacuum Testing. All project maintenance holes shall be vacuum tested. The Contractor shall furnish all materials, equipment and labor for making a vacuum test. Vacuum test procedures and requirements shall be as follows:

1. All maintenance hole openings shall be sealed with plugs and a rubber ring "donut" type plug inserted inside the cone opening.
2. A small vacuum pump shall be attached to a hose connected to the plug and 4 psi of vacuum shall be applied.
3. The vacuum shall be permitted to stabilize at 3.5 psi for one minute; then the test shall begin. The maintenance hole must maintain vacuum such that no greater then 0.5-psi of vacuum shall be lost during the specified test period.
4. The specified test period is as follows:

Maintenance hole Depth (Ft.)	Test Period (Min.)
0-5	4.5
5-10	5.5
10-15	6.0
Greater than 15	6.5

6. Maintenance holes failing the test shall be patched as required and re-tested.
7. A vacuum regulator shall be provided on the vacuum pump such that no pressure greater than 10 psi can be applied to the maintenance hole during the test. All maintenance holes not meeting the leakage test or are unsatisfactory from a visual inspection shall be repaired to the Engineer's satisfaction.

303-9.2.b Hydrostatic Testing. At the Contractor's option and with the Engineer's approval, hydrostatic testing may be substituted for vacuum testing. The test shall consist of plugging all inlets and outlets and filling the maintenance hole with water to a height determined by the Engineer. Leakage in each maintenance hole shall not exceed 0.1 gallon per hour per foot of head above the invert. All maintenance holes that do not meet the leakage test or are unsatisfactory from a visual inspection shall be repaired to the Engineer's satisfaction. Contractor is responsible for supplying water for testing.

306-3 TRENCH EXCAVATION.

306-3.1 General.

ADD THE FOLLOWING PARAGRAPH TO THE END OF SUBSECTION 306-3.1:

Where directed to pothole to verify the depths of underground utility crossings, the Contractor shall excavate to locate said underground utility crossings and relay this depth information to the Engineer.

REPLACE SUBSECTION 306-3.5 WITH THE FOLLOWING:

306-3.5 Maximum Length of Open Trench. Except with the Engineer's written permission, the maximum length of open trench at any one time shall be 300 feet (91 meters).

306-7 PREFABRICATED GRAVITY PIPE.

306-7.4 Vitrified Clay Pipe (VCP).
ADD NEW SUBSECTION 306-7.4.4 TO READ:
306-7.4.4 Special Joints. Type "D" joints shall be used to join sections of pipe of dissimilar material.

306-7.8.2.1(e) Pressure Testing and Leakage Inspection.
ADD THE FOLLOWING TO THE END OF SUBSECTION 303-7.8.2.1(e)
Pipeline cleaning shall be performed prior to CCTV inspection in accordance with 500-1.1.4.

ADD NEW SUBSECTION 306-16 TO READ:
306-16 BUILDING SEWERS.
306-16.1 General. Building sewer work shall consist of reconnecting existing building sewers to the new pipe or rehabilitated sewer main in accordance with 500-1.1.7(a), the Standard Specifications, and as specified herein.

The two uppermost lateral connections on a sewer main below a cleanout, lamphole or maintenance hole with no upstream sewer shall be connected with a wye-connection.

306-16.1.1 Records to be Kept. The Contractor shall maintain a list of the active/inactive building sewers showing:

1. Approximate distance from upstream maintenance hole on public sewer
2. Building sewer status: active or inactive
3. Address being served by active building sewer

The Contractor shall deliver to the Engineer two copies of the completed logs prior to acceptance of work. Logs shall be provided in an electronic format, acceptable for incorporation with existing geospatial information systems.

306-16.2 Material. Pipe for building sewers shall be vitrified clay, high density polyethylene, cast iron, or any other material approved by the Engineer. Connections of building sewers to public sewer mains shall be made only by using a Wye branch, a Tee branch, a drilled tap or saddle as approved by the Engineer.

The size of any building sewer shall be at least as large as the existing building sewer to which it connects, but in no case less than four inches (102 mm).

When an existing five-inch (127 mm) building sewer is encountered, the Contractor shall install a six-inch (152 mm) connection to the main and construct six-inch (152 mm) building sewer to the reconnection point. At the reconnection point, a five-inch to six-inch increaser shall be used.

PART 5 – PIPELINE SYSTEM REHABILITATION

500-1 PIPELINE REHABILITATION.

500-1.1.5 Television Inspection.
ADD THE FOLLOWING TO THE END OF THE SUBSECTION:

All inspections shall be documented with written reports that include a NASSCO Pipeline Assessment Certification Program (PACP) coding of all defects, or the Agency's standard coding of defects if different than NASSCO. The PACP coding shall be accomplished by an operator or worker who holds current PACP certification.

500-1.1.6 Sampling, Testing and Installation.
ADD THE FOLLOWING THREE PARAGRAPHS TO THE END OF THE SUBSECTION:

Prior to beginning work, Contractor shall clean sewer pipe of any obstruction and debris including roots in accordance with 500-1.1.4. The Contractor shall provide pre-rehabilitation CCTV inspection in accordance with 500-1.1.5. Point Repairs, if required, shall be performed as specified in 500-1.2.

All insertion processes shall be carried out in compliance with all applicable Cal-OSHA requirements. The installation Contractor shall have the necessary Cal-OSHA licenses before the work commences. Special attention shall be paid to the safety requirements involving work in confined spaces and work with steam.

The Contractor shall remove all protruding laterals that may prevent proper liner insertion. The removal method for protruding laterals shall be submitted with the shop drawings for approval.

500-1.1.7 Miscellaneous.

500-1.1.7 a) Service Connections.

ADD THE FOLLOWING TO THE END OF SUBSECTION 500-1.1.7a).

External Service Reconnections. The Contractor shall expose the building sewer and make arrangements with the occupant and/or owner to access all the plumbing fixtures in each building and perform dye tests to determine if the exposed building connection sewer is active. If the occupant or owner denies access to the building, the exposed building connection sewer shall be assumed active unless otherwise directed by the Engineer and shall be reconnected in accordance with these specifications.

If the service connection is to be re-established with an external reconnection, the existing service connections shall be excavated and disconnected at the joint. The existing sewer (now the host or carrier pipe for the liner) shall be carefully broken/removed to expose the liner to the extent necessary without damaging the liner. The liner pipe shall be allowed to normalize to ambient temperature and to cool down before a hole is drilled out. This (and any other) “coupon” shall be retrieved and handed over to the Engineer for inspection of liner integrity, if requested by the Engineer. A pre-fabricated polyethylene saddle equipped with a neoprene gasket and a protruding stub-out shall be installed onto the exposed liner with an epoxy-bonding agent over the cut out. The saddle's attached stub-out must protrude into the liner a distance equal to the liner's wall thickness. The strap-on saddle shall then be tightened with two Type 301 stainless steel or higher-grade bands, one on each side. The nuts and bolts shall be Type 305 stainless steel. The new stub-out, or lateral, shall be connected to the existing service line with a flexible coupling. The stubout attached to the saddle shall not be smaller than the nominal size of the service line to which it is to be attached. All exposed liner shall be encased in concrete. The entire connection structure, including the main, saddle, stub-out, and exposed building connection sewer shall be backfilled as specified in 500-1.3.6.3.

For service reconnection locations in the street, all CIPP lined sewers shall have service connections reconnected externally. The Contractor may elect to temporary reconnect the lateral by internal method, but no additional payment shall be made for the temporary connection.

Internal Service Reconnections. For service reconnections locations in the sidewalks and in easements where CIPP lined sewers are installed, Internal service reconnections shall be. Internal service reconnections use a remote-control cutting device operating within small diameter pipe or directly for man-entry pipe. A color, pivot head CCTV camera shall be attached to the cutting device for precise location of service connections and inspection of the liner pipe. The CCTV inspection shall be performed in the same direction as the CCTV inspection performed before liner insertion.

The Contractor shall have a fully operation backup device for the remote-control cutting device. If the Contractor is unable for any reason to re-establish remotely the service connections, the Contractor shall re-establish each service connection by open excavation at no additional cost.

The remote-control cutting device must provide nearly full-diameter holes, free from burrs or projections, each hole providing a minimum of 95% and a maximum of 100% of the original service connection diameter and area. The new hole edges shall be smooth and crack free with no loose material. The service connection invert shall match the bottom of the reinstated service opening.

REPLACE SUBSECTION 500-1.2.6 WITH THE FOLLOWING**:**

500-1.2.6 Installation and Field Inspection. The installation of the replacement pipe and/or repair work shall conform to Section 306. One or a combination of the following three point repair methods shall be used. The selected method shall be subject to the Engineer's approval prior to implementation.

a) **Repair Clamp.** Install full circle repair clamps as recommended by the manufacturer and approved by the Engineer. All full circle repair clamps shall be of Type 316 stainless steel fastened with Type 305 stainless steel nuts and bolts.
b) **Heat-Shrink Sleeve.** Install in accordance with manufacturer's recommendations.
c) **Remove and Replace Pipe or Fittings.** Remove defective pipe or fittings to the nearest joint or by cutting perpendicular to the pipe axis to leave a plain end. Prepare a replacement section of like pipe material (or as otherwise approved by the Engineer or shown on the drawings). Make connections using shielded couplings, or heat-shrink sleeves.

500-1.3 High Density Polyethylene (HDPE) Solid Wall Liner.

REPLACE SUBSECTION 500-1.3.1 TO READ:

500-1.3.1 General. HDPE solid-wall liner pipe shall comply with ASTM D3350 and ASTM F714. Fittings shall comply with ASTM D2683 or ASTM D3261. Fittings fabricated by mitered, butt fusions are also permitted. Unless otherwise specified or approved, the outside diameter of the line shall not be less than 90 percent of the inside diameter of existing pipes, and the standard dimension ratio (SDR) of the liner for sliplining shall be equal to 26.

500-1.4 Cured-in-Place Pipe Liner (CIPP) Liner.

REPLACE THE WORDS "epoxy or epoxy vinyl-ester resin" WITH "epoxy, or epoxy vinyl-ester resin" WHEREVER THEY APPEAR IN SUBSECTION 500-1.4.

500-1.4.1 General.

REPLACE SUBSECTION 500-1.4.1 WITH THE FOLLOWING:

500-1.4.1 General.

- CIPP liner for pipeline rehabilitation shall be either of two types:
  Type A – inversion process in compliance with ASTM F1216 or
  Type B – pull-in-place process in compliance with ASTM F1743.

- The CIPP liner shall use an approved epoxy, or epoxy vinyl-ester resin-impregnated flexible fabric tube.
- **The minimum liner thickness shall be 0.236 inch (6.0 mm).**

- Prior to commencing work, the Contractor shall provide submittals on all lining materials and resins and shall furnish manufacturer certification that the liner material complies with the requirements stated herein. The submittals shall include information about all component materials. In accordance with 2-5.3, the Contractor shall submit shop drawings of construction details, including complete manufacturer's recommendations for storage procedures, temperature control, removing roots and protruding laterals, liner handling and insertion, curing details, re-establishing service connections, trimming and finishing. The shop drawings shall include placement location(s) and method(s) and bypass location(s) with sufficient detail to assure that the work can be accomplished without sewage spill. The Contractor shall also provide manufacturer's certification, field measurements and pipe-sizing calculations that demonstrate that the liner has been properly sized to avoid the creation of wrinkles or folds and to avoid gaps between the liner and the host pipe. Only manufacturer-licensed and certified contractors shall install CIPP liner.

500-1.4.2 Material Composition and Testing.

REPLACE THE WORDS "epoxy or epoxy vinyl-ester resin" WITH "epoxy, or epoxy vinyl-ester resin" WHEREVER THEY APPEAR IN SUBSECTION 500-1.4.2.

ADD THE FOLLOWING TO THE END OF THE SECOND PARAGRAPH OF SUBSECTION 500-1.4.2:

The certified test results shall be from liner samples that have undergone the same curing process, formulation, size and thickness as that proposed to be installed. All material testing shall be performed at the Contractor's expense by a registered, independent, third party laboratory approved by the Engineer. A certificate of compliance and certified test results from an independent third-party laboratory shall also be provided for long-term flexural modulus.

ADD TABLE 500-1.4.2 (A) TO READ:

TABLE 500-1.4.2 (A)

CIPP Liner Minimum Flexural Requirements for Polyester Resin			
Type of Polyester Resin [1]	Flexural Modulus (E) (Initial[2], psi)	Flexural Modulus (E_L) (Long Term[3], psi)	Flexural Strength (psi)
Enhanced	400,000	200,000	4,000
Standard	300,000	150,000	4,500

[1] Only one type of resin shall be used for this project.
[2] The initial flexural modulus is defined in ASTM D790.
[3] The long-term flexural modulus is defined as fifty years and is determined by ASTM D2990 Test Method.

The Engineer may, at any time prior to installation, direct the Contractor to obtain cured samples and test them in accordance with the appropriate ASTM standards.

REPLACE SUBSECTION 500-1.4.4 WITH THE FOLLOWING:

500-1.4.4 Chemical Resistance.

The CIPP liner furnished shall meet the chemical resistance requirements of ASTM D5813. The CIPP liner shall also meet the chemical resistance requirements of ASTM F1216 or ASTM F1743, depending upon the installation method. The Contractor shall submit to the Engineer verification that the CIPP liner complies with the ASTM testing requirements. This verification of compliance shall be in written form of a finalized, signed, and dated independent laboratory report. The date on this report shall constitute the compliance date.

REPLACE SUBSECTION 500-1.4.5 WITH THE FOLLOWING:

500-1.4.5 Installation

- The outer diameter of the tube shall be properly sized to allow for expansion to ensure that the CIPP can fit snugly against the host pipe. The installed CIPP liner shall tightly fit the internal circumference and length of the original pipe. The gap between the existing pipe ID (inside diameter), and the OD (outside diameter) of the installed liner pipe shall not exceed 0.25 inches at any point along the pipeline. The pipe shall be rejected if shrinkage exceeds this amount.
- The CIPP shall be installed in accordance with the manufacturer's recommendations as approved by the Engineer and ASTM F1216 or ASTM F1743. Immediately prior to installation, the CIPP liner tube shall be saturated with resin (on or off the job site) and stored / transported at a cool temperature as recommended by the resin manufacturer.
- Before tube installation, the manufacturer shall provide data on the tube's maximum allowable stresses and elongation. The exterior of the manufactured tube shall be marked along its length at regular intervals not exceeding five feet. These marks shall be used as a gauge to measure elongation during installation. Any tube length experiencing overall elongation greater than five percent shall be rejected and replaced at the Contractor's expense.
- If the cured pipe does not fit tightly against the host pipe at its termination point(s), the void shall be sealed by filling with a resin mixture compatible with the CIPP Liner.
- Wrinkles in the finished liner pipe that cause a backwater, reduce the pipe's hydraulic capacity or structural stability, or create voids between the liner and pipe wall are unacceptable and shall be removed and repaired at the Contractor's expense.
- Measurements to confirm that the liner's outside diameter is within the acceptable tolerance shall be made at the lateral connections, maintenance holes and terminal ends after liner stabilization has occurred and prior to re-establishing the service connections.
- Laterals shall be reconnected the same day of the liner installation.

REPLACE SUBSECTION 500-1.4.8 WITH THE FOLLOWING:

500-1.4.8 Repair and Rejection. The Contractor shall replace the pipeline in any reaches that the liner samples fail to meet the standard specifications.

ADD SUBSECTION 500-1.4.9 TO READ:

500-1.4.9 Material Testing. The Contractor shall provide certified test results of the short term structural properties of the cured lining material from the actual installed liner at a minimum of one location per each liner insertion setup as part of the acceptance requirements. All material testing shall be performed by a registered, independent, third party laboratory approved by the Engineer at the Contractor's expense.

The cured liner shall be sampled and tested for flexural strength and flexural modulus (short term) in accordance with the requirements of ASTM F1216 or ASTMF1743 and ASTMD790. The liner shall be in conformance with the structural properties specified in 500-1.4.2.

In addition, the Contractor shall furnish all liner ends for each installation to the Engineer for inspection and thickness verification. These samples shall be used to confirm the liner's thickness meets the specified requirement.

The Contractor shall replace the pipeline in any reach that the liner samples fail to meet the project specifications.

ADD NEW SUBSECTION 500-1.4.10 TO READ:

500-1.4.10 Spill Prevention in Curing Process. In addition to the Spill Prevention and Control in section 7-8.6, the Contractor is required to submit a plan for review by the Engineer to prevent and contain any water leak/spill during curing process. No water from the boiler is allowed to spill into street, gutters, storm drains or creek.

500-1.5 Polyvinyl Chloride (PVC) Pipe Lining Systems.

DELETE THE SUBSECTION.

500-1.6 Pipe-Bursting Method.
500-1.6.1 General. The pipe bursting method is a type of trenchless construction in which a bursting tool splits/fractures the existing pipe while simultaneously installing a new polyethylene pipe of the same size or larger using a static or pneumatic pipe bursting technique. The Contractor shall furnish all labor, equipment, materials, tools, and appurtenances necessary or proper for the performance and completion of pipe bursting work.
500-1.6.1.1 Preliminary Surface Inspection. The Contractor shall make a careful preliminary surface inspection of the site along which the operation is run. Special note shall be taken and a photographic record shall be kept of the following:

1) Signs of surface cracks in roadways, sidewalks, and other paved areas;
2) Evidence of cracks and misalignments in boundary walls and structure walls near the trench;
3) Evidence of recent road work;
4) Current work in progress by other contractors;
5) Signs of possible leakage from water or gas mains; and
6) Other relevant features present before operations commence.

The preliminary surface inspection work shall be considered part of the sewer installation work and no separate payment will be made.

500-1.6.2 Contractor Qualifications. The Pipe Bursting Contractor shall have experience and qualifications in the installation of pipe using pipe bursting as required by the Agency.
500-1.6.2.1 Field Supervisory Qualifications. Field supervisory personnel employed by the pipe bursting contractor shall have at least three (3) years of documented experience in the performance of the work and tasks as stated in contract documents.

500-1.6.3 Contractor Submittals.
500-1.6.3.1 Contractor Qualifications. The Contractor shall submit, with other bid documents, documentation of their project and personnel experience with other projects similar in size and nature to the project specified in the contract documents.
500-1.6.3.2 Drawings and Documents. Shop drawings, catalog data, and manufacturer's technical data showing complete information on material composition, physical properties, and dimensions of new pipe and fittings shall be submitted prior to installation. A manufacturer's compliance certificate for these specifications shall be provided by the Contractor for all material furnished under this specification. Prior to beginning pipe installation the Contractor shall provide a certificate of conformance to the applicable ASTM specifications.

500-1-6-4 Materials.
500-1.6.4.1 High Density Polyethylene (HDPE) Pipe. Polyethylene pipe shall be high density polyethylene pipe (HDPE) and meet applicable requirements of ASTM F714 and ASTM D3035. HDPE pipe and fittings shall be used in accordance with the material specifications. All additional appurtenances (maintenance holes, tees, gaskets, etc.) shall meet the material specifications.
Pipe Joining. All pipe installed by pipe bursting shall be joined by butt fusion, electro fusion (per ASTM F2620), or full circle clamp as detailed in 500-1.6.5, Pipe Joining.
Pipe Production. HDPE pipe shall be produced from resins meeting the requirements of ASTM D1248, designation PE3408, ASTM D3350 cell classification PE345444C, and will meet the requirements of AWWA C901 and C906. HDPE pipe shall meet the minimum stability requirements of ASTM D3350.
Pipe Markings. Pipe shall be legibly marked at intervals of no more than five (5) feet with the manufacturer's name, trademark, pipe size, HDPE cell classification, appropriate legend such as SDR 17, ASTM D3035, AWWA C901 or C906, date of manufacture and point of origin.
Pipe Material. All pipe shall be made of virgin material. No rework material except that obtained from the manufacturer's own production of the same formulation shall be used. The pipe shall be homogeneous throughout and shall be free of visible cracks, holes, foreign material, blisters, or other deleterious faults.

Pipe Color and Quality. For CCTV inspection purposes, the HDPE pipe shall have a light-colored interior achieved with a homogeneous, light-colored material throughout or with a fully-bonded light-colored interior meeting the above specifications.
Liner Pipe Dimensions. The minimum wall thickness shall conform to Standard Dimension Ratio (SDR) of 17 when measured in accordance with ASTM D2122. The minimum inside diameter (ID) of new pipe to be installed shall be as specified in the plans. Depending on the availability of pipe product, the nearest size to the specified pipe shall be required, upon the Engineer's approval.
Pipe - General. All HDPE pipe without an ultraviolet inhibitor shall not be stored uncovered outside. The Contractor shall exercise care during the unloading, handling, and storage of all polyethylene pipe to ensure that the pipe is not cut, gouged, scored, or otherwise damaged.

500-1.6.5 Pipe Joining for Sections of HDPE Pipe. The polyethylene pipe shall be assembled and joined at the site using the butt-fusion method to provide a leak-proof joint, and in conformance with ASTM D2620. Insertion of pipe shall be in accordance with ASTM F585. Threaded or solvent-cement joints and connections are not permitted. All equipment and procedures used shall be in strict compliance with the manufacturer's recommendations. Fusing shall be accomplished by personnel certified as fusion technicians by a manufacturer of polyethylene pipe and/or fusing equipment.
Terminal Sections. Terminal sections may also be joined by Electrofuse Couplings, Friatec, or approved equal. Terminal sections may also be joined by full circle repair clamps by Smith Blair, JCM, or approved equal.

500-1.6.6 Service Connection Materials. The preferred method of sewer service connections to the HDPE sewer main shall be the use of electrofusion saddles by Central Plastics, Friatec, or equal as approved by the Engineer. Mechanical taps, Inserta Tees made by Fowler Manufacturing or approved equal, may also be used for sewer service connections if approved by the Engineer. Depending upon site conditions and if approved by the Engineer, sewer service connections to the HDPE main may be made by plastic saddles with stainless steel straps, by GPK, or approved equal, or rubber saddles with stainless steel straps by Fernco Company, DFW, or approved equal.

500-1.6.7 Sealing Connections at Maintenance holes. The annular space at each maintenance hole may also be sealed with a waterstop gasket by Fernco Company or approved equal, and finished with a quick setting grout. Pipe shall be allowed to relax in accordance with 506-1.6.11.d.

500-1.6.8 Pipe Bursting Equipment. The pipe bursting unit shall be designed and manufactured to force its way through the existing line by fracturing the pipe and compressing the broken pieces into the surrounding soil as the equipment progresses. The bursting unit shall generate sufficient force to burst and compact the existing pipeline. In each case the pipe bursting unit shall pull the polyethylene pipe with it as it moves forward.

500-1.6.9 Execution of Work - General. Bypass pumping shall be accomplished when and where necessary. The Contractor shall provide flow diversion with pumps adequate in size and capacity to handle all flows generated during the pipe bursting process. All costs for bypass pumping shall be incidental unless specific pay items for this work are included in the bid and pay schedule. Excavation of insertion pits shall be at locations determined by the Contractor. Insertion pits shall be of sufficient length to allow the bursting head and new HDPE pipe to enter the host pipe at an angle that will maintain the grade of the existing sanitary sewer.

500-1.6.10 Preparation of Work. All sewer service connections shall be located prior to pipe bursting the main, by pre-CCTV inspection, and then exposed prior to pipe bursting. If the pre-inspection reveals obstructions or pipe materials that will prevent the existing pipe from being pipe burst properly and cannot be removed by conventional cleaning equipment, a point repair will be made by the Contractor, with approval from the Engineer. If the pre-CCTV inspection reveals a sag or hump, sag or hump removal shall be made by the Contractor, with approval from the Engineer.

500-1.6.11 Insertion of the HDPE Pipe.
500-1.6.11.a. The polyethylene pipe shall be assembled and joined at the site using the butt-fusion method to provide a leak-proof joint. Threaded or solvent-cement joints and connections are not permitted. All equipment and procedures used shall be in compliance with the manufacturer's recommendations. Fusing shall be accomplished by personnel certified as fusion technicians by a manufacturer of HDPE pipe and/or fusing equipment.
500-1.6.11.b. Insertion shall be in accordance with ASTM F585. The butt-fused joint shall be in true alignment and shall have uniform rollback beads resulting from the use of proper temperature and pressure. The joint shall be allowed adequate cooling time before removal of pressure. The fused joint shall be watertight and shall have tensile strength equal to that of the pipe. All defective joints shall be cut out and replaced at the expense of the Contractor. The inside weld bead shall be removed by cutting the bead away without scoring the inside wall of the pipe, to the satisfaction of the Engineer.
500-1.6.11.c. Service connections to the HDPE pipe shall be made with materials submitted and approved in accordance with 500-1.6.6.
500-1.6.11.d. A relaxation period shall be allowed prior to making service connections and connections to maintenance holes. The relaxation period shall be appropriate with and dependent upon site conditions, but not less than eighteen (18) hours unless otherwise determined by the Contractor.
500-1.6.11.e. If concrete encasements are encountered, a point repair shall be performed, with the approval of the Owner, to excavate and break out concrete prior to the pipe bursting operation to allow the steady and free passage of the pipe bursting head.
500-1.6.11.f. The new HDPE pipe shall be inserted immediately behind the pipe bursting head in accordance with the manufacturer's recommended procedures. The bursting tool shall be specifically designed and manufactured for the type of insertion process being used. It shall be utilized to guide and assist the bursting head during the operation. A pushing machine may be utilized to aid pipe insertion from the rear.
500-1.6.11.g. New HDPE pipe shall extend into each maintenance hole, a maximum of two inches after pipe relaxation and prior to installation of any restraints. The annular space shall be sealed in accordance with 500-1.6.7.

500-1.6.12 Service Reconnections. Service connections to the HDPE pipe shall be made with materials submitted and approved in accordance with 500-1.6.6. After the new HDPE pipe has been installed and tested, the Contractor shall be responsible for reconnecting existing sewer services in accordance with 500-1.1.7.a. All service lines shall be the size indicated in the plans and specifications.

500-1.6.13 Testing and Acceptance. After the new HDPE pipe is installed and all services are reconnected, the pipe shall be inspected by CCTV. Post-CCTV video shall be submitted to the Engineer for approval and acceptance of the new pipe. Leakage testing will also be performed and both this testing and CCTV inspection shall be in accordance with 500-5, Acceptance Testing.

500-1.7 Deformed/Reformed HDPE Liner.

ADD THE FOLLOWING TWO PARAGRAPHS TO SUBSECTION 1.7.1:

Only manufacturer-licensed and certified contractors shall install Deformed/Reformed HDPE Liner.

The HDPE liner minimum wall thickness shall conform to the Standard Dimension Ratio (SDR) of 26 when measured in accordance with ASTM D2122.

500-1.9 External In-Place Wrap.
DELETE THE SUBSECTION.

500-1.10 Folded and Re-formed PVC Pipe Liner.
DELETE THE SUBSECTION.

500-1.12 Polyvinyl Chloride (PVC) Closed Profile Liner Pipe.
DELETE THE SUBSECTION.

500-1.13 Machine Spiral Wound Polyvinyl Chloride (PVC) Pipe Liner.
DELETE THE SUBSECTION.

REPLACE SUBSECTION 500-2 WITH THE FOLLOWING:

500-2 MAINTENANCE HOLE AND STRUCTURE REHABILITATION.

500-2.1 General.

- The section covers repair and rehabilitation of existing maintenance holes, lampholes, cleanouts, and appurtenances. Rehabilitation methods include sealing of walls, covers, pipes entering and leaving maintenance holes; replacing cast iron frames and/or covers; replacing maintenance hole steps; rebuilding maintenance hole walls; removing and replacing the entire structure; and other related miscellaneous work. Sewer flow control, as necessary, shall be performed in accordance with 500-1.1.4c.
- All maintenance hole rehabilitation materials shall be submitted to the Engineer and are subject to the approval of the Engineer. The manufacturer shall provide certification that the materials proposed for use are compatible with one another. All materials that shall contact the sewer environment shall be specifically designed for chemical resistance to the sewer environment. The manufacturer shall certify that the materials are resistant to the sanitary sewer environment and to the following: 5% nitric acid, 5% sulfuric acid, 10% phosphoric acid, 100% ASTM fuel C, 100% vegetable oil, 0.1% detergent, 0.1% soap, 5% sodium hydroxide, and 1% ferric chloride.

500-2.2 Leakage at Frames and Covers. Leakage at cast iron frames and covers shall be eliminated by one of the following methods of this subsection, or as directed by the Engineer.

500-2.2.1 Replace Cover. When an existing frame is in good, sound condition but the cover is broken or otherwise determined to be unusable (for example because of vent holes which allow infiltration), it shall be removed and replaced as shown or specified. It shall be replaced with a new cast iron maintenance hole cover of approximately the same thickness and weight conforming to 206-7. The seating surface shall be machined to permit it to rest tightly against the surface of the frame without "rocking " under vehicular traffic. The cover's configuration must be such as to mate closely with that of the frame.

500-2.2.2 Adjust Frame and Cover. Structure frames and covers shall be adjusted where shown or specified. This repair consists of removing and replacing the maintenance hole frame and the grade rings. This shall be accomplished by excavating as necessary, lifting off the frame and grade rings as directed, thoroughly cleaning the frame's bottom bearing surface, removing the old mortar from the maintenance hole cone and grade rings, and replacing the existing frame and rings to the new grade as specified for new maintenance holes in 303-9.

500-2.2.3 Replace Frame and Cover. When shown of specified, or when the condition of the frame is satisfactory but a replacement cover meeting the requirements described above is not available, the Contractor shall remove and replace the entire assembly with a new frame and cover in accordance with 201-8 and 303-9.

500-2.3 Sealing Maintenance hole Walls. Maintenance hole walls shall be sealed where shown or specified, or as directed by the Engineer. Sealing of the maintenance hole walls shall be accomplished by any of the methods specified in sections 201-10.6.1, including:

Cement-Epoxy Mixtures. Openings, cracks, and deteriorated joints in maintenance hole walls shall be repaired and sealed by utilizing cement-epoxy mixtures manufactured for this purpose, such as those manufactured and/or supplied by Standard Dry Wall Products; Water-Wastewater Products & Systems, Inc.; IPA Systems, Inc.; Stonehard, Inc.; or approved equal.

Chemical Grout. Openings, cracks, and deteriorated joints in maintenance hole walls shall be repaired and sealed using chemical grout and applicable procedures specified for sewer system rehabilitation.

Polyurethane Coatings. Sprayable polyurethane coating shall be used to seal maintenance hole walls. The coating shall be a high-build polyurethane specifically formulated for use in a sewer system environment. The minimum thickness of the dry coating shall be 125 mils.

Modified Polyester/Polymorphic Coatings. Spray-applied modified polyester/polymorphic resin shall be used to seal maintenance hole walls. The coating shall be a two-component, 100% solids system. Prior to applying the prime coat, the maintenance hole surface shall be sandblasted or hydroblasted and properly dried.

Epoxy Coating. Sprayable or brushable epoxy coatings may be used to seal maintenance hole walls. The coating shall be a high-build epoxy, Mainstay DS-5, Sewer Guard 210, or approved equal, specifically formulated for use in the sewer system and applied in accordance with manufacturer's recommendations and guidelines and at 50-125 mils thickness in one or two coats. Prior to coating, the maintenance hole walls shall be thoroughly sandblasted or hydroblasted and cleaned as recommended by the manufacturer to ensure complete coverage and bonding. Openings and cracks larger than 1/8 inch in the maintenance hole walls shall be filled with mortar, Mainstay ML-72 or ML-72F, or approved equal, at one-half to one inch thickness, prior to trimming and applying the epoxy coating.

Fiberglass Liners. Existing maintenance hole walls shall be thoroughly sandblasted and cleaned or primed as recommended by the materials manufacturer to ensure complete coverage and bonding. Openings and cracks larger than 1/8 inch in the maintenance hole walls shall be filled with mortar prior to priming and applying the fiberglass.

i) Factory-Manufactured Fiberglass Liners. Maintenance hole liners shall be made of fiberglass reinforced plastic (FRP), having an inside diameter of not less than 42 inches. Maintenance hole liners shall meet the requirements of ASTM D3753. The liner shall be installed in accordance with manufacturer's recommendations including removal of the existing cone, grouting of the annular space between the liners and existing maintenance hole walls, rebuilding or replacing the cones, backfilling, installing steps, and installing cast iron frames and covers.

ii) Field-Fabricated Fiberglass Liners. Maintenance hole liners shall be field-fabricated by applying glass fibers and resin to the maintenance hole walls. The completed lining thickness shall be not less than 1/4 inch at any location.

HDPE Liners. Lining manufacturer shall be GSE "Studliner", GU-International AGRU "Suregrip" or equal. Polymer mortar shall consist of a primer if recommended by the manufacturer and a liquid binder and a dry aggregate mixed together to make a mortar of consistency as required for the application. The mortar shall be designed for application to vertical or overhead surfaces and must be accepted by the lining manufacturer. The liquid binder shall be chemical and oil resistant, stress relieved, low modulus, moisture insensitive, two-component epoxy-resin compound. The consistency shall be similar to lightweight oil for proper mixing with aggregate. Material shall conform to ASTM C881, type 3, Grade 1, Sika Corporation Sikadur 22 Lo-Mod Series or equal.

i) HDPE lining, joint strips and angle strips (hereinafter collectively referred to as "lining") shall be made from minimum 97 percent virgin high density polyethylene (HDPE). Color shall be gray.

ii) Lining shall be impermeable to sewage gases and liquids and shall be nonconductive to bacterial or fungal growth. All linings shall be factory checked to ensure freedom from porosity.

iii) Lining shall have good impact resistance, shall be flexible, and shall have elongation sufficient to bridge up to ¼ inch settling crack.

iv) Once cast into the concrete of the maintenance hole wall, lining shall be permanently and physically attached to the concrete by the lining studs and shall not rely on an adhesive bond unless otherwise specified at a specific location.

v) Locking studs shall be made of the same material as the lining and integrally extruded with the sheet. Stud spacing shall be on approximately 1.25-inch centers, such that there are approximately 110 studs per square foot.

vi) Plasticizer shall not be added to the resin formation.

vii) Lining shall be free of holes, pinholes, bubbles, blisters, excessive contamination by foreign matter, and nicks and cuts on roll edges.

viii) Adhesive to bond HDPE lining to metal shall be in accordance with the recommendations of the HDPE lining manufacturer.

ix) All work shall be in strict conformity with all applicable specifications, instructions, and recommendations of the lining manufacturer.

x) Prior to shipping lined precast maintenance hole sections and then again after field welding is complete, the lining shall be spark tested in the presence of the Engineer. The spark test shall be done with an approved electrical holiday detector (Turnhert Rasor, model AP-W with power pack or equal) with the instrument set at a minimum of 20,000 volts. Any imperfection shall be repaired in accordance with the manufacturer's recommendations and with the approval of the Engineer.

Cementitious Crystalline Waterproofing. Waterproofing manufacturer shall be Xypex Chemical Corporation, Xypex Concentrate, Modified, Patch'n Plug or equal. Application shall be in accordance with Xypex recommended specifications.

i) For use in new maintenance holes, the Xypex materials Admix C-500, Admix C-1000, Admix C-2000 or equal shall be used.

500-2.4 Remove and Replace Existing Sewer Structure. Where specified or shown, or directed by the Engineer, existing sewer structures shall be removed and new structures built in their place in conformance with the applicable specifications and details.

500-2.5 Testing. After rehabilitation work at each maintenance hole has been completed, the maintenance hole shall be tested for leakage in accordance with 303-9.2. Maintenance holes rehabilitated only from the cover to the top of the cone will not require testing. Replaced lampholes and cleanouts shall be tested for leakage as an integral part of the sewer pipe system.

ADD NEW SUBSECTION 500-5 TO READ:

500-5 ACCEPTANCE TESTING.

500-5.1 General. The Contractor shall perform acceptance tests on all repaired, rehabilitated, or new facilities. Unless otherwise noted, no separate compensation will be paid for testing; the testing cost is to be included in the related pay items. If the work should fail to pass the tests, it is the Contractor's responsibility to correct the work and re-test with no additional compensation.

If, within the warranty period, any section of the sewer system is not acceptable due to subsequent excessive leakage or any other defects, although originally accepted, the Contractor shall repair or replace the affected portion at no cost to the Agency. It is understood that if the Contractor fails to do such work as required, the Surety shall be liable for said costs of repair or replacement.

500-5.2 Leakage Testing. All new sewers and those sewers rehabilitated by pipe expanding and cured-in-place lining methods shall be tested for leakage in accordance with 306-7.8.2. Sewer mains and building connection sewers in each reach shall be tested for leakage together, as an integral system, except as otherwise specified herein.

500-5.3 Miscellaneous Testing. The Agency, at its discretion, may perform tests to check compliance with the specifications as they pertain to backfill compaction, concrete strength, and other such items where test performance is not specified as the Contractor's responsibility. The Contractor shall cooperate with the Agency by providing samples, making necessary excavations, and other related services necessary to carry out the testing, at no cost to the Agency. In the event of failed tests, the Contractor shall bear the cost of correction and re-testing.

500-5.4 Acceptance. Prior to the Engineer's final acceptance of the sewer system, the Contractor shall flush and clean all system parts. The Contractor shall remove all accumulated construction debris, rocks, gravel, sand, silt, and other foreign material from the sewer system at or near the closest downstream maintenance hole. If necessary, the Contractor shall use mechanical rodding or bucketing equipment. A collection basket shall be used to capture all debris.

Following completion of the work, including cleaning and testing, the Contractor shall conduct a CCTV inspection of the sewers as specified in 500-1.1.5. The Contractor shall correct all defects discovered by this procedure before the work under the contract will be considered for final acceptance.