



# **STANDARD SPECIFICATIONS**

**DECEMBER 2021**

**DOCUMENT 00 00 30**  
**TABLE OF CONTENTS**

Reference Number	Title	No. of Pages
---------------------	-------	-----------------

---

**INTRODUCTORY INFORMATION**

00 00 30	Table of Contents .....	1
----------	-------------------------	---

**DIVISION 01 – GENERAL REQUIREMENTS**

01 00 50	Administrative Provisions .....	3
01 33 00	Submittals .....	3
01 45 00	Quality Control .....	2
01 57 00	Construction Facilities and Temporary Controls .....	4
01 78 50	Closeout Procedures .....	2

**DIVISION 03 – CONCRETE**

03 10 00	Cast-In-Place Concrete .....	7
----------	------------------------------	---

**DIVISION 31 – EARTH WORK**

31 23 00	Excavation, Backfilling and Compaction .....	9
----------	--	---

**DIVISION 33 – UTILITIES**

33 05 23	Cured-In-Place Pipe (CIPP) .....	8
33 11 00	Water Distribution and Transmission .....	17
33 13 00	Disinfection of Water Distribution Systems .....	3
33 31 00	Sanitary Sewer Systems .....	12
33 31 20	Temporary Sewer By-pass pumping.....	6

## SECTION 01 00 50 ADMINISTRATIVE PROVISIONS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. This section includes reference standards, work schedule, contractor use of premises, Taylorsville-Bennion Improvement District ("District") occupancy, District furnished services, coordination and field engineering.

#### 1.2 RELATED WORK

- A. Section 01 33 00 – Submittals
- B. Section 01 45 00 – Quality Control
- C. Section 01 57 00 – Construction Facilities and Temporary Controls
- D. Section 01 78 00 – Closeout Procedures

#### 1.3 REFERENCES

- A. For products specified by association or trade standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. The date of the standard is that in effect as of the Bid date, or date of Owner-Contractor Agreement when there are no bids, except when a specific date is specified.
- C. Obtain copies of standards when required by individual specifications section. Maintain copy at jobsite during progress of the specific work.
- D. Schedule of reference standards:

AASHTO - American Association of State Highway  
and Transportation Officials  
444 North Capitol Street, N.W.  
Washington, DC 20001

ACI - American Concrete Institute  
Box 19150  
Redford Station  
Detroit, MI 48219

ANSI - American National Standards Institute  
1430 Broadway  
New York, NY 10018

APWA- American Public Works Association  
1275 K Street, NW, Suite 750  
Washington, DC 20005

ASTM - American Society for Testing and Materials  
100 Barr Harbor Drive  
Conshohocken, PA 19428-2959

AWWA- American Water Works Association  
6666 W. Quincy Ave  
Denver, CO 80235

DIPRA- Ductile Iron Pipe Research Association  
PO Box 190306  
Birmingham, AL 35219

OSHA- Occupational Safety and Health Administration  
200 Constitution Ave NW  
Washington, DC 20210

UL - Underwriters' Laboratories, Inc.  
333 Pfingston Road  
Northbrook, IL 60062

Uni-Bell PVC Pipe Association  
2711 Lyndon B Johnson Fwy #1000  
Dallas, TX 75234

#### 1.4 WORK SEQUENCE

- A. Provide and coordinate construction schedule and operations with District.

#### 1.5 CONTRACTOR USE OF PREMISES

- A. Notify the District at least 48 hours prior to commencing any work.
- B. Limit use of premises for work and for construction operations; limit construction operations to areas within the construction limits or easement or developer property.
- C. Limit access to site from public roads or other construction easements as shown.
- D. Coordinate use of premises with the District.

#### 1.6 COORDINATION

- A. Coordinate work of the various sections of specifications to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items installed later.
- B. Coordinate with the District regarding construction schedule and progress such that

they may survey new construction such as waterlines, valves, sewer lines, manholes, and appurtenances prior to permanently backfilling or concealing work.

**1.7 FIELD ENGINEERING**

- A. Verify locations of all existing underground utilities and facilities and other items affecting the work and coordinate work with the owner of those utilities and other facilities. Call Blue Stakes Location Service at least 48 hours before digging.
- B. Provide field engineering services as required to establish grades, lines, and levels from construction stakes in order to complete the work in accordance with these drawings and specifications.
- C. The locations of existing underground utilities depicted on the drawings are shown in an approximate way only. Determine the exact location of all existing utilities, whether or not shown on the drawings, before commencing work. Contractor agrees to be fully responsible for any and all damages which might be occasioned by his failure to exactly locate and preserve any and all underground utilities. If damaged or removed, the existing utility shall be restored or replaced by Contractor.
- D. Locate and protect survey reference lines, bench marks and monuments

**PART 2 PRODUCTS**

Not Used.

**PART 3 EXECUTION**

Not Used.

**END OF SECTION**

## **SECTION 01 33 00 SUBMITTALS**

### **PART 1      GENERAL**

#### **1.1      SECTION INCLUDES**

- A. This section includes general procedures and requirements for submittals during the course of construction.

#### **1.2      RELATED WORK**

- A. Section 03 10 00 – Cast-In-Place Concrete
- B. Section 31 23 00 – Excavation, Backfilling and Compaction
- C. Section 33 05 23 – Cured-In-Place Pipe (CIPP)
- D. Section 33 11 00 – Water Distribution and Transmission
- E. Section 33 13 00 – Disinfection of Water Distribution Systems
- F. Section 33 31 00 – Sanitary Sewer Systems
- G. Section 33 31 20- Temporary Sewer Bypass Pumping

#### **PROCEDURES**

- A. Transmit each submittal to the District with Contractor's standard submittal form.
- B. Sequentially number the transmittal forms. Resubmittals to have original number with an alphabetic suffix.
- C. Identify Project, Contractor, subcontractor or supplier; pertinent drawing sheet and detail number(s), and specification Section number, as appropriate.
- D. Sign or initial each submittal certifying that review, verification of products required, field dimensions, adjacent construction Work, and coordination of information, is in accordance with the requirements of the Work and Contract Documents.
- E. Schedule submittals to expedite the Project, and deliver to District at business address. Coordinate submission of related items.
- F. Identify variations from Contract Documents and product or system limitations which may be detrimental to successful performance of the completed Work.
- G. Revise and resubmit submittals as required, identify all changes made since previous submittal.
- H. Distribute reviewed submittals to concerned parties. Instruct parties to promptly

report any inability to comply with provisions.

- I. Required Contractor submittals for this project include but are not limited to those indicated in the sections listed in "Related Work" above.

### 1.3 SCHEDULE

- A. Submit construction schedule within 15 days after date of Notice to Proceed.
- B. Revise and resubmit as required.

### 1.4 PROPOSED PRODUCTS LIST

- A. Within 15 days after date of Notice to Proceed, submit complete list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
- B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

### 1.5 SHOP DRAWINGS

- A. Submit the number of copies which Contractor requires, plus two (2) copies which will be retained by the District.
- B. After review, produce copies in accordance with procedures established in this section and for record documents as described in Section 01 78 50 – Closeout Procedures.

### 1.6 PRODUCT DATA

- A. Mark each copy to identify applicable products, models, options, and other data; supplement manufacturers' standard data to provide information unique to the Work.
- B. Submit the number of copies which Contractor requires, plus two (2) copies which will be retained by the District.

### 1.7 MANUFACTURER'S INSTRUCTIONS

- A. When required in individual specification section, submit manufacturer's printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for product data.

### 1.8 MANUFACTURER'S CERTIFICATES

- A. Provide certificates of compliance with specifications as requested by the District

or individual specifications sections.

**1.9 SAMPLES**

- A. Provide samples of materials as required by individual specification sections.
- B. Include identification on each sample, giving full information.
- C. Submit the number specified in respective specification section; one will be retained by the District.
- D. Provide field samples of finishes at project as required by individual specification section.

**PART 2 PRODUCTS**

Not Used.

**PART 3 EXECUTION**

Not Used.

**END OF SECTION**



## **SECTION 01 45 00 QUALITY CONTROL**

### **PART 1      GENERAL**

#### **1.1      SECTION INCLUDES**

- A. This section includes general quality control, workmanship, manufacturer's instructions and certificates, and testing services.

#### **1.2      RELATED WORK**

- A. Section 01 00 50 - Administrative Provisions
- B. Section 01 33 00 – Submittals
- C. Section 01 57 00 – Construction Facilities and Temporary Controls
- D. Section 01 78 50 – Closeout Procedures
- E. Section 03 10 00 – Cast-In-Place Concrete
- F. Section 31 23 00 – Excavation, Backfilling and Compaction
- G. Section 33 05 23 – Cured-In-Place Pipe (CIPP)
- H. Section 33 11 00 – Water Distribution and Transmission
- I. Section 33 13 00 – Disinfection of Water Distribution Systems
- J. Section 33 31 00 – Sanitary Sewer Systems
- K. Section 33 31 20– Temporary Sewer Bypass Pumping

#### **1.3      SUBMITTALS**

- A. Before construction, identify testing agency including name, address, telephone number, licensed professional for testing agency who is to review services, names and levels of certification and years of experience of testing agency's laboratory and field technicians.
- B. During construction, submittal quality control test data requested by District to demonstrate that the work performed complies with the contract documents.

#### **1.4      QUALITY CONTROL - GENERAL**

- A. Maintain quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

#### **1.5      WORKMANSHIP**

- A. Comply with industry standards except when more restrictive tolerances or specified

requirements indicate more rigid standards or more precise workmanship.

B. Perform work by persons qualified to produce workmanship of specified quality.

1.6 MANUFACTURERS' INSTRUCTIONS

A. Comply with instructions in full detail, including each step in sequence. Should instructions conflict with District specifications, request clarification from District before proceeding.

1.7 MANUFACTURERS' CERTIFICATES

A. When required by individual Specifications Section, submit manufacturer's certificate, in duplicate, that products meet or exceed specified requirements.

1.8 TESTING LABORATORY SERVICES

A. Contractor shall employ and pay for services of an Independent Testing Laboratory to perform inspections, tests, and other services required by individual Specification Sections.

B. Services will be performed in accordance with requirements of local jurisdiction having authority and with specified standards.

C. Reports will be submitted to District in duplicate giving observations and results of tests, indicating compliance or noncompliance with specified standards and with Contract Documents.

D. Contractor shall cooperate with Testing Laboratory personnel; furnish tools, samples of materials, mix design, equipment, storage and assistance as requested.

1. Notify District and Testing Laboratory 24 hours prior to expected time for operations requiring testing services.

2. Make arrangements with Testing Laboratory and pay for additional samples and tests for Contractor's convenience.

**PART 2 PRODUCTS**

Not Used.

**PART 3 EXECUTION**

Not Used.

**END OF SECTION**

**SECTION 01 57 00**  
**CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS**

**PART 1      GENERAL**

1.1      SECTION INCLUDES

- A. Requirements for controlling surface and subsurface environmental conditions at a construction site, and related areas under the Contractor's responsibility.
- B. Requirements for traffic control.

1.2      RELATED WORK

- A. Section 01 00 50 - Administrative Provisions.
- B. Section 01 70 00 - Contract Closeout

1.3      SUBMITTALS

- A. Fugitive Dust Permit, as required by Utah DEQ Division of Air Quality
- B. Storm Water Pollution Prevention Permit, as required by Utah DEQ Division of Water Quality
- C. Layout of fences, barriers and enclosures
- D. Traffic control plan, approved by the proper local or state authority

1.4      TEMPORARY UTILITIES

- A. Field Office: contractor's choice.
- B. Utilities: provide power, telephone, water, storm and sanitary facilities, and all other temporary utilities required.
- C. Security and protection: construct and maintain temporary fencing for the protection of materials, tools and equipment. Obtain prior approval for all fence locations.
- D. Construction and support: set up and maintain in a neat and orderly manner temporary roads and paving, dewatering facilities, enclosures, identification signs and bulletin boards, waste disposal and temporary heat. Provide and maintain temporary all weather pedestrian walkways and road detours.
- E. Electricity, Lighting: provide service required for construction operations, with branch wiring and distribution boxes located to allow service and lighting by means of construction-type power cords. Provide lighting for construction operations.

1.5      SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures.

- B. Existing restroom facilities shall not be used.

#### 1.6 BARRIERS AND ENCLOSURES

- A. Provide barriers and enclosures as required to prevent public entry to construction areas while allowing for District's use of site, and to protect existing facilities and adjacent properties from damage from construction operations.
- B. Provide 6 foot high fence around construction site and equip with vehicular and pedestrian gates with locks. Construction: contractor's option.
- C. Provide barricades and covered walkways as required by governing authorities for public rights-of-way and for public access to existing building.
- D. Provide barriers around trees and plants designated to remain. Protect against vehicular traffic, stored materials, dumping, chemically injurious materials, and puddling or continuous running water.
- E. Use local standards and codes for erection of adequate fences and barricades. Maintain all signing, barricades, fencing, drainage and other items as required to protect public and private property from damage caused by construction operations.

#### 1.7 PROTECTION OF INSTALLED WORK

- A. Provide temporary protection for installed products. Control traffic in immediate area to minimize damage. Repair or replace at the District's option any installed work damaged by traffic, the public, or Work operations.
- B. Prohibit traffic on restored lawn and landscaped areas.

#### 1.8 DUST, WATER AND NOISE CONTROL

##### A. Surface Water, Erosion and Sediment Control:

1. Surface water shall be controlled so that the construction area is not allowed to become wet from runoff from adjacent areas. Surface water shall be directed away from these areas but not directed toward adjacent property, buildings, or any improvement that may be damaged by water. Surface water shall not be allowed to enter sanitary sewers.
2. Prevent erosion and sedimentation.
3. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.

##### B. Dust Control:

1. Provide suitable equipment to control dust or air pollution caused by construction operations to all work areas, storage areas, haul and access roads, or other areas affected by construction.
2. All work shall be in compliance with the Federal, State, and local air pollution standards, and not cause a hazard or nuisance to personnel and the public in the vicinity of the work.

3. Execute work by methods to minimize raising dust from construction operations.

C. Noise Control:

1. Use equipment that is equipped with noise attenuation devices. Comply with local laws and regulations.
2. Control construction noise in residential areas as specified by Salt Lake County Health Department.

1.9 CONSTRUCTION CLEANING

- A. All public and private areas used as haul roads shall be continuously maintained and cleaned of all construction caused debris such as mud, sand, gravel, soils, pavement fragments, sod, etc. Care shall be taken to prevent spillage on haul routes. Any such spillage shall be removed immediately and the area cleaned.
- B. Public roads shall be maintained in accordance with applicable ordinances and regulations.
- C. Throughout all phases of construction, including suspension of work, and until final acceptance of the project, the Contractor shall keep the work site clean and shall remove daily all refuse, dirt, damaged materials, unusable materials, and all other trash or debris that he has created from his construction activities.
- D. Materials and equipment shall be removed from the site as soon as they are no longer necessary; and upon completion of the work and before final inspection, the entire worksite shall be cleared of equipment, unused materials, and rubbish so as to present a satisfactory clean and neat appearance. All cleanup costs shall be included in the Contractor's Bid.

1.10 TRAFFIC REGULATION

- A. Follow local and state requirements regarding traffic control.
- B. Where local jurisdictions have no requirements, construct and erect according to "Manual on Uniform Traffic Control Devices for Streets and Highways" (MUTCD).

1.11 BY-PASS PUMPING

Provide for the flow of sewage around the section or sections of pipe designated for rehabilitation. Bypass pumping operations shall not interfere with traffic flow on streets or cross railroad tracks without prior written consent from the appropriate agencies or jurisdictions. The pumps and bypass lines shall be of adequate capacity and size to handle the flow and will be equipped with sound attenuating devices. A 100% capacity standby pumping system shall be available on site at all times to be used in the event of bypass pump failure. The bypass plan is to be submitted 2 weeks prior for approval. Bypass pumping of private lateral connections is required.

1.12 GROUND WATER CONTROL

- A. Provide a dewatering system sufficient to maintain excavations and foundations dry

and free of water on a 24 hour basis.

- B. Remove all dewatering facilities when no longer required.
- C. Dispose of water in a manner that will not cause damage to adjacent or downstream areas or facilities.

1.13 POLLUTION CONTROL

- A. Soil: prevent contamination of soil from discharge of noxious substances (including engine oils, fuels, lubricants, etc.). Excavate and legally dispose of any such contaminated soil off-site, and replace with acceptable compacted fill and topsoil.
- B. Water: prevent disposal of wastes, effluent, chemicals, or other such substances adjacent to or into streams, waterways, sanitary sewers, storm drains or public waterways. Perform any emergency measures required to contain any spillage.
- C. Air: Control atmospheric pollutants.

1.14 REMOVAL

- A. Remove temporary materials, equipment, services, and construction prior to Substantial Completion inspection.
- B. Clean and repair damage caused by installation or use of temporary facilities. Remove underground installations to a depth of 2 feet; grade site as indicated. Restore existing facilities used during construction to specified, or to original, condition.

**PART 2 PRODUCTS**

Not Used.

**PART 3 EXECUTION**

Not Used.

**END OF SECTION**

**SECTION 01 78 50  
CLOSEOUT PROCEDURES**

**PART 1      GENERAL**

1.1      SECTION INCLUDES

- A. This section includes closeout procedures, final cleaning, project record documents, and operation and maintenance data.

1.2      RELATED WORK

- A. Section 01 00 50 – Administrative Provisions
- B. Section 01 33 00 – Submittals
- C. Section 01 45 00 – Quality Control
- D. Section 01 57 00 – Construction Facilities and Temporary Controls

1.3      SUBMITTALS

- A. All survey data, survey information showing dimensions, location angles and elevations of construction on contract Record Drawings.
- B. Operation and maintenance data
- C. Final summary report of contractor's testing agency.

1.4      CLOSEOUT PROCEDURES

- A. When Contractor considers Work has reached final completion, submit written certification that the work is complete in accordance with the drawings and specifications and ready for the District's review.
- B. Provide submittals required by governing authorities.
- C. After receipt of Contractor's certification of work completion, the District will make a final inspection to determine status of completion.
- D. Should Work not be complete, remedy deficiencies and resubmit a written notice.

1.5      FINAL CLEANING

- A. Execute prior to final inspection.
- B. Clean and flush drainage systems.
- C. Clean site; sweep paved areas, rake clean other surfaces.
- D. Remove waste and surplus materials, rubbish, and construction facilities from the

Project and from the site after final acceptance.

1.6 PROJECT RECORD DOCUMENTS

- A. Store record documents separate from those used for construction.
- B. Keep documents current; do not permanently conceal any work until required information has been recorded.
- C. At Contract closeout, submit documents including construction redlines for producing "Record Drawings" with transmittal letter containing date, Project title, Contractor's name and address, list of documents, and signature of Contractor.
- D. For each Specification Division, give names, addresses, and telephone numbers of subcontractors and suppliers list:
  - 1. Shop Drawings and Product Data
  - 2. Warranties

**PART 2 PRODUCTS**

Not Used.

**PART 3 EXECUTION**

Not Used.

**END OF SECTION**



**SECTION 03 10 00**  
**CAST-IN-PLACE CONCRETE**

**PART 1      GENERAL**

1.1      SECTION INCLUDES

- A. This section covers cast-in-place concrete, including formwork, reinforcement, concrete mixtures and handling, placing and constructing for flatwork, manhole collars and bases, and thrust blocks.

1.2      RELATED WORK

- A. Section 31 23 00 – Excavation, Backfilling and Compaction
- B. Section 33 11 00 – Water Distribution and Transmission

1.3      REFERENCES

- A. For concrete street improvements such as curb and gutter, sidewalk, drive approaches, etc. refer to the proper municipal or state standards
- B. ACI 301 – Structural Concrete (latest revision)
- C. ACI 306 – Cold Weather Concreting (latest revision)
- D. NSF 61 – Drinking Water System Components (latest revision)
- E. ACI 305 – Hot Weather Concreting (latest revision)
- F. ACI 201.2R-01 – Guide to Durable Concrete (latest revision)

1.4      SUBMITTALS

- A. Concrete mixtures
  - 1. Mixture proportions and characteristics.
  - 2. Method and test data used to establish mixture proportions.
  - 3. Information on types, classes, producers' names and plant locations for cementitious materials; types, pit or quarry locations, producers' names, grading and properties required by ASTM C 33 for aggregates; types, brand names, and producer's names for admixtures.
- B. Reinforcement and reinforcement supports
  - 1. Certified test reports on materials.
  - 2. Placing drawings showing fabrication dimensions and locations for placement of reinforcement and supports.
  - 3. Copy of plant certifications.
  - 4. When Contractor finds it necessary to move reinforcement from locations

specified to avoid interference with other reinforcement, submit the revised reinforcement arrangement.

C. Formwork and formwork accessories

1. Plan and procedures for installation and removal of reshoring and back shoring.
2. Data on formwork release agent or formwork liners.
3. Shop drawings for formwork.

D. Handling, placing and constructing

1. The District must be notified 24 hours in advance of placement of concrete.
2. When applicable or requested by the District, hot weather or cold weather precautions must be submitted.
3. Proposed location and treatment of construction joints not shown on the project drawings.
4. Proposed methods of curing.
5. Specification and data and methods of use for any proposed repair material.

E. Repair

1. Proposed repair methods, materials, and modifications to the Work.
2. Description of repair work performed to bring strength-deficient concrete into compliance with the Contract Documents.
3. Description of repair performed to bring potentially nondurable concrete into compliance with the Contract Documents.

1.5 QUALITY STANDARD

- A. Work shall conform to all requirements of ACI 301-05 published by the American Concrete Institute, Farmington Hills, Michigan, except as modified by these Contract Documents.

1.6 TESTING

- A. Testing of concrete materials shall be in accordance with ACI 301.
- B. Payment for testing shall be in accordance with the General Conditions.

1.7 NOTICE TO PUBLIC

- A. Follow laws and regulations concerning when and to whom notices are to be given at least two days before work starts.
- B. Indicate when concrete work will take place and when driveway approach can be used.
- C. Warn of potential vehicle tow away and other construction issues affecting

neighborhood

- D. Should work not occur on specified day, send a new notice.

## **PART 2 PRODUCTS**

### **2.1 FORMWORK AND FORMWORK ACCESSORIES**

- A. Form materials shall be faced with material which will produce smooth and uniform texture on concrete, unless indicated otherwise. Do not use material with raised grain, patches, or other defects which will impair the texture of the concrete surface.
- B. Arrange facing material in a symmetrical manner, keeping number of seams to a minimum.
- C. Form ties:
  - 1. Use ties constructed so end fasteners can be removed without spalling concrete faces.
  - 2. After end fasteners of ties have been removed, embedded portion of ties are to terminate not less than two times the diameter or thickness of the fasteners from formed faces of concrete, but in no case greater than  $\frac{3}{4}$  inch.
  - 3. When formed face on concrete is not exposed, form ties may be cut off flush with formed surfaces. Use ties with  $\frac{3}{4}$  inch diameter cones on both ends or approved equal for water retaining structures.
- D. Form release agents shall be a colorless material which will not stain concrete, absorb moisture, impair natural bonding or color characteristics of concrete.

### **2.2 REINFORCEMENT AND REINFORCEMENT SUPPORTS**

- A. Reinforcing steel shall conform to ASTM A 615/A 615M, 60 ksi yield grade.
- B. Coated reinforcing bars shall be required as shown in the Project Drawings.
  - 1. Epoxy-coated bars shall conform to ASTM A 775/A 775M.
- C. Reinforcing steel shall be of the size specified in the Project Drawings.
- D. Reinforcement supports shall be plastic.
- E. Tie wire shall be minimum 16 gage annealed type or an acceptable patented system.

### **2.3 CONCRETE MIXTURES**

- A. All materials shall be in accordance with NSF Standard 61.
- B. Concrete admixtures shall conform to ASTM C494 or C261.

- C. Portland cement shall meet ASTM C150, Type II or V, ASTM C1157, MH or ASTM C595.
- D. Fine aggregate shall conform to ASTM C33 with a fineness modulus greater or equal to 2.6.
- E. Fly ash shall meet ASTM C618, Class F or N.
- F. Silica fume shall conform to ASTM C1240.
- G. Slag cement shall conform to C989.
- H. The nominal maximum size of coarse aggregate shall be 1 inch and conform to ASTM C33.
- I. Minimum performance of concrete for various portions of the work shall be as shown in the following table:

<b>Class</b>	<b>Use</b>	<b>Max. W/CM Ratio</b>	<b>Average 7-Day Comp. Strength (psi)</b>	<b>Minimum 28-Day Comp. Strength (psi)</b>
2000	Thrust blocks	-	1,675	2,500
4000	Manhole bases Manhole collars Flatwork	0.45	2,680	4,000

- J. Concrete shall meet the following performances requirements:
  1. Mixture shall have total alkalis less than 0.40% or meet the equivalent requirements of ASTM C441.
  2. Mixture shall conform to a value of less than 1500 coulombs when tested according to ASTM C1202 at or before 56 days.
  3. The shrinkage of the concrete mixtures shall be less than 500 me after 28 days when tested according to ASTM C157.
- K. Concrete shall be air entrained to withstand severe exposure as described in ACI 301-05.
- L. The ready-mix concrete production facility shall demonstrate that it meets the requirements of National Ready Mixed Concrete Association (NRMCA) certification.

**2.4 HANDLING, PLACING AND CONSTRUCTING**

- A. Concrete curing compound shall bestyrene-acrylic, styrene butadiene, or alpha-methylstyrene conforming to ASTM C 1315, Type II Class A or B (white pigmented) or Type ID Class A (clear with fugitive dye). Comply with local, state

and federal requirements for volatile organic compounds (VOCs).

## **PART 3 EXECUTION**

### **3.1 FORMWORK AND FORMWORK ACCESSORIES**

- A. Keyway depths shall be as shown on the Project Drawings.
- B. Chamfers and bevels on corners or edges of formed concrete shall be as shown on the Project Drawings.
- C. Construction joints shall be as shown on the Project Drawings.
- D. When removal of formwork or reshoring is based on concrete reaching a specified strength, it shall be assumed that concrete has reached this strength when either of the following conditions have been met:
  - 1. When test cylinders, field-cured along with the concrete they represent, have reached the specified strength.
  - 2. When concrete has been cured for the same maturity as the field-cured cylinders which reached specified strength as determined by the maturity method in ASTM C1074.

### **3.2 REINFORCEMENT AND REINFORCEMENT SUPPORTS**

- A. Maintain minimum concrete cover around reinforcing as described in the Project Drawings, or if it is not specified, maintain minimum cover as described in ACI 301-05.
- B. Splicing:
  - 1. Furnish all reinforcement in the full lengths indicated unless otherwise permitted. Splicing of bars, except where indicated, is not permitted without written approval.
  - 2. Lap splice length shall be in accordance with ACI 318-05 and the International Building Code (IBC). Located reinforcing splices not indicated on Drawings at points of minimum stress. Indicate location of splices on shop drawings. Stagger splices where possible.
  - 3. Unless indicated otherwise, overlap reinforcing bars a minimum of 30 diameters to make the splice. In lapped splices, place the bars and wire to maintain the minimum distance for clear spacing to the surface of the concrete.
  - 4. Do not use lap splices on bars greater in diameter than no. 11 unless otherwise approved.
  - 5. Weld reinforcing steel only if indicated or if authorized in writing. Weld in conformance to AWS D1.4.
  - 6. Do not bend reinforcement after embedding in hardened concrete.
  - 7. Do not permit reinforcement or other embedded metal items bonded to the

concrete, to extend continuously through any expansion joint, except dowels in floors bonded on only one side of joints.

- C. All reinforcement to be free of loose mill scale, loose or thick rust, dirt, paint, oil or grease.
- D. Place all reinforcement in the exact position indicated. With tie wire, tie bars together at all intersections except where spacing is less than 12 inches in each direction, in which case tie alternate intersections.
- E. Maintain the distance from vertical forms and between layers of reinforcement by means of prefabricated chairs, ties, hangers or other approved devices. Placing and fastening of reinforcement in each section of the Work must be approved before concrete is placed.
- F. Overlap sheets of metal mesh one square plus 6 inches to maintain a uniform strength. Securely fasten at the ends, edges, and supports to maintain clearances.
- G. Flat slab work:
  - 1. Support reinforcing steel of formed flat slabs with metal chairs, precast concrete blocks or other slab bolsters.
  - 2. Size chairs or bolsters to position the steel in the exact location indicated.
  - 3. Space chairs for supporting the top steel and bolsters for supporting the bottom steel not more than 5 feet on centers in each direction.
  - 4. Plastic or epoxy coat the portion of the metal in contact with the forms to prevent rust.
  - 5. Tie down deck steel to beams or forms at regular intervals of not more than 5 feet on centers along the beams or forms to prevent movement of the steel during concrete placement.

### 3.3 CONCRETE MIXTURES

- A. Slump and air content shall be determined at the point of placement. Once slump and air loss during pumping can be determined, acceptance or rejection of concrete based on slump can then be determined at the delivery point.
- B. Slump adjustment by addition of water at the site is not permitted without the consent of the District.

### 3.4 HANDLING, PLACING AND CONSTRUCTING

- A. The subgrade for slabs-on-ground shall be constructed of the material and compacted to the density shown on the Project Drawings or as specified in Section 31 23 00 – Excavation, Backfilling and Compaction.
- B. In cold weather, as defined in ACI 301-05, concrete shall be placed in accordance with ACI 306. Similarly, in hot weather, as defined in ACI 301-5, concrete shall be placed in accordance with ACI 305.

- C. Do not place concrete slabs or other flatwork if wind is greater than 5 mph unless a wind break is provided.
- D. The finish of formed portions of concrete work shall have a uniform surface appearance in color and texture. All formed work shall have a smooth form finish as defined in ACI 301.
- E. All flatwork shall have a float with broom finish as defined by ACI 301.
- F. Where pipes, castings or conduits are to pass through structures, the Contractor shall place such pipes or castings in the forms before placing the concrete. Additional reinforcement shall be provided around large openings as shown in the Project Drawings.

**END OF SECTION**

**SECTION 31 23 00**  
**EXCAVATION, BACKFILLING AND COMPACTION**

**PART 1      GENERAL**

1.1      SECTION INCLUDES

- A. This section includes preparation, excavation, backfilling, compaction, dewatering and/or runoff control measures, trench shoring, restoration of existing facilities damaged or displaced as a result of the work of the project, clean up, protection and maintenance.

1.2      RELATED WORK

- A. Section 33 11 00 - Water Distribution and Transmission
- B. Section 33 31 00 - Sanitary Sewer Systems

1.3      REFERENCES

- A. The applicable provisions of the latest editions of the References listed below shall govern the Work covered under this Section, unless there is a conflict between said References and the requirements of this Section. In the case of such a conflict, the requirements of this Section shall apply.
- B. Utah Occupational Safety and Health Division (UOSHD).
- C. American Association of State Highway and Transportation Officials (AASHTO):
- D. American Society for Testing and Materials (ASTM)
- E. American Public Works Association (APWA)

1.4      SUBMITTALS

- A. Submit evidence of materials conformance with applicable requirements as well as these specifications.

1.5      QUALITY ASSURANCE

- A. Comply with federal, state, and local codes and regulations.
- B. All working conditions shall be in accordance with the "Utah Occupational Safety and Health Division", Safe Practices for Excavation & Trenching Operations, latest edition, or other Laws or Regulations which apply.
- C. Utah Department of Transportation requirements shall govern for all work in U.D.O.T. highway right-of-ways.
  - 1. All work shall conform to the applicable standards, regulations, and requirements of Utah Department of Transportation, including the



Speculations for Excavation on State Highways.

2. Permits shall be obtained and paid for by the Contractor.
  3. License and Permit Bond, without cancellation clause, in an amount and form prescribed by Utah Department of Transportation, shall be provided by the Contractor in connection with his excavations in U.D.O.T. right-of-ways.
- D. Salt Lake County requirements shall govern for all work in Salt Lake County highway right-of-ways.
1. All work shall conform to the applicable standards, regulations, and requirements of Salt Lake County.
  2. Permits shall be obtained and paid for by the Contractor.
  3. License and Permit Bond, without cancellation clause, in an amount and form prescribed by Salt Lake County, shall be provided by the Contractor in connection with his excavations in Salt lake County right-of-ways.
- E. Taylorsville City requirements shall govern for all work in Taylorsville City road right-of-ways:
1. All work shall conform to the applicable standards, regulations, and requirements of Taylorsville City.
  2. Permits shall be obtained and paid for by the Contractor.
  3. License and Permit Bond, without cancellation clause, in an amount and form prescribed by Taylorsville City, shall be provided by the Contractor in connection with his excavations in Taylorsville City right-of-ways.

## **PART 2 PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Materials suppliers shall provide, upon request, verification of a consistent record of meeting or exceeding materials or performance standards as specified herein.

### **2.2 FOUNDATION MATERIALS**

- A. All foundation materials shall be free from alkali, salt, and petroleum products, roots, sod, limbs, and other vegetative matter, slag, cinders, ashes and rubbish, or other material that in the opinion of the District may be objectionable or deleterious.
- B. Undisturbed soil foundation material:
1. Shall be natural trench bottom soil unless unable to adequately support pipe or structures.
  2. Shall not be lumpy or frozen.
- C. Sewer Rock:
1. Shall be hard, durable, broken, angular, crushed stone or high quality mineral or combination thereof.

2. Shall be graded as follows:

<i>Sewer Rock Gradation</i>	
<i>Sieve Size</i>	<i>% Passing</i>
2"	100
1.5"	90-100
1"	20-55
¾"	0-15
3/8"	0-5

## 2.3 BEDDING MATERIALS

### A. Sand Bedding for Water Pipes:

1. Shall be free from alkali, salt, and petroleum products, roots, sod, limbs, and other vegetative matter, slag, cinders, ashes and rubbish, or other material that in the opinion of the District may be objectionable or deleterious.
2. Graded within the following limits:

<i>Sand Bedding Gradation</i>	
<i>Sieve Size</i>	<i>% Passing</i>
¾"	100
No. 4	80-100
No. 10	30-50
No. 40	10-30
No. 200	0-15

### B. Gravel Bedding for Sewer Pipes:

1. Shall be hard, durable, broken, angular, crushed stone or high quality mineral or combination thereof.
2. Shall be graded as follows:

<i>Gravel Bedding Gradation</i>	
<i>Sieve Size</i>	<i>% Passing</i>
1-1/2"	100
1"	95-100
½"	25-60
No. 4	0-10
No. 8	0-5

## 2.4 BACKFILL MATERIALS

### A. Granular backfill:

1. Shall be readily compactable and shall be free from alkali, salt, and petroleum products, roots, sod, limbs, and other vegetative matter, slag, cinders, ashes and rubbish, or other material that in the opinion of the District may be objectionable or deleterious.

2. Graded within the following limits:

<i>Granular Backfill Gradation</i>	
<i>Sieve Size</i>	<i>% Passing</i>
3"	100
No. 10	50 max
No. 40	30 max
No. 200	15 max

3. May be select material from excavation if it will meet all requirements of granular backfill, including compaction requirements as specified for type of surface improvement above trench.

**B. Excavated Soil Backfill Material:**

1. Shall be free from alkali, salt, and petroleum products, roots, sod, limbs, and other vegetative matter, slag, cinders, ashes and rubbish, or other material that in the opinion of the District may be objectionable or deleterious.
2. Shall be select material from excavation, with no particle larger than 4 inches in diameter.
3. Use on-site materials only if specified compaction requirements can be met.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. It shall be the Contractor's sole responsibility to locate all (whether or not shown on the Drawings) existing water, sanitary sewer, storm drain, and gas lines, electrical and telephone conduit and other underground utilities with their existing house service connections, and all other underground structures in order that no damage or loss of service will result from interference with existing lines.
- B. Review all available drawings, notes, and information on the location of these underground lines and structures in determining the location of the existing facilities.
- C. Have an electronic pipe finder on the job at all times and mark all lines on the road ahead of the excavating machine.
- D. Blue Stakes Location Center shall be contacted 48 hours before any excavation is commenced.
- E. Mark with paint any existing cracks on concrete along which work will take place, in order to determine after the construction is completed whether such damage was caused by the operations of the Contractor or had occurred previously. Any concrete showing unmarked cracks upon completion of construction will be evidence of damage by the Contractor's forces, and shall be replaced or repaired to the satisfaction of the owner of the damaged concrete, at the Contractor's own expense.
- F. All fences removed for excavation shall be returned to their original condition except that damaged portions will be replaced with new fencing at the Contractor's expense.

G. Obtain all required permits.

### 3.2 METHODS AND PROCEDURES

#### A. General Requirements

1. All gas, sanitary sewer, storm drain, water and other pipelines, flumes and ditches of metal, wood or concrete, underground electrical conduits and telephone cable, and all walks, curbs, and other improvements encountered in excavating trenches carefully shall be supported, maintained and protected from injury or interruption of service until backfill is complete and settlement has taken place.
2. If any existing facility is damaged or interrupted, promptly after becoming aware thereof and before performing any Work affected thereby except in an emergency, identify the owner of such existing facility, and give written notice thereof to that owner and the District. Indemnify the District and Engineer from any and all damages resulting from damaged facilities.
3. All damage, injury or loss resulting from lack of adequate sheeting, bracing, and shoring shall be the responsibility of the Contractor; and the Contractor shall effect all necessary repairs or reconstruction resulting from such damage.
4. The trenches shall not be backfilled until the utilities systems as installed conform to the requirements of the Drawings and Specifications. Where, in the opinion of the District, damage is likely to result from withdrawing sheeting, the sheeting shall be left in place.
5. Trenches shall be backfilled to the proper surface with material as shown or specified. Trenches improperly backfilled shall be reopened to the depth required for correction, then refilled and compacted as specified, or the condition shall be otherwise corrected as approved.
6. Care shall be exercised so that when backfilling is complete and settlement has taken place, all existing pipes, flumes, ditches, conduits, cables, walks, curbs, and other improvements will be on the same alignment and grade as they were before work commenced.
7. Compaction shall be the responsibility of the Contractor. He shall select the methods to be used and carefully perform the work of backfilling and compaction so as to prevent damage to new or existing piping. Any new or existing piping damaged during the Contractor's work shall be replaced as directed by the District with new piping.

### 3.3 INSTALLATION

#### A. Excavation

1. Excavation for pipe lines, concrete valve boxes, manholes, vaults and appurtenant structures shall include the work of removing all earth, sand, gravel, quicksand, stone, loose rock, solid rock, clay, shale, cement, hardpan, boulders, and all other materials necessary to be moved in excavating the trench for the pipe; maintaining the excavation by shoring, bracing, and sheeting or well pointing to prevent the sides of the trench from caving in

while pipe laying is in progress; and removing sheeting from the trench after pipe has been laid.

2. Trench support system shall be suitable for the soil structure, depth of cut, water content of soil, weather conditions, superimposed loads, vibration. Contractor may select one of the following methods of ensuring the safety of workers in the trench, as approved by the Utah State Industrial Commission or its safety inspectors:
  - a. Sloping sides of trench to the angle of repose at which the soil will remain safely at rest.
  - b. Shoring trench sides by placing sheeting, timber shores, trench jacks, bracing, piles, or other materials to resist pressures surrounding the excavation.
  - c. Using a movable trench box built-up of steel plates and a heavy steel frame of sufficient strength to resist the pressures surrounding the excavation.

Trenches shall be of the necessary width for proper laying of pipe. Care shall be taken not to over-excavate. The bottom of the trenches shall be accurately graded to provide uniform bearing and support for each section of the pipe along the entire length of the barrel of the pipe.

3. Trenches shall be excavated to the depths shown on the Drawings, including any required allowances for the sewer rock foundation, when required, and for other pipe bedding requirements.
4. Minimum cover over the top of the pipe, including any paving, shall be as follows:
  - a. Water supply piping: 3.5 feet minimum from finish grade.
  - b. Sanitary sewer: as indicated on the plans.
5. Grading of trenches shall be performed to avoid interference of water and sewer lines with other underground utilities and structures:
  - a. Water supply piping: Unless otherwise indicated, trenches shall be graded to avoid high points with the necessity of placing vacuum and relief valves in the water lines.
6. The width of trench, measured at the top of the pipe, shall be as narrow as possible, but not wider than 15 inches on each side of sewer or water pipe.
7. Excavation for manholes, concrete valve boxes, and similar structures shall be sufficient to leave at least 12 inches in the clear between the outer surfaces and the embankment or timber that may be used to hold and protect the banks.
8. Excess materials shall be hauled away from the construction site or otherwise disposed of by the Contractor as approved by the District.

## B. Backfilling

1. Materials for trench backfill shall be as shown on the Drawings.
2. Pipe bedding:
  - a. Consists of preparing an acceptable pipe foundation, excavating the pipe groove in the prepared foundation and backfilling from the foundation to 12 inches above the top of the pipe. All piping shall be protected from lateral displacement and possible damage resulting from impact or unbalanced loading during backfilling operations by being adequately bedded.
  - b. Pipe foundation: Shall consist of natural soil in the bottom of the trench, or a built-up foundation if conditions so warrant. Wherever the trench subgrade material does not afford a sufficiently solid foundation to support the pipe and superimposed load, and where groundwater must be drained, the trench shall be excavated below the bottom of the pipe to such depth as may be necessary, and this additional excavation filled with clean, compacted sewer rock.
  - c. Install pipe bedding materials from pipe foundation to 12 inches above top of pipe: Materials shall be deposited and compacted in layers not to exceed 8 inches in uncompacted depth. Refer to Section 33 31 00 – Sanitary Sewer Systems. Deposition and compaction of bedding materials shall be done simultaneously and uniformly on both sides of the pipe. All bedding materials shall be placed in the trench with hand tools or other approved method in such a manner that they will be scattered alongside the pipe and not dropped into the trench in compact masses. Materials used shall be as shown in the Typical Trench Section in the Drawings and as specified in Part 2.
  - d. A pipe groove shall be excavated in the pipe foundation to receive the bottom quadrant of the pipe so that the installed pipe will be true to line and grade. Bell holes shall be dug after the trench bottom has been graded. Bell holes shall be excavated so that only the barrel of the pipe bears on the pipe foundation.
3. Each lift shall be evenly spread and moistened or dried by disk harrowing or other means so that the required density will be produced.
4. Backfill around valves, vaults and appurtenances with granular backfill material.

#### C. Compaction

1. Backfill Compaction Requirements:
  - a. Under pavements, or other surface improvements, the minimum density shall be 96% of laboratory maximum density as determined by ASTM D-1557.
  - b. In shoulders and other unimproved areas, the minimum density shall be 90% of laboratory maximum density as determined by ASTM D-1557.
2. Compaction shall be performed in strict accordance with the manufacturer's

recommendations for each type of pipe.

3. Mechanical compaction: Shall be accomplished by the use of a sheep-foot roller, pneumatic tire roller, vibrating roller, or other mechanical tampers of a size and type necessary to achieve the required degree of compaction.

#### D. Dewatering

1. The Contractor shall do all pumping, build all drains and do all the work necessary to keep the trench and pipes free from water during the progress of the work.
2. In wet trenches, a channel shall be kept open along the side of the pipe for conducting the water to a sump hole, from which it shall be pumped out of the trench. No water shall be allowed to enter the pipe.

### 3.4 PROTECTION

- A. Provide barricades and restrict access as appropriate to prevent damage to Work in place.
- B. Contractor shall be responsible for protection of Work in place against displacement, damage, or loss until District's acceptance. Any work and subsequently damaged, lost or displaced shall be repaired or replaced to the District's satisfaction at no additional cost.

### 3.5 CLEANING

- A. Thoroughly clean, rake, wash, flush or sweep as required to clean adjacent improvements of materials covered as part of this Work prior to submitting for District's acceptance.
- B. Contractor shall provide all labor, equipment, materials and other items as required to perform clean up as required by the District, adjacent property owners and other jurisdictions.
- C. Finish grading of areas affected by this Work shall be required as part of clean up.
- D. The roadway including shoulders, slopes, ditches, and borrow pits shall be smoothly trimmed, and shaped by machinery, or other satisfactory methods, to the lines, grades and cross-sections, as established, and shall be so maintained until accepted. Any surplus material not suitable for spreading along the road to widen the existing shoulder or raise the grade shall be disposed of as specified above.

### 3.6 TESTING

- A. The Contractor shall employ a testing laboratory to perform field and laboratory density tests. The Contractor shall make such additional tests, at his expense, as deemed necessary by him to assure that the work of compaction is performed properly and determine any adjustments in compacting equipment, thickness of layers, moisture content and compactive effort or other means necessary to obtain the specified minimum relative density. Provide access to the work and all men and machinery necessary to aid the testing laboratory personnel in performing field

density tests or taking samples for laboratory tests. In general, tests and samples shall be made as the work proceeds.

- B. Have testing laboratory perform maximum density tests on materials to be compacted from samples submitted by Contractor taken from locations selected by the District.
- C. Have testing laboratory perform field density tests of compacted backfill materials. The approximate location and number of such tests shall be as shown on the drawings or as selected by the District. Field density tests shall be taken as follows:
  - 1. In planted or unimproved areas:
    - a. 18" above the top of the pipe
    - b. Finished grade
  - 2. In streets, roads, parking lots or other paved areas:
    - a. 18" above the top of the pipe
    - b. 24" to 36" below the gravel road base
    - c. Gravel road base subgrade
    - d. Top of gravel road base
    - e. Top of bituminous surface course
- D. Copies of test results prepared by the testing laboratory shall be transmitted to the Contractor at the same time they are transmitted to the District.
- E. Successful performance of compaction at the location of the field density test shall not relieve the Contractor of his responsibility to meet the specified density requirements for the complete project.

**END OF SECTION**



**SECTION 33 05 23  
CURED-IN-PLACE PIPE (CIPP)**

**PART 1      GENERAL**

1.1      SECTION INCLUDES

- A. This section includes materials, equipment and installation of a flexible resin filled pipe line in an existing gravity sewer pipeline. After installation, the liner is cured with steam or hot water, or by UV. The pipeline and the cured pipe liner become a continuous rigid composite pipe.

1.2      RELATED WORK

- A. Section 01 33 00 – Submittals
- B. Section 01 45 00 – Quality Control
- C. Section 33 31 20- Temporary Sewer Bypass Pumping

1.3      REFERENCES

- A. ASTM Standards:
  - 1. D 790 - Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
  - 2.
  - 3. D 5813 – Cured-in-Place Thermosetting Resin Sewer Pipe
  - 4. F 1216 – Rehabilitation of Existing Pipelines and Conduits by Inversion and Curing of Resin-Impregnated Tube
  - 5. F 1743 – Rehabilitation of Existing Pipelines and conduits by Pulled-in-Place Installation of a Cured-in-Place Thermosetting Resin Pipe

1.4      SUBMITTALS

- A. Tube and resin manufacturer’s product data, equipment and material specifications.
- B. Contractor shall submit design calculations signed and sealed by a registered civil engineer that establish the ability of the liner to meet the required structural requirements prior to initiating liner fabrication. Information included in the submittal:
  - 1. Thickness of each proposed segment
  - 2. Liner thickness allowances for creep and stretching during installation
  - 3. Compare the strength of the liner to the requirements for H-20 and E-80 loading.
- C. Submit approved traffic control plan and permits from municipal or UDOT Traffic Engineer and construction offices as applicable. Provide letter of Noise Permit approval from Salt Lake Valley Health Dept.

- D. Submit sewer bypass control plan for review and approval. Indicate sequence of diversion operations, temporary plugs, silenced bypass pumping systems, temporary vehicle and pedestrian bypass, and site reinstatement after diversion.
- E. Company safety plan describing employee and public protection and addressing safety issues, problems and resolution related to this project. All work is to be conducted in accordance with OSHA requirements.
- F. Copy of written notice to neighborhood.
- G. Pre- and post-installation video.

## 1.5 PERFORMANCE REQUIREMENTS

### A. General:

1. All portions of existing pipe are to be provided with a new composite pipe.
2. After installation, there shall be completely water tight seals at and through each manhole.
3. All service connections shall be re-established with a water tight seal that eliminates infiltration and is acceptable to the District.

### B. Corrosion Resistance Requirements:

1. The finished CIPP shall be fabricated from materials which when cured will be chemically resistant to withstand internal exposure to raw domestic sewage.

### C. Structural Requirements:

1. Installed CIPP shall be designed as a stand-alone pipe. No structural support for hydrostatic, live or earth loading shall be assumed to come from the existing sewer pipe.

### D. Hydraulic Capacity:

1. Overall, the hydraulic profile shall be maintained as large as possible. The CIPP shall have a minimum of the full flow capacity of the original pipe before rehabilitation. Calculated capacities may be derived using a commonly accepted roughness coefficient for the existing pipe material taking into consideration its age and condition.

## 1.6 NOTICE TO PUBLIC

- A. The Contractor is to distribute the approved written notification and verbally communicate and coordinate with customers, property owners and businesses within the project area and areas affected by the project. Commercial businesses, multi resident buildings, hospitals, retirement centers, etc. will require 7 days minimum prior notification, coordination and communication. Single family residential units will require three days minimum prior notification and coordination. Additional notifications and verbal communication are to be provided by the contractor to all residents and businesses 24 hours prior to beginning the scheduled work.

- B. The notice shall include:
1. A description of the work
  2. Beginning date and time of the work
  3. Work duration
  4. Expected pipeline use restrictions
  5. Address filling floor drains, sink and bathtub traps with water, open windows if odors and smells are present
  6. Provide all residents and businesses 24 hour-emergency contact names and phone numbers of onsite superintendent and foreman.

## 1.7 QUALIFICATION REQUIREMENTS

- A. Since sewer products are intended to have a 50-year design life, and in order to minimize the District's risk, only proven products with substantial successful long term track records will be approved. All trench-less rehabilitation products and installers must be pre-approved prior to receiving bid documents.

## PART 2 PRODUCTS

### 2.1 RESIN

- A. The resin shall be composed of polyester resin and catalyst, epoxy resin and hardener or vinyl ester resin and catalyst. When properly cured, the resin shall meet the requirements of ASTM D 5813, ASTM F 1216, or ASTM F 1743.
- B. The resin shall produce CIPP which comply with the structural and chemical resistance requirements of this specification.

### 2.2 TUBE

- A. The tube shall be composed of a flexible, absorbent woven or non-woven felt fabric with the outer layer (before inversion) coated with a translucent, impermeable, flexible plastic membrane.
- B. The wet out tube shall have a uniform thickness that when compressed at installation pressures will meet or exceed the design thickness.
- C. The tube shall be sewn to a size that when installed will tightly fit the internal circumference and length of the original pipe. Allowance should be made for circumferential stretching during inversion. Overlapped layers of felt in longitudinal seams that cause lumps in the final product shall not be utilized.
- D. The membrane shall not be subject to delamination after curing of the composite pipe.
- E. The tube shall be sewn or spot-welded, having sufficient strength to bridge missing segments in the host pipe, stretch to fit irregular host pipe cross-sections and have measurement marks at regular intervals (not to exceed 5 feet) along the flexible

plastic membrane.

- F. The wall color of the interior pipe surface of CIPP after installation shall be a light reflective color so that a clear detailed examination with closed circuit television inspection equipment may be made.
- G. Seams in the tube shall be stronger than the non-seamed felt.

### 2.3 STRUCTURAL DESIGN

- A. The CIPP shall be designed as per ASTM F1216-07a, Appendix X1. The CIPP design shall assume no bonding to the original pipe wall. The lining calculations shall assume a fully deteriorated pipe condition having ground water loading condition measured from the pipe flow line to the ground surface. Provide lining calculations for each project location and submit to the District for approval prior to purchasing materials or beginning work. Pipe deflections used in liner design calculations shall be based upon actual pipe deflection and or pipe damage and corrosion observed in pipe inspection videos but in no case less than as required in the Design Parameter Table within this specification. Any existing noticeable pipe deflection, structural damage, pipe ovality or pipe deterioration will require the contractor to prove the adequacy of submitted liner thicknesses. Additional loading requirements may be necessary in specific situations.
- B. The layers of the cured CIPP shall be uniformly bonded. It shall not be possible to separate any two layers with a probe or point of a knife blade so that the layers separate cleanly or the probe or knife blade moves freely between the layers; nor shall separation of the layers occur during testing performed under the requirements of this specification.
- C. The Contractor must have performed long-term testing for flexural creep of the CIPP pipe material installed. Such testing results are to be used to determine the long term, time dependent flexural modulus to be utilized in the product design. This is a performance test of the materials (tube and resin) and general workmanship of the installation and curing as defined within the relevant ASTM standard. A percentage of the instantaneous flexural modulus value (as measured by ASTM D790 testing) will be used in design calculations for external buckling. The percentage, or the long-term creep retention value utilized, will be verified by this testing. The materials utilized for the contracted project shall be of a quality equal to or better than the materials used in the long-term test with respect to the initial flexural modulus used in the CIPP design.
- D. The cured pipe material (CIPP) shall conform to the minimum structural standards as listed below and incorporate the following minimum values into the liner calculations submitted for approval:

Design Parameter Table	
Design safety factor	2.0
Ovality (calculated from ASTM F 1216) Where no pipe corrosion, structural damage, deflection or excessive pipe	2% to 5% measured ovality - design for 5% 5% to 10% measured ovality - design for 10%

loading conditions exist, 2% design ovality is acceptable in accordance with ASTM F 1216)	Greater than 10% measured ovality – provide repair or as approved by District
Soil modulus	1,000 psi
Groundwater depth (above invert of existing pipe)	Ground surface
Soil depth (above crown of existing pipe)	As indicated on the as-built plans
Live load	E-80 and HS-20
Soil load	120 pcf
Minimum service life	50 years
Cured pipe flexural stress ASTM D-790	4,500 psi
Cured pipe modulus of elasticity ASTM D-790	400,000 psi
Retention factor for long-term flexural modulus – creep retention	50%
Pipe condition	Fully deteriorated

### **PART 3 EXECUTION**

#### **3.1 EXAMINATION AND PREPARATION**

##### **A. Installation Responsibilities for Incidental Items**

1. It shall be the responsibility of the District to locate and designate all manhole access points. The Contractor shall be responsible for obtaining any permits required to access these points including traffic control, excavation and noise permits. The District shall also designate which manholes are to be abandoned in-place (if any). If a street must be closed to traffic because of the orientation of the sewer, the Contractor shall institute the actions necessary to do this for the mutually agreed time period. The Contractor shall also obtain access to water hydrants for cleaning, installation and other work items requiring water. The contractor shall obtain a fire hydrant meter from TBID and pay a refundable five hundred dollar (\$500.00) deposit, barring no damage. There shall be no charge for water used through the fire hydrant meter for CIPP projects.
2. Cleaning of Sewer Lines - The Contractor shall remove and dispose of all internal debris, wye intrusions, grout and other deposits out of the sewer line prior to the lining installation. All cleaning techniques employed shall be physical in nature (i.e. high pressure wash, pigging, root and deposit cutters, lumber jack cleaning, and removal equipment). No chemicals shall be used without the written consent of the District. The District may provide a dump site for all debris removed from the sewers during the cleaning operation. Approval for dumping at the site shall be obtained prior to disposal of debris. Some restrictions may apply. Any hazardous waste material encountered

during this project will be considered as a changed condition.

3. Mechanical Pipe Cleaning: Mechanical pipe cleaning, in addition to and instead of normal high pressure cleaning as required, shall be provided with approved equipment and accessories driven by power winching devices. The manufacturer's operational manual and guidelines shall be strictly followed. All equipment and devices shall be operated by experienced operators so that they do not damage the pipe in the process of cleaning. Scrapers, porcupines, heavy duty brushes, and other debris-removing equipment/accessories shall be used as appropriate and necessary in the field, in conjunction with product manufacturer approved power equipment. The use of cleaning devices such as rods, porcupines, scrapers, root saws, snakes, and other miscellaneous approved equipment, in conjunction with hand winching device, and/or gas, electric rod propelled devices, shall be considered normal cleaning equipment. The Contractor may be required to demonstrate the performance capabilities of the cleaning equipment proposed for use on the project. If the results obtained by the proposed sanitary sewer cleaning equipment are not satisfactory, the Contractor shall use different equipment and/or attachments, as required, to meet specifications. More than one type of equipment/attachments may be required at a location. When hydraulic or high velocity cleaning equipment is used, a suitable sand trap, weir, dam, or suction shall be constructed in the downstream manhole in such a manner that all the solids and debris are trapped for removal.
4. Bypassing Sewage - The Contractor shall provide for the flow of sewage around the section or sections of pipe designated for rehabilitation. The bypass shall be made by plugging the line at an existing upstream manhole and pumping the flow into a downstream manhole or an adjacent system manhole as approved by TBID. Bypass pumping operations shall not interfere with traffic flow on streets or cross railroad tracks without prior written consent from the appropriate agencies or jurisdictions. The pumps and bypass lines shall be of adequate capacity and size to handle the flow and will be equipped with sound attenuating devices. A 100% capacity standby pumping system shall be available on site at all times to be used in the event of bypass pump failure. The District requires a detailed bypass plan to be submitted 2 weeks prior to initiating rehabilitation or pumping operations. Bypass pumping of private lateral connections is required where excessive lateral flow, head pressure and/or sewage pumps may interfere with the proper installation of the CIPP liner. Bypassing of sewage will be maintained until after the final video inspection of the rehabilitated pipe is complete.
5. Inspection of Pipelines - Inspection of pipelines shall be performed by experienced personnel trained in locating breaks, obstacles and service connections by close circuit television. The interior of the pipeline shall be carefully inspected to determine the location of any conditions which may prevent proper installation of CIPP into the pipelines, and it shall be noted so that these conditions can be corrected. A digital video recording in MPEG 1 (NTSC) format with 352x240 / 320x240 x30 fps resolution and audio bit rate of 256 Kbps, suitable and compatible digital log file of the pre and post lining installation work in PDF .DOC or .XLS format is to be provided on DVD disk or external drive for review of the CIPP installation, lateral restorations, and

for future reference. Videos and Log files are to reference project numbers, street names and address, manhole ID's and stations as indicated on the plans. In addition, a video of the pre and post lining work is to be immediately provided to the District for review after each individual project segment has been cleaned and lined. Project payments will not be made until the completed video and digital log files have been reviewed, accepted and field quantities of completed lining installations have been surveyed and installed lengths verified. It shall be the contractor's responsibility to field verify all quantities and pipeline diameters before ordering any materials. Lengths and sizes shown on plans are approximate and calculated from the best available information.

6. Line Obstructions - It shall be the responsibility of the Contractor to clear the lines of obstructions such as solids, roots, intrusions, grout, debris and deposits. If pre-installation inspection reveals an obstruction such as intruding service connection, dropped joint, or a collapse that will prevent the installation process, and it cannot be removed by conventional sewer cleaning equipment, cutters and lumber jack work, then the Contractor shall make a point repair excavation to uncover and remove or repair the obstruction. Such excavation shall be approved in writing by the District's representative prior to the commencement of the work and shall be considered as a separate pay item.

### 3.2 INSTALLATION

- A. CIPP installation shall be in accordance with ASTM F1216, Section 7, with the following additional requirements:
  1. Resin Impregnation - The quantity of resin used for tube impregnation shall be sufficient to fill the volume of air voids in the tube with additional allowances for polymerization shrinkage and the loss of resin through cracks and irregularities in the original pipe wall. A vacuum impregnation process shall be used. A roller system shall be used to uniformly distribute the resin throughout the tube. The Contractor shall designate an offsite factory location where the tube will be vacuum impregnated prior to installation. The Contractor shall allow the District or District's representative to inspect the materials and the "wet-out" procedure.
  2. After the liner is in place, the Contractor shall supply a suitable heat source and recirculation equipment to uniformly raise the temperature of the resin impregnated tube to a level required to effectively cure the resin. Boiler temperatures required to cure the resin and duration of time curing temperatures shall be maintained as recommended by the resin manufacturer. This may require continuous recirculation of the heat sources (water or steam). Temperature gauges shall be placed to determine the temperature of the incoming and outgoing water or steam from the heat source. Another such gauge shall be placed inside the tube at the remote end to determine the temperature at that location during the cure cycle. Boilers are to be equipped with sound attenuating devices.
  3. Initial cure shall be decreed complete when inspection of the exposed portions of the tube appear to be hard and sound and the temperature sensors indicate that the temperature is of a magnitude to realize an

exotherm.

4. Cool down - The Contractor shall cool the hardened CIPP to a temperature below 100° F before relieving pressure in the new pipe.
5. Finish - The new pipe shall be cut off and feathered to match the existing manhole flow line. The liner should be expanded and locked into the manhole walls in the upstream and downstream manholes. A chemical resin mixture seal compatible with the CIPP lining is to be provided in accordance with the manufacturers specifications. It is required that the seal at the manhole walls and pipe flow line provide a smooth, watertight transition. Sikadur 51 NS solvent free flexible epoxy adhesive may be used for general grouting of liner and manhole. The finished product shall be continuous over the length of pipe reconstructed and be free from dry spots, delaminating, wrinkling, bubbles and lifts. It shall also meet the leakage requirements specified in the latest version of ASTM F1216.

### 3.3 RESTORATION OF PIPE CONNECTIONS

- A. It is the intent of these specifications that lateral connections to buildings, drop manhole connections and intersecting mainline connections be reopened without excavation, utilizing a remotely controlled cutting device, monitored by a video TV camera. The Contractor shall certify he has a minimum of 2 complete working units plus spare key components on the site before each inversion. Compressors and equipment used for lateral cutting equipment will be equipped with sound attenuating devices. No additional payment will be made for excavations for the purpose of reopening connections and the Contractor will be responsible for all costs and liability associated with such excavation and restoration work. The Contractor shall provide a full-diameter hole, free from burrs or projections and finished with a smooth, brushed and buffed crack-free edge. The hole shall match the original intersecting pipe connection diameter and location.

### 3.4 TESTING AND INSPECTION

- A. After installation of the CIPP liner, samples shall be prepared by the contractor and tested according to Section 01 45 00 – Quality Control. Contractor shall provide certification to the District that the samples meet the specifications. The samples will be tested in accordance with ASTM F1216, Section 8.1 using either method proposed.
- B. Leakage testing of the CIPP shall be accomplished during cure while under a positive head. CIPP products in which the pipe wall is cured while not in direct contact with the pressurizing fluid (e.g., a removable bladder) must be tested by an alternative method approved by the District.
- C. Visual inspection of the CIPP shall be in accordance with ASTM F1216, Section 8.4 and this specification. Sewage bypass is to be provided during final video inspection of the rehabilitated sewer.

### 3.5 CLEAN-UP

- A. Upon acceptance of the installation work and testing, the Contractor shall reinstate



and restore all areas disturbed by the construction operations.

**END OF SECTION**

**SECTION 33 11 00**  
**WATER DISTRIBUTION AND TRANSMISSION**

**PART 1      GENERAL**

1.1      SECTION INCLUDES

- A. This section includes water system transmission or distribution piping, valves, fittings and accessories, hydrants, thrust blocking, corrosion protection, installation, protection, cleaning, and hydrostatic and leakage testing for potable waters systems.

1.2      RELATED WORK

- A. Section 31 23 00 Excavation, Backfilling and Compaction.
  - 1. Excavation of trenches, pipe bedding and backfill, compaction of backfill
- B. Section 33 13 00 - Disinfection of Water Distribution Systems
- C. Section 03 10 00 - Cast-in-Place Concrete
  - 1. Thrust blocks, vaults and other structures associated with water systems.

1.3      REFERENCES

- A. The applicable provisions of the latest editions of the References listed below shall govern the Work covered under this section, unless there is a conflict between said References and the requirements of this Section. In the case of such a conflict, the requirements of this section shall apply.
- B. American Water Works Association (AWWA)
- C. American Society for Testing and Materials (ASTM)
- D. American National Standards Institute (ANSI)
- E. American Association of State Highway and Transportation Officials (AASHTO)
  - 1. Standard Specifications for Highway Bridges
- F. Ductile Iron Pipe Research Association (DIPRA)
- G. Uni-Bell PVC Pipe Association
- H. American Public works Association (APWA)

1.4      SUBMITTALS

- A. Submit shop drawings, manufacturer's literature, certifications, and other product data in accordance with Section 01 33 00 - Submittals.
- B. Required submittals include, but are not limited to:
  - 1. Evidence of materials conformance with these specifications.

2. Manufacturer's recommended transportation, unloading and storage requirements. Manufacturer's installation guides and instructions.
  3. Dimensional information for pipe, valves, fittings, castings, and structures.
- C. Contractor shall maintain accurate construction record drawings of all as-built valve, fitting, and line locations, manhole locations, pipe lengths, and other relevant data and shall submit these records to the District for approval prior to application for final completion in accordance with Section 01 78 50 – Closeout Procedures.

#### 1.5 QUALITY ASSURANCE

- A. Transportation, handling, storage and installation practices shall be in accordance with manufacturer's recommended practice for materials provided as part of this Work.
- B. Contractor's personnel shall be experienced in the installation of materials provided as part of the Work, and shall comply with manufacturer's recommended practices during handling, placement and installation of such materials.
- C. Pipe, valve and appurtenant materials and Workmanship shall be in accordance with ANSI/NSF 61 and AWWA Standards as applicable.

#### 1.6 DELIVERY, STORAGE AND HANDLING

- A. Contractor shall be responsible for proper transportation, unloading, handling, storage and security of all equipment and materials to be provided as part of this specification in accordance with manufacturer's recommendations.
- B. Materials shall be stored in such a manner as to prevent damage or degradation. Any materials damaged prior to installation shall be removed from the project and replaced with new materials at no additional cost. Lost or stolen materials shall be replaced at no additional cost.
- C. Load and unload pipe, fittings, specials, valves and accessories by lifting with hoists or skidding so as to avoid shock or damage. Do not skid or roll pipe on skidways against pipe already on the ground.
- D. Each length of pipe shall be unloaded opposite or near the place where it is to be laid in the trench.
- E. Polyvinyl Chloride (PVC) piping, fittings, and materials shall be protected during storage from ultraviolet and ozone degradation. Noticeably faded materials shall not be installed and shall be promptly removed from project site.
- F. At times when pipe laying is not in progress, the open end(s) of pipe in the trench shall be closed by a watertight plug.

#### 1.7 PERFORMANCE REQUIREMENTS

- A. Depth of Cover

1. Minimum cover shall be 3-½' from top of pipe to ground surface
2. Where vertical conflicts exist with the waterline, a pre-fab steel loop will be required to be installed.

#### B. Layout

1. Comply with Utah administrative rules R309-550. As a minimum, locate potable water pipe at least 18 inches vertical and 10 feet horizontal edge to edge between water and sewer lines. Place water lines above sewer line.
2. When a water crosses over a sewer force main, a casing shall be provided for the sewer line within 10 feet of the crossing.
3. Where minimum separation standards cannot be met, alternative design may be required. Submit alternative design to the District for approval and to the Division of Drinking Water for an exception to rule.
4. Do not put potable water lines in the same trench with sewer lines, storm drains or electrical wires.

#### C. Minimum Water Main Size

1. The minimum water main size shall be 8-inches.

## **PART 2      PRODUCTS**

### 2.1      MANUFACTURERS AND FABRICATION

- A. Manufacturers providing materials or equipment as part of this specification shall have a minimum of five (5) years in the design, manufacture, and testing of such materials.
- B. Manufacturers shall provide, upon request, verification of a consistent record of meeting or exceeding materials or performance standards as specified herein.
- C. Allowable Manufacturers - Subject to compliance with specified requirements, manufacturers offering products that may be incorporated in the Work include the following:
  1. Water System Piping
    - a. Ductile Iron (DIP)
      - (i) Pacific States Cast Iron Pipe Company, Provo, Utah
      - (ii) United States Pipe and Foundry Company, Birmingham, Alabama
      - (iii) Tyler Pipe, Tyler, Texas (Fittings Only)
    - b. Polyvinyl Chloride (PVC)

- (i) J M Eagle, Livingston, New Jersey
  - (ii) Diamond Plastics, Grand Island, Nebraska
- 2. Water Valves
  - a. Gate Valves
    - (i) Mueller Company, Decatur, Illinois
    - (ii) Clow/McWane, Oskaloosa, Iowa
    - (iii) American Darling, Beaumont, Texas
  - b. Butterfly Valves
    - (i) Mueller Company, Decatur, Illinois
    - (ii) Clow/McWane Incorporated, Birmingham, Alabama
  - c. Check Valves
    - (i) Mueller Company, Decatur, Illinois
    - (ii) Clow/McWane Incorporated, Birmingham, Alabama
- 3. Air Relief/Vacuum Valves
  - (i) Crispin Multiplex Manufacturing Company, Berwick, Pennsylvania
  - (ii) APCO Willamette Valve and Primer Corporation, San Clemente, California
- 4. Pressure Reducing Valves
  - (i) CLA-VAL Company, Newport Beach, California
  - (ii) Singer Valve, Surrey, BC
- 5. Mechanical Couplings
  - a. Connections to AC Pipe (outside diameter transition coupling)
    - (i) PowerSeal, Wichita Falls, Texas
    - (ii) Viking Johnson, Hitchin, Hertfordshire, United Kingdom
  - b. Connections to DIP and PVC Pipe
    - (i) Tyler Union, Tyler, Texas
- 6. Fire Hydrants
  - a. Dry Barrel Fire Hydrants
    - (i) Mueller Company, Decatur, Illinois
- 7. Fittings
  - a. Mechanical Joint
    - (i) Tyler Union, Tyler, Texas
    - (ii) Star Pipe Products, Houston, Texas
  - b. Flanged Joint

- (i) Tyler Union, Tyler, Texas
  - (ii) Star Pipe Products, Houston, Texas
- c. Joint Restraints
- (i) EBAA Iron, Inc. (Mega Lug), Eastland, Texas
  - (ii) Star Pipe Products, Houston, Texas
  - (iii) Sigma One-Lok, Ontario, California
8. Tapping Sleeve
- (i) Mueller Company, Decatur, Illinois
  - (ii) JCM Industries, Nash, Texas
  - (iii) Tyler Union, Tyler, Texas
9. Pre-fabricated Steel Loops
- (i) Utility Coatings and Fabrication, West Jordan, Utah

## 2.2 POTABLE WATER SYSTEM PIPING

A. Water system piping shall be of the size, type, and class indicated on the drawings and as specified herein.

### B. Ductile Iron Pipe and Fittings

1. Ductile Iron pipe shall be pressure class 350.
2. Ductile iron pipe shall be designed and manufactured in accordance with the following requirements:
  - a. AWWA/ANSI C150/A21.50 - American National Standard for the Thickness Design of Ductile Iron Pipe.
  - b. AWWA/ANSI C151/A21.51 - American National Standard for Ductile Iron Pipe, Centrifugally Cast, for Water and Other Liquids.
3. Ductile iron fittings shall comply with the requirements of the following:
  - a. AWWA/ANSI C110/A21.10 - American National Standard for Ductile Iron and Grey Iron Fittings, 3 in. through 48 in., for Water and Other Liquids.
  - b. AWWA/ANSI C153/A21.53 - American National Standard for Ductile Iron Compact Fittings, 3 in. through 24 in. and 54 in. through 64 in. for Water Service.
4. Ductile iron pipe and fittings shall be cement mortar lined and shall have a bituminous seal coat in accordance with the requirements of AWWA/ANSI C104/A21.4 - American National Standard for Cement-Mortar Lining for Ductile Iron Pipe and Fittings for Water.
5. Joints and gaskets shall be in accordance with AWWA/ANSI C111/A21.11 American National Standard for Rubber Gasketed Joints for Ductile Iron Pressure Pipe and Fittings.
6. Flanged pipe shall be in accordance with AWWA/ANSI C115/A21.15 - American National Standard for Flanged Ductile Iron Pipe with Ductile Iron or

Grey Iron Threaded Flanges.

C. Polyvinyl Chloride Pipe

1. PVC Pipe shall be DR-18
2. PVC pipe shall be manufactured from virgin Class 12454A or 12454B materials as defined by ASTM D1784 .
3. PVC pipe and fittings shall be designed and manufactured in accordance with the following requirements:
  - a. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. Through 12 in., for Water Distribution.
  - b. AWWA C905 - Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameters 14 in. Through 36 in.
  - c. AWWA C907 - Polyvinyl Chloride (PVC) Pressure Fittings for Water - 4 in. Through 8 in.

D. Prefabricated Steel Loops

1. Steel water loops shall be fabricated using steel pipe A53 Grade B ERW.
2. Steel Pipe fittings shall conform to ASTM A234.
3. All welding shall be full penetration butt welds per ASTM C200
4. Lining and Coating Specifications;
  - a. All fabricated steel pipe shall be sandblasted to "near white" (SSPC-SP10). Each section of pipe and or fittings shall be primed by the spraying method with Tnemec Series FC-20 Pota Pox (fast cure) Epoxy - Polyamide 20-1255 beige primer. This shall be 7 mils wet and 4 mils after drying. The minimum drying time shall be 3 hours at 77° F or 12 hours at 50° F before intermediate coats are applied. Proper curing will not occur under 35° F.
  - b. Intermediate and topcoat shall be Tnemec Series FC-20 Pota Pox (Fast Cure) epoxy Polyamide 20-AA83 Tank White applied by the spraying method. Each coat shall be 9.0 mils wet and 5.0 mils dry per coat. The minimum dry time shall be 3 hours at 77° F. or 12 hours at 50° F. before finish coat is applied. Proper curing will not occur under 35° F.
  - c. Total Dry Film Thickness shall be 14.0 mils (minimum).
  - d. All welded joints or other repairs shall be made in the same manner as listed above.
  - e. All underground loops, spools, and fabricated piping shall be double tape wrapped after the above coatings, with Polyken 934-35 Pipe Wrap or equal
  - f. All Tnemec products listed above are listed by the State of Utah, Board

of Health, NSF and conforms to AWWA 1DO1 Inside System No. 1.

## 2.3 CORROSION PROTECTION

- A. Bolts: Apply 2 coats of Coal for Mastic (Kopper 50 or equal) to all exposed surfaces of bolts and to all bolt threads after installation of piping, fittings, valves, and couplings.
- B. Fittings, valves, and specialties shall be tape wrapped with Polyken 930 filler tape for filling voids and with Polyken 930 tape to cover.
- C. Polyethylene encasement, if required, shall conform to AWWA/ANSI C105/A21.5 - American National Standard for Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids.
- D. Buried ductile iron mechanical joints shall be covered in grease and 8 mil vinyl wrap plastic.

## 2.4 VALVES

- A. Gate valves:
  - 1. Shall be ductile-iron body resilient seat, non-rising bronze stem with mechanical joint ends, except as otherwise specified or shown on the Drawings.
  - 2. Gate valves shall conform to the following requirements:
    - a. AWWA C515 – Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service.
  - 3. All valves shall be provided with a 2" square operating nut for key operation from ground surface and open to the left, unless hand wheels are indicated.
  - 4. Valve body and gates shall be rated to a design working pressure of 200 psig for valves up to 12", and 150 psig for valves of 16" or greater. All valves shall be factory tested to twice the rated working pressure.
  - 5. Gate valves for potable water service shall be epoxy lined in accordance with AWWA/ANSI C550 - Protective Epoxy Interior Coatings for Valves and Hydrants.
  - 6. Gate valves shall be similar and equivalent to that produced by the following manufacturers:
    - a. Mueller Series 2300
    - b. Clow Cat. Model No. 2639
    - c. American Darling Series 2500
  - 7. Isolation valves shall be placed at all intersection and at no more than 500 foot intervals in residential areas and no more than 800 foot intervals in commercial areas.



B. Tapping valves and sleeves:

1. Tapping valves shall have large diameter seat rings to permit entry of tapping machine cutters. Inlet shall be flanged. Outlet shall suit branch piping and shall include the required flange for tapping machine adapter connection. Tapping valves shall conform to the applicable requirements for gate valves as specified herein.
2. Tapping sleeves shall be suitable for assembly around the existing main. Body shall be high strength ribbed construction. End gaskets shall be sized to suit the existing main.
3. Tapping valves and sleeves shall be similar and equivalent to those produced by the following manufacturers:
  - a. Mueller cast iron split tapping sleeve
  - b. JCM model 414 custom fabricated mechanical joint steel tapping sleeve

C. Butterfly Valves

1. Butterfly valves shall conform to the requirements of AWWA/ANSI C504 - Rubber Seated Butterfly Valves.
2. Butterfly valves for potable water service shall be epoxy lined in accordance with AWWA/ANSI C550 - Protective Epoxy Interior Coatings for Valves and Hydrants.
3. Butterfly valves shall comply with the following requirements:
  - a. Valve bodies shall be ductile iron conforming to ASTM A126, Class B.
  - b. Discs shall be streamlined and shall have a continuous 360E seating surface of 18-8 stainless steel.
  - c. Shafts shall be 18-8 stainless steel of stub construction with at least 1-1/2 shaft diameter engagement into the disc and shall be fastened to the disc with upset pins.
  - d. Seats shall be Buna-N material and shall be bonded to the valve body. Seats shall provide tight shutoff
  - e. Mueller Lineseal III Series
  - f. Clow Style 4500

D. Check Valves

1. Check valves shall conform to the requirements of AWWA/ANSI C508 - Swing Check Valves for Waterworks Service - 2 in. through 24 in. NPS.
2. Check valves for potable water service shall be epoxy lined in accordance with AWWA/ANSI C550 - Protective Epoxy Interior Coatings for Valves and Hydrants.
3. Check valves shall be weighted swing arm type unless otherwise noted,

similar and equivalent to those produced by the following manufacturers:

- a. Mueller Cat. No. A-2600 Series
- b. Clow Cat. No. F-5300 Series

E. Air Relief/Vacuum Valves

1. Air relief/vacuum valves shall conform to the requirements of AWWA/ANSI C512 - Air-Release, Air/Vacuum, and Combination Air Valves for Waterworks Service.
2. Air and Vacuum Valves shall vent air from lines being filled and shall allow entry of air upon draining of lines. Design of valves shall be such that velocity of air passing through the valve will not blow float shut at design volumes.
  - a. Valve body shall be cast iron conforming to ASTM A126, Class B.
  - b. Float, and guide rod shall be stainless steel conforming to ASTM A240 and A582, respectively.
  - c. Valves shall be designed to withstand hydrostatic pressures of 300 psig.
  - d. Valve seat shall be BUNA-N Rubber.
  - e. Valve inlet shall be ANSI Class 125 or Class 250 flanged, or NPT as indicated.
  - f. Valve shall be of the size indicated and shall include vent piping of the size, type and configuration indicated.
  - g. Air and Vacuum Valves shall be similar and equivalent to Crispin AL Series as manufactured by Multiplex Manufacturing Co.
3. Air Relief Valves shall vent air from high points in lines under pressure.
  - a. Valve body shall be cast iron conforming to ASTM A126, Class B.
  - b. Float, float lever and operating linkages shall be stainless steel conforming to ASTM A240 or A582, bronze conforming to ASTM B62, or brass conforming to ASTM B16.
  - c. Valves shall be designed to withstand hydrostatic pressures of 300 psig.
  - d. Valve seat shall be PVC or stainless steel conforming to ASTM A276.
  - e. Valve inlet shall be ANSI Class 125 or Class 250 flanged, or NPT as indicated.
  - f. Valve shall be of the size indicated and shall include vent piping of the size, type and configuration indicated.
  - g. Pressure Air Relief Valves shall be similar and equivalent to Crispin P

Series as manufactured by Multiplex Manufacturing Co.

4. Combination or Universal Air Relief Valves shall allow air to be vented from lines being filled, shall allow entry of air when lines are being drained, and shall allow venting of air from lines under pressure. Valve shall be a single unit (universal type) or dual unit (combination type) assembly as indicated.
  - a. Universal Air Relief Valves shall be similar and equivalent to Crispin UL Series as manufactured by Multiplex Manufacturing Co.
  - b. Combination Air Relief Valves shall consist of an Air and Vacuum Valve and a Pressure Air Release Valve and shall be similar and equivalent to Crispin C Series as manufactured by Multiplex Manufacturing Co.

F. Pressure Reducing Valves (PRV)

1. Pressure reducing valves shall be hydraulically operated, pilot controlled diaphragm operated, globe pattern regulating valves with the following function features.
  - a. Reduce variable inlet pressure to constant downstream pressure regardless of flow rate.
  - b. Include pressure sustaining feature to maintain inlet pressure above a predetermined minimum.
  - c. Rate of opening/closing adjustment.
2. PRV unit shall consist of valve body, pilot controls, related piping and all other items required to provide a complete, operational installation. PRV unit shall be constructed of the following materials:
  - a. Valve body and cover shall be of ductile iron meeting the requirements of ASTM A536.
  - b. Trim shall be bronze meeting the requirements of ASTM B62.
  - c. Stem, nut and spring shall be of Type 304 stainless steel.
  - d. Disk shall be Buna-N rubber.
  - e. Diaphragm shall be of nylon reinforced Buna-N rubber.
  - f. Pilot assemblies shall consist of bronze (ASTM B62) pilot control, Type 303 stainless steel trim, and Buna-N synthetic rubber parts. Control assembly shall be provided with a strainer.
  - g. Control valves and piping shall be of bronze, copper, stainless steel or other non-corrosive metals.
3. Working pressure shall be 150 psi at maximum water temperature of 180° F.
4. Valve size, inlet/outlet pressures, and screwed/flanged designation shall be as indicated on the drawings.

5. Pressure reducing valves shall be similar and equivalent to the following:
  - a. CLA-VAL Model 92-01
6. Isolation valves shall be installed on both sides of the pressure reducing valve.
7. A low flow bypass PRV line shall be considered.

## 2.5 VALVE BOXES

- A. Shall be suitable for HS-20 (AASHTO) traffic loading.
- B. Shall be furnished and installed over each line valve and over each auxiliary hydrant valve. All buried valves shall be installed complete with two-piece, cast iron, slip type, 5-1/4 inch shaft valve box.

## 2.6 HYDRANTS

- A. Hydrants shall be dry barrel type, of cast or ductile iron construction, with bronze glands, bushings, stems, stem nuts, valve seats, and nozzles.
- B. Hydrants shall conform to the requirements of AWWA/ANSI C502 - Dry Barrel Fire Hydrants.
  1. Hydrant rated working pressure shall be 200 psig.
- C. Hydrant features shall conform to the following requirements:
  1. Main valve opening shall be a minimum of 5-1/4".
  2. Pumper and hose nozzles shall be threaded in accordance with National Standard hose coupling thread specifications.
    - a. Provide one (1) pumper nozzle, 4-1/2" nom. ID., 7.5 threads per inch
    - b. Provide two (2) hose nozzles, 2-1/2" nom. ID., 6 threads per inch.
  3. Operating nut shall be National Standard, 1-1/2" pentagon, opening counter-clockwise.
  4. Hydrants shall be warranted for ten (10) years against defects in materials and workmanship and shall be similar and equivalent to those produced by the following manufacturers:
    - a. Mueller Super Centurion Series
- D. Hydrant appearance and paint scheme shall be in accordance with the requirements of the local jurisdiction.
- E. Fire hydrants shall be located in accordance with the local fire code official and as required for maintenance- such as for a blow off at the end of dead end lines.

## 2.7 INDICATOR POSTS

- A. UL 789, FM Approved, vertical type, cast iron body with operating wrench, extension

rod, and adjustable cast iron barrel of length required for depth of bury of valve.

1. Mueller A-20806 for 4" - 14"
2. Mueller A-20807 for 16" - 24"

B. Supervisory Switches: SPDT designed to signal valve in other than full open position.

## 2.8 MECHANICAL JOINT SLEEVES / COUPLINGS

A. AC pipe transition coupling to DI or PVC

1. PowerSeal, PowerMax Coupling
2. Viking-Johnson MaxiFit Coupling
3. Smith Blair Quantum Coupling

B. Mechanical Joint Long Sleeve

1. Tyler, MJ "Long" Sleeve
2. Mueller DI Sleeve

## 2.9 MECHANICAL JOINT RESTRAINTS

A. EBAA IRON Megalugs® Series 1100 mechanical joint restraint for ductile iron pipe, 3" - 12".

B. EBAA IRON Megalug® Series 2000PV for restraining plain end PVC pipe at mechanical fittings and appurtenances, 3" - 36".

C. Sigma One-Lok™

D. Stargrip

## 2.10 REPAIR CLAMPS

A. Clamps shall provide a gasketed seal around the full circumference of the pipe. Bolts shall be high strength carbon steel.

B. Gasket dimensions shall suit existing and new pipe, as required.

C. Quality standard: Mueller series 540 (150 psig).

## 2.11 BOLTS

A. Bolts shall be core 10 Ductile bolt, conforming to ASTM A193 B8 and the nut shall be Grade 8. Install with an anti-seize lubricant. Do not use an impact wrench. Torque in accordance with the pipe manufacturer's criteria so as to not crush the pipe. Grease and wrap as specified.

B. Steel studs shall conform to ASTM A 193 B7 and the nut shall conform to ASTM A194 2H. The studs and nuts shall be treated with trivalent blue type 2 zinc coating. Grease and wrap as specified.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- A. Verify that Work covered under other sections of these specifications is complete to the point that Work covered under this section may properly commence without hindering or damaging Work of other trades. Do not proceed with construction until unsatisfactory conditions have been corrected.
- B. Carefully examine all pipe fittings, valves and other appurtenances for damage and other defects immediately before installation.
- C. Mark and hold defective materials for inspection by District, who may prescribe corrective repairs or reject the materials. Used materials are not allowed.
- D. Prior to installation, inspect valves for direction of opening, freedom of operation, tightness of pressure resisting bolts, cleanliness of valve ports and seating surfaces, handling damage and cracks. Hold defective valves for inspection by District.
- E. Verify installation or connection requirements prior to construction by potholing as necessary.

### **3.2 METHODS AND PROCEDURES**

#### **A. General**

- 1. Prior to pipe installation, prepare trench in accordance with the plans and Section 31 23 00 - Excavation, Backfilling and Compaction.
- 2. Proper implements, tools, and facilities shall be provided and used for the safe and convenient performance of the Work. All pipe, fittings, and valves shall be lowered carefully into the trench by means of a derrick, ropes, or other suitable tools or equipment, in such a manner as to prevent damage to materials, protective coatings and linings. Under no circumstances shall water system materials be dropped or dumped into the trench.
- 3. Manufacturers' Installation Manual recommendations for handling and laying pipe, fittings and related materials shall be strictly adhered to. In no case shall these materials be dropped or dumped during transport, unloading, or handling.

#### **B. Special Design Considerations**

- 1. Site specific geologic factors and soil conditions shall be considered in the design of the waterline.
- 2. Waterline installation shall be avoided in areas of contamination. Where this is not possible, special design shall be required.
- 3. Where a waterline crosses a water body greater than 15 feet wide it shall at a minimum:

- a. have a minimum cover of 2 feet
- b. be constructed of a jointless pipe or a pipe with restrained joints
- c. have isolation valves on either side of the crossing
- d. have a means to sample the pipeline upstream and downstream of the crossing
- e. have a means to be pressure tested.

### 3.3 INSTALLATION

#### A. Water Pipe Installation

1. Water pipe installation shall be in accordance with the applicable requirements of the following documents:
  - a. AWWA/ANSI C600 - Installation of Ductile Iron Water Mains and their Appurtenances.
  - b. AWWA C605 - Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water.
  - c. AWWA/ANSI C105/A21.5 - Standard for Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids.
  - d. DIPRA - The Guide for the Installation of Ductile Iron Pipe
  - e. UNI-B-3-92 - Recommended Practice for the Installation of Polyvinyl Chloride (PVC) Pressure Pipe (Nominal Diameters 4-36 Inch).
2. All lumps, blisters, and excess coating shall be removed from the bell and spigot ends of each pipe, and the outside of the spigot and the inside of the bell shall be wiped clean and dry so as to be free from dirt, sand, grit, or any foreign material before the pipe is laid. Bevel and file spigot of pipe to prevent gasket damage during joint assembly.
3. The water pipe shall be laid and maintained to lines and grades established by the Drawings and Specifications with fittings and valves at the required locations unless otherwise approved by District.
4. When crossing existing pipelines or other structures, alignment and grade shall be adjusted as necessary, with the approval of District to provide clearance as required by federal, state, or local regulations or as deemed necessary by District to prevent future damage or contamination of either structure.
5. Lay all water lines on a continuous grade to avoid high points except as shown on the Drawings.
6. Prevent foreign material from entering the pipe while it is being placed in the trench. During laying operations, no soil, debris, tools, clothing, or other materials shall be placed in, or allowed to enter the pipe.
7. Assemble joints in accordance with manufacturer's recommendations.

8. The pipe shall be brought to correct line and grade, and shall be secured in place with approved backfill material in accordance with Section 31 23 00 Excavation, Backfilling and Compaction.
9. Wherever it is necessary to deflect pipe from a straight line, either in the vertical or horizontal plane, to avoid obstructions or where long-radius curves are permitted, the amount of deflection allowed shall not exceed that recommended by pipe manufacturer.
10. At times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other means approved by the District. When practical, the plug shall remain in place until the trench is pumped completely dry. Care must be taken to prevent pipe flotation should the trench fill with water.
11. Where necessary, cut pipe perpendicular to the pipe centerline. Grind cut ends and rough edges smooth. For push on joint connections, the cut end shall be beveled.
12. Fire hydrants shall be set plumb at proper finish grade as indicated on the drawings (see typical hydrant detail).

#### B. Valve Installation

1. Locate valves as shown on drawings.
2. Orient valve operating stems in a manner that will allow proper operation.
3. A valve box shall be provided for every valve that has no gearing or operating mechanism or in which the gearing or operating mechanism is fully protected with a gear case. The valve box shall not transmit shock or stress to the valve and shall be centered over the operating nut of the valve. Set box cover at grade shown on Drawings.
4. In no case shall valves be used to bring misaligned pipe into alignment during installation. Support pipe in such a manner as to prevent stress on the valve.

#### C. Restraints and Thrust Block Installation

1. Megalug restraints are required on all fittings.
2. Provide thrust blocks at reducers, valves, tees, hydrants, plugs and caps, and at bends deflecting 11-1/4 degrees or more.
3. Place thrust block between solid ground and the component to be shored; the area of bearing on the pipe and on the ground in each instance shall be that shown on Drawings. Unless otherwise shown or directed, locate block so as to contain the resultant thrust force and so that the pipe and fitting joints will be accessible for repair.
4. Concrete for thrust blocks shall have a compressive strength of not less than 2500 psi at 28 days. Concrete mixes shall be provided in accordance with Section 03 10 00 –Cast-In-Place Concrete of these specifications.
5. Verify that concrete has achieved 70% of specified compressive strength prior to charging line.



### 3.4 PROTECTION

- A. Provide barricades and restrict access as appropriate to prevent damage to Work in place.
- B. Contractor shall be responsible for protection of Work in place against displacement, damage, loss, or theft until District's acceptance. Any Work installed and subsequently damaged, lost, or displaced shall be repaired or replaced to the District's satisfaction at no additional cost.

### 3.5 CLEANING

- A. Thoroughly clean all pipe lengths or units of all debris immediately after laying.
- B. Thoroughly clean by flushing and remove all debris from water mains and appurtenances. Inspect and verify lines are clean prior to submitting facilities for District's acceptance.

### 3.6 TESTING

- A. Temporary connections for pressure testing shall be made by Contractor at his expense and removed by Contractor after satisfactory completion of the testing Work.
- B. Testing procedures shall as a minimum be in accordance with the most recent update of the following specifications and regulations.
  - 1. AWWA C600 - Pressure and Leak Testing
- C. Hydrostatic Pressure Test:
  - 1. After completion of the installation of the system, or any reasonable length thereof, after backfilling and after thorough flushing of the portion to be tested, pressure tests shall be made. The system to be tested shall be subjected to a hydrostatic pressure of 200 pounds per square inch, unless otherwise noted on the Drawings, for a period of not less than 2 hours duration.
  - 2. The portion to be tested shall be filled with water slowly and the specified test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the District. The Contractor shall make the temporary connection for pressure testing.
  - 3. Before applying the specified test pressure, air shall be expelled completely from the pipe, valves, and hydrants. If permanent air vents are not located at all high points, the Contractor shall install corporation stops at such points so that the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied.
  - 4. All exposed pipe, fittings, valves, hydrants, and joints shall be examined carefully during the test. Any damage or defective pipe, fittings, valves, or hydrants that are discovered following the pressure test shall be repaired or replaced with sound material and the test shall be repeated until it is

satisfactory to the District.

D. Leakage Test:

1. A leakage test shall be conducted concurrently with the pressure test.
2. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within 5 psi of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water.
3. No leakage shall be allowed.
4. All visible leaks, other than a minor amount of sweating, shall require immediate stoppage of the test and tightening of the joints so that, when pressure is again put on the system, there will be no leakage.

**END OF SECTION**

**SECTION 33 13 00**  
**DISINFECTION OF WATER DISTRIBUTION SYSTEMS**

**PART 1      GENERAL**

1.1      SECTION INCLUDES

- A. This section includes flushing of water distribution system and supply lines, chlorine disinfection and final flushing.

1.2      RELATED WORK

- A. Section 33 11 00 - Water Distribution and Transmission
  - 1. Construction and installation of water distribution and transmission piping, hydrostatic testing, cleaning and flushing requirements.

1.3      REFERENCES

- A. AWWA B300: AWWA Standard for Hypochlorites
- B. AWWA B301: AWWA Standard for Liquid Chlorine
- C. AWWA C651: AWWA Standard for Disinfecting Water Mains
- D. Rules governing public drinking water systems as found in R309 of the Utah Administrative Code.

1.4      SUBMITTALS

- A. Submit manufacturer's literature, certifications, and other product data in accordance with Section 01 33 00 - Submittals.
- B. Submit bacteriological laboratory's evidence of certification
- C.
- D. Submittals required after testing as a condition for final acceptance include but are not limited to the following:
  - 1. Results of chlorine residual tests.
  - 2. Results of bacteriologic quality tests.

1.5      QUALITY ASSURANCE

- A. All disinfection and testing procedures shall be in accordance with applicable Federal, State, and local standards.

1.6      DELIVERY AND HANDLING

- A. Contractor shall be responsible for proper transportation, unloading, handling,

storage and security of all equipment and materials provided as part of this specification in accordance with manufacturer's recommendations.

- B. Materials shall be stored in such a manner as to prevent damage or degradation. Any materials damaged or degraded prior to installation shall be removed from the project and replaced with new materials at no additional cost. Lost or stolen materials shall be replaced at no additional cost.

## **PART 2 PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Manufacturers providing materials as part of this specification shall have a minimum of five (5) years' experience in the manufacture and testing of such materials.
- B. Manufacturers shall provide, upon request, verification of a consistent record of meeting or exceeding materials or performance standards as specified herein.

### **2.2 CHLORINE**

- A. Dry shall conform to AWWA B300 - Standard for Hypochlorite's.
- B. Liquid shall conform to AWWA B301 - Standard for Liquid Chlorine.
- C. Store in a cool, dark, and dry environment to minimize deterioration.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- A. Examine water facilities to verify they have been properly cleaned, flushed, and hydrostatically tested, as appropriate prior to performing disinfection Work. Verify that other Work will not contaminate or disturb disinfected facilities.
- B. Notify District at least 72 hours prior to any flushing and disinfecting.

### **3.2 METHODS AND PROCEDURES**

#### **A. General**

- 1. Disinfection procedures shall as a minimum be in accordance with the following specifications and regulations.

- a. AWWA C651 - Disinfecting Water Mains
- b. AWWA C652 - Disinfection of Water Storage Facilities

#### **B. Chlorination of Water Distribution and Supply System**

- 1. Use one of the methods defined under AWWA C651 that is acceptable to the District. Fill the pipe line to the required residuals.

#### **C. Flushing of Water Distribution and Supply System**

1. After the applicable retention period, the chlorinated disinfection water shall be flushed from the line. Flush the chlorinated water from the main through hydrants or if a hydrant is not available, install a tap of sufficient size to provide a flushing velocity of 2.5 feet per second.
2. Iodine residual determination shall be made to ascertain that the heavily chlorinated water has been removed from the line. The line shall be flushed until the residual chlorine concentration is less than 1 mg/l.
3. The disinfection water shall be legal disposed of.
4. The discharge of highly chlorinated disinfection water to the environment is not allowed. The Contractor shall follow methods for de-chlorinating the disinfection water as found in AWWA C651.

D. Bacteriological Sampling and Testing

1. Sampling and testing shall be conducted in accordance with AWWA Manual M12 - Simplified Procedures for Water Examination.
2. After the main has sat for a minimum of 48 hours without water use following flushing, and before the water line is placed in service, samples shall be collected from the water line, and tested for coliform. Two samples shall be taken, from each location, at least 15 minutes apart.
3. If the initial disinfection fails to produce satisfactory samples, disinfection shall be repeated until satisfactory samples have been obtained.

3.3 PROTECTION

- A. Contractor shall be responsible for maintaining disinfected facilities from contamination until acceptance by the District. Should facilities be contaminated prior to acceptance, Contractor shall re-disinfect and retest at no additional cost.

**END OF SECTION**

**SECTION 33 31 00  
SANITARY SEWER SYSTEMS**

**PART 1      GENERAL**

1.1      SECTION INCLUDES

- A. This section includes the following:
  - 1. Sewer piping, manholes, and service laterals.
  - 2. Connections with existing sewerage facilities.
  - 3. Cleaning, flushing, and testing sewerage facilities.

1.2      RELATED WORK

- A. Section 31 23 00 - Excavation, Backfilling, and Compaction
  - 1. Trench excavation, over-excavation of unsuitable materials, backfill placement and compaction associated with installation of items specified as part of this Work.
- B. Section 03 10 00 - Cast-In-Place Concrete
  - 1. Construction of concrete structures associated with or required as part of this Work.

1.3      REFERENCES

- A. The applicable provisions of the latest editions of the References listed below shall govern the Work covered under this Section, unless there is a conflict between said References and the requirements of this Section. In the case of such a conflict, the requirements of this Section shall apply.
- B. American Society for Testing and Materials (ASTM)
- C. American National Standards Institute (ANSI)
- D. Uni-Bell PVC Pipe Association - Handbook of PVC Pipe
- E. Ductile Iron Pipe Research Institute (DIPRA)
- F. American Association of Safety and Highway Transportation Officials (AASHTO)
- G. Utah Department of Transportation Construction Standards (UDOT)
- H. American Public Works Association (APWA) - Standard Specifications

1.4      SUBMITTALS

- A. Submit shop drawings, manufacturer's literature, certifications, and other product data in accordance with Section 01 33 00 - Submittals

- B. Submittal data shall include, but not necessarily be limited to the following:
  - 1. Manufacturer's recommended transportation, unloading and storage requirements. Manufacturer's installation guides and instructions.
  - 2. Evidence of conformance with the requirements of these specifications.
  - 3. Dimensional information for structures, castings, and fittings.
- C. Contractor shall maintain accurate construction record drawings of all as-built invert elevations, manhole locations, pipe lengths, and wye locations and shall submit these records to the District for approval prior to application for final completion.

## 1.5 QUALITY ASSURANCE

- A. Transportation, handling, storage and installation practices shall be in accordance with manufacturer's recommended practice for materials provided as part of this Work.
- B. Contractor's personnel shall be experienced in the installation of materials provided as part of the Work, and shall comply with manufacturer's recommended practices during handling, placement and installation of such materials.

## 1.6 DELIVERY AND HANDLING

- A. Contractor shall be responsible for proper transportation, unloading, handling, storage and security of all equipment and materials to be provided as part of this specification in accordance with manufacturer's recommendations.
- B. Materials shall be stored in such a manner as to prevent damage or degradation. Any materials damaged prior to installation shall be removed from the project and replaced with new materials at no additional cost. Lost or stolen materials shall be replaced at no additional cost.

## **PART 2 PRODUCTS**

### 2.1 MANUFACTURERS

- A. Manufacturers providing materials or equipment as part of this specification shall have a minimum of five (5) years' experience in the manufacture, testing, and installation of such materials and equipment.
- B. Manufacturers shall provide, upon request, verification of a consistent record of meeting or exceeding materials or performance standards as specified herein.
- C. Allowable Manufacturers - Subject to compliance with specified requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to the following:
  - 1. Sanitary Sewer Piping
    - a. Polyvinyl Chloride (PVC)

- (i) J - M Manufacturing Company, Livingston, New Jersey
- (ii) Extrusion Technologies, Incorporated, Denver, Colorado
- (iii) Pacific Western Extruded Plastics Company, Eugene, Oregon

b. Concrete (CP)

- (i) Amcor Precast, Ogden, Utah
- (ii) Geneva Pipe, Orem Utah

2. Sanitary Sewer Manholes (Precast)

- (i) Amcor Precast, Ogden, Utah
- (ii) Geneva Pipe, Orem, Utah

3. Sewer Laterals and Fittings

- (i) Pipe and fittings shall be of same manufacturer as main piping.
- (ii) Naco Industries, Logan, Utah for fabricated PVC SDR 35 and SDR 26 PVC Fittings for 18" - 27" diameter.
- (iii) Adaptors shall be Fernco or Romac.

## 2.2 SANITARY SEWER PIPING

A. Sanitary sewer piping shall be of the size, type, and class specified on the drawings and as specified herein.

B. Polyvinyl Chloride (PVC) Pipe

- 1. Unless otherwise indicated, PVC pipe shall be SDR 35 designed and manufactured in accordance with ASTM D-3034 for pipes sizes 4" to 15" and ASTM F-679, PS 46 for pipe sizes 18" to 27".
- 2. Pipe shall be bell and spigot type consisting of integral bell section, factory beveled spigot ends, and securely attached rubber sealing ring conforming to the requirements of ASTM D-3212.
- 3. Piping shall be green pigmented.
- 4. Fittings shall conform to the requirements of ASTM D-3034 (4" to 15") and shall be provided with joints conforming to ASTM D-3212.
- 5. Fabricated SDR 35 and SDR 26 PVC Gasketed Fittings meeting ASTM D 1784, ASTM D3034, ASTM F679, ASTM F 1366, and ASTM F477 for sizes 18" - 27".

## 2.3 SANITARY SEWER MANHOLES

A. Manholes shall be either cast in place or precast units of the size, depth and configuration indicated on the drawings.

- 1. Line manholes shall be 48 inch diameter, unless otherwise indicated.
- 2. Manholes servicing 3 or more intersecting sewer lines shall be 60 inch diameter, unless otherwise specified.
- 3. Manholes with sewer lines 12 inches in diameter and larger shall be 60 inch diameter



- B. Precast concrete manhole sections shall be designed and manufactured in accordance with the requirements of ASTM C 478.
- C. Concentric and Eccentric cone sections shall conforming to ASTM C 478. .
- D. Manholes with Eccentric cones shall have steps aligned over the shelf that have been case into the manhole of the manhole.
- E. Manhole rings and flat top sections shall be designed and manufactured in accordance with the requirements of ASTM C 478 and AASHTO HS-20 loading.
- F. Manholes shall be of watertight construction, utilizing either bitumastic sealant or rubber gasket between adjacent manhole sections.
- G. Cement for manholes shall be Portland Cement, Type V, or Type II-A complying with ASTM C 150.
- H. All required openings in manhole sections shall be performed during the casting process at proper locations required for indicated installation. Each opening shall be provided with a watertight rubber boot equipped with stainless steel bands to secure boot to both manhole and pipe connection.
- I. Manhole ring and cover shall be manufactured of grey iron castings conforming to ASTM A 48, Class 30, with non rocking, machined bearing surfaces between cover and frame.
  - 1. Cover shall be vented and shall bear the lettering "Taylorsville-Bennion Imp. Dist."
  - 2. Ring and cover shall be HS 20 traffic rated
- J. Pipe to Manhole Connectors shall be resilient, flexible watertight seals meeting the requirements of ASTM C 923.
  - 1. Grout pipe connections to manhole.

#### 2.4 SEWER LATERAL STUBS

- A. Sewer laterals, unless otherwise noted, shall consist of service wye, lateral pipe, plug, and cleanout as indicated on the drawings.
- B. Service wye shall comply with the requirements of local jurisdiction.
- C. Service laterals shall consist of 45° wye, bends, tees and other fittings conforming to ASTM D 3034 and D 3212, and PVC lateral piping conforming to ASTM D 3034.
- D. Provide approved 'Fernco' or other fittings for connections to existing services where required.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- A. Verify installation or connection requirements prior to construction by potholing as necessary.
- B. Verify that Work covered under other sections of these specifications is complete to the point that Work covered under this section may properly commence without hindering or damaging Work of other trades. Do not proceed with construction until unsatisfactory conditions have been corrected.

### **3.2 METHODS AND PROCEDURES**

- A. Install materials and equipment included in the Work in accordance with materials/equipment manufacturer's recommended methods and procedures.
- B. Pipe grades shall be established and checked by use of laser grade control. Pipe grade shall be checked as often as necessary to assure pipe is installed at proper grade, but in no case shall grades be checked less frequently than 50 foot intervals.
- C. Pipe which has not been installed at proper grade shall be corrected immediately at no additional cost to the District.
- D. Tie-ins to existing manholes shall be performed by core drilling the existing manhole (or other structure) and installing a flexible rubber boot connection.

### **3.3 INSTALLATION**

#### **A. General**

- 1. Install sewer piping to the lines, grades, and elevations indicated on the drawings. Install service wyes at the locations indicated or as otherwise required to provide service connections to existing services.

#### **B. Bedding:**

- 1. Bedding shall be prepared in accordance with Section 31 23 00 of these specifications and as indicated on the drawings.
- 2. Over-excavate as necessary and install approved material to provide firm, stable foundation for sewer piping installation. Over-excavation shall be approved by the District.
- 3. Prepare bedding to ensure trench bottom is free of large stones, debris, frozen, organic or other deleterious materials.
- 4. Excavate at pipe bells to ensure pipe is supported properly along its entire length.

#### **C. Pipe Laying Procedures**

- 1. Dewater trench as necessary to prevent the accumulation of groundwater or other unacceptable water in trench.

2. Pipe laying operations shall proceed in an uphill direction with all bell facing uphill unless otherwise specifically approved by the District.
3. Contractor shall follow pipe manufacturer's recommended practice for lowering, assembling, and installing sewer pipe.
4. During pipe installation, verify that no foreign material is inside pipe. Clean interior of each pipe joint prior to installation.
5. Sewer pipe shall be laid to uniform line and grade between manholes unless otherwise approved by the District.
6. Plug open end of installed sewer piping and close trench at the end of each day's work. Open trenches may not be left overnight without specific permission from the District.

D. Water main crossing requirements:

1. Maintain 18" vertical separation
2. Sewer mains shall be installed beneath water mains.
3. If vertical separation or installation beneath water main requirement cannot be met, Alternative design shall be submitted to the District for approval and to the Division of Drinking water for an exception to rule.

E. Horizontal separation requirements.

1. Maintain a minimum 10' horizontal separation between sewer main and existing water mains wherever possible.
2. Advise the District of horizontal separation less than 10' and receive approval of corrective measures prior to proceeding with sewer main installation. Apply with the Division of Drinking Water for an exception to rule.

F. Backfilling

1. Install backfill and compact in strict accordance with the manufacturer's recommendations for each type of pipe. In general, compact in layers not to exceed 8 inches in uncompacted depth.
2. Backfill material shall be free of large rocks, organic or frozen material.

G. Manholes

1. Excavation, bedding and backfill for manhole installation shall be in accordance with Section 31 23 00 of these specifications and as indicated on the drawings.
2. Install manholes at locations and to grades indicated on the drawings.
3. Set manhole lid flush with finished surface unless otherwise noted on the drawings.
4. Cast-in-place base and floor shall conform to requirements of standard details for layout and configuration.
5. Provide 0.2 feet of drop through the manhole

6. All lifting holes shall be grouted watertight.
7. Prevent debris from entering installed sewer main piping via manholes by providing suitable barriers or covers.
8. Pipe transition into manhole must be smooth and free of any pockets or indentations. Any such inconsistencies shall be filled with non-shrink grout to form a smooth surface.

### 3.4 PROTECTION

- A. Provide barricades and restrict access as appropriate to prevent damage to Work in place.
- B. Contractor shall be responsible for protection of Work in place against displacement, damage, loss or theft until acceptance by the District. Any Work installed and subsequently damaged, lost, or displaced shall be repaired or replaced to the District's satisfaction at no additional cost.

### 3.5 CLEANING

- A. Thoroughly clean all pipe lengths or units of all debris immediately after laying.
- B. Thoroughly clean by flushing and remove all debris from sewer mains and manholes. Inspect and clean all lines as specified herein. Sewerage facilities shall be thoroughly cleaned prior to turning over to the District.

### 3.6 TESTING

- A. Contractor shall provide all materials, equipment, and labor to perform testing of installed sewer main piping, services, and manholes as required for acceptance.
- B. The District shall be notified no less than two full working days prior to any proposed testing.
- C. The sewer main shall be tested after placement of pipe zone material but before final backfill and surfacing.
- D. Testing of sewer mains shall consist of the following
  1. The District shall visually inspect each run of piping by lamping to verify consistent line and grade.
  2. Mandrel testing
    - a. Mandrel (deflection testing) shall be conducted no sooner than 30 days after pipe is backfilled.
    - b. Mandrel shall be manufactured to provide proofing ring and minimum 9-point bearing with an outside diameter of 95% of the average inside diameter of line to be tested. Contractor shall provide certifications that mandrel meets these requirements prior to testing.

- c. Mandrel shall be pulled by hand in the presence of the District and shall pass freely through the line being tested.
  - d. In the event the mandrel cannot pass freely through the line, pipe shall be excavated, re-bedded and backfilled to reduce pipe deflection below 5%. All costs for excavation, re-bedding, and repair of deflected pipe shall be borne by Contractor.
  - e. Contractor shall re-perform mandrel test and make repairs until acceptable deflection results.
3. Low pressure air testing.
- a. Plug each end of pipe to be tested with suitable test plugs and brace each plug securely. Plugs shall be equipped with pressure release devices set to a maximum of 6 psi.
  - b. Locate all gauges, manifolds and valves on outside of manhole. No personnel shall be allowed to enter manhole during testing procedure.
  - c. Slowly increase pressure in line to be tested to 4.0 psi above external hydrostatic pressure on piping.
  - d. Allow internal pressure to stabilize for two (2) minutes, adding air as necessary to maintain 4.0 psi.
  - e. Disconnect air supply and allow line pressure to drop to 3.5 psi, where upon test interval is started.
  - f. Determine time interval from beginning of test until line pressure drops to 2.5 psi.
  - g. Allowable air test holding time shall conform to Table 1 below. If the time interval exceeds the minimum allowable time, then the line segment shall be considered as passing the low pressure air test.

**Table 1 - TIME HOLDING TABLE FOR SEWER MAIN AIR TEST**

*Time in Seconds Required for Pressure Drop from 3.5 to 2.5 psig  
 Dry Pipe Test Standard (Based on 0.005 cfm/sf and 2.0 cfm)  
 Pipe Diameter in Inches*

<b>Length (ft.)</b>	<b>4"</b>	<b>6"</b>	<b>8"</b>	<b>10"</b>	<b>12"</b>	<b>15"</b>	<b>18"</b>	<b>21"</b>	<b>24"</b>	<b>27"</b>	<b>30"</b>	<b>33"</b>	<b>36"</b>
<b>25</b>	3	6	10	16	23	36	51	73	95	120	149	179	214
<b>50</b>	5	12	20	32	46	71	102	146	190	241	297	359	428
<b>75</b>	8	17	30	47	69	106	153	218	285	361	446	539	612
<b>100</b>	10	23	41	64	91	142	204	291	383	459	511	561	
<b>125</b>	13	29	51	79	114	177	255	357	408				
<b>150</b>	15	34	61	95	137	212	306						
<b>175</b>	18	40	71	111	160	255							
<b>200</b>	20	46	81	127	188								
<b>225</b>	23	51	91	143	204								
<b>250</b>	25	57	102	159									
<b>275</b>	28	63	112	174									
<b>300</b>	31	69	122										
<b>350</b>	36	81	142										
<b>400</b>													
<b>450</b>	46	103											
<b>500</b>	51												
<b>550</b>	56												
<b>600</b>	61	103	142	174	204	255	306	357	408	459	511	561	612

- E. In the event that line fails testing, Contractor shall make all required repairs, replacements, or other measures necessary to pass required acceptance tests. All costs for repair, replacement, and retesting to verify acceptability of installed work shall be borne by the Contractor at no additional cost to the District.
- F. If the above minimum specifications cannot be met after all sources of air leakage have been corrected, a water exfiltration test may be conducted with the District's approval to determine the acceptability of the test section.
  - 1. Exfiltration Tests: The length of pipe tested shall be limited so that the pressure on the invert of the lower end of the section tested shall not exceed 16 feet of water column, and in no case shall the length of the section tested be greater than 400 feet or the distance between manholes, whichever is

less.

2. Allowable Leakage: The measured rate of leakage during the test shall not exceed 100 gallons per inch of pipe diameter per mile of pipe per 24 hours, with a 4 foot head at the crown at the upper end of the test section.

#### G. Exfiltration Tests for Laterals

1. Tests shall be performed on laterals between building or structure served and test tees, or between the building served and the manhole if the lateral connects directly to the manhole.
2. All tests shall be performed in the presence of the District.
3. Test Procedure;
  - a. Install a temporary plug at the test tee or manhole.
  - b. Install a standpipe extending five (5) feet above the finished grade at the end of the lateral and a temporary water connection to the water supply to fill the lateral.
  - c. Fill the lateral, including cleanout branches and temporary standpipe with water to produce a water level in the standpipe approximately 4 feet above finished grade.
  - d. Remove plugs on cleanout branches to permit air escape. Replace the plugs when all air is expelled.
  - e. Repair any visible leaks and request approval of District before proceeding with leakage test.
  - f. After water level has stabilized, refill standpipe to 4 feet above finished grade. Maintain water level at 4 feet for duration of test period. Keep record of water added during test period. Determine leakage rate in gallons per inch diameter per mile per day.

Example: If a 300 foot test section of 6 inch lateral required a total of 5 gallons to maintain the 4 foot level in the standpipe for 6 hours, what is the leakage rate?

$$(5 \text{ gal}) / [(6 \text{ hours}) \times (6 \text{ inch}) \times (300 \text{ feet})] \times (24 \text{ hr/day}) \times (5280 \text{ feet/mi}) = 58.7 \text{ gallons/inch/mile/day.}$$

- g. Allowable leakage in seconds per length of pipe size is given in Table 2 below.

**Table 2 - TIME HOLDING CHART FOR WATER TEST OF LATERAL**

*Time in Seconds Required for Pressure Drop from 3.5 to 2.5 psig  
Wet Pipe Test Standard (Based on 0.003 cfm per sq. ft. and 2.0 cfm)  
Pipe Diameter in Inches*

<b>Length (ft.)</b>	<b>4"</b>	<b>6"</b>	<b>8"</b>	<b>10"</b>	<b>12"</b>	<b>15"</b>	<b>18"</b>	<b>21"</b>	<b>24"</b>	<b>27"</b>	<b>30"</b>	<b>33"</b>	<b>36"</b>
<b>25</b>	4	10	18	28	40	62	89	121	158	200	248	299	356
<b>50</b>	9	20	35	55	79	124	178	243	317	401	495	599	713
<b>75</b>	13	30	53	83	119	186	267	364	475	601	743	898	1020
<b>100</b>	18	40	71	110	158	248	356	485	639	765	851	935	
<b>125</b>	22	50	88	138	198	309	446	595	680				
<b>150</b>	26	59	106	165	238	371	510						
<b>175</b>	31	69	123	193	277	425							
<b>200</b>	35	79	141	220	317								
<b>225</b>	40	89	158	248	340								
<b>250</b>	44	99	176	275									
<b>275</b>	48	109	194	283									
<b>300</b>	53	119	211										
<b>350</b>	62	139	227										
<b>400</b>	70	158											
<b>450</b>	79	170											
<b>500</b>	88												
<b>550</b>	97												
<b>600</b>	106												
<b>650</b>	113	170	227	283	340	425	510	595	680	765	851	935	1020

H. Manhole Testing:

1. Sewer manholes shall be tested in accordance with ASTM C 1244-Standard Test Method for Concrete Sewer Manholes by the Negative Air pressure (Vacuum) test.
2. Contractor shall provide suitable test head, pipe plugs and related equipment as required for testing.
3. Procedure:
  - a. Place test head on manhole top in accordance with test head



manufacturer's recommendations.

- b. Apply vacuum to 10 in. mercury. Close vacuum pump. Shut off vacuum.
- c. Determine time required for vacuum reading to drop from 10 in. to 9 in. Manhole shall pass if time required meets or exceeds values indicated in the following table.

**Table 3 – MANHOLE VACUUM TEST REQUIREMENTS**

<b>Depth (ft)</b>	<b>36" Diameter</b>	<b>48" Diameter</b>	<b>60" Diameter</b>	<b>72" Diameter</b>
8	14 sec.	20 sec.	26 sec.	33 sec
10	18 sec.	25 sec.	33 sec.	41 sec.
12	21 sec.	30 sec.	39 sec.	49 sec.
14	25 sec	35 sec	46 sec.	57 sec.
16	29 sec.	40 sec.	52 sec	57 sec.
18	32 sec.	45 sec.	59 sec.	67 sec.

**END OF SECTION**

**SECTION 33 31 20  
TEMPORARY SEWER BYPASS PUMPING**

**PART 1      GENERAL**

1.1      SECTION INCLUDES

- A. This section includes the design, installation and operation of the temporary bypass sewers required by the work to maintain continuous and reliable wastewater flow. Various phases of the Work that shall require the implementation of temporary bypass sewers include, but are not limited to, connections of new sewers to existing sewers, trenchless rehabilitation of existing sewers, and pipeline inspection.

1.2      RELATED WORK

- A. Section 33 05 23 – Cured-In-Place Pipe (CIPP)
- B. Section 33 31 00 – Sanitary Sewer Systems

1.3      REFERENCES

- A. Utah Code R317-003 Paragraph 1.11

1.4      SUBMITTALS

- A. Bypass Pumping Plan. Prepare a specific, detailed description of the proposed pumping system (Bypass Pumping Plan). The Bypass Pumping Plan shall be submitted and approved prior to the mobilization of any of the equipment included in the Bypass Pumping Plan. The Bypass Pumping Plan shall outline all provisions and precautions to be taken by the Contractor regarding handling of existing wastewater flows. This Bypass Pumping Plan must be specific and complete, including such items as schedules, locations, elevations, capacities of equipment, materials, and all other incidental items necessary and/or required to ensure proper protection of the facilities, including protection of the access and bypass pumping locations from damage due to the discharge flows, and compliance with the requirements and permit conditions specified herein. No Construction shall begin until all provisions and requirements have been reviewed and accepted by the Engineer and Owner. The plan shall include but not limited to the following details:

- 1. Nominal and peak wastewater flow rates (as measured by Contractor)
- 2. Staging areas for pumps.
- 3. Sewer plugging method and types of plugs.

4. Size and location of manholes or access points for suction and discharge hose or piping.
5. Size of pipeline or conveyance system to be bypassed, including calculations for selection of bypass pumping pipe size.
6. Number, size, material, location and method of installation of suction piping.
7. Number, size, material, location and method of installation of discharge piping.
8. Bypass pump sizes, capacities, and number of each size to be provided onsite including all primary, secondary, and spare pumping units. Provide 100% redundancy on-site.
9. Calculations of static lift, friction losses, and flow velocity (pump curves showing pump, operating range, and suction head required shall be submitted).
10. Downstream discharge plan.
11. Method of protecting discharge manholes or structures from erosion and damage.
12. Thrust and restraint block sizes, locations, and any temporary pipe supports and anchoring requirements. Provide the details necessary to demonstrate the integrity of all suction and discharge piping including piping and fittings associated with all primary and secondary pumping units.
13. Sections showing suction and discharge pipe depth, embedment, select fill and special backfill.
14. Indicate maximum elevation of sewer flows during pumping and show that pumping at this level will not cause backups or any adverse conditions in the upstream sewer system.
15. Method of noise control for each pump and any additional equipment that is included in the Bypass Pumping Plan.
16. Access plans to all bypass pumping locations indicated on the drawings.
17. Schedule for installation of and maintenance of bypass pumping lines.
18. Plan indicating location of bypass pumping pipe locations.
19. Emergency plan for adverse weather and flooding for various phases of the Work. Include spill containment provisions.
20. Contractors plan for providing continuous monitoring of the bypass pumping operation as well as the monitoring persons' qualifications.

## 1.5 QUALIFICATIONS AND REQUIREMENTS OF BYPASS PUMPING PERSONNEL

- A. Pump operators shall have a minimum of two years of experience and shall have experience bypassing flow rates of 5,000 gpm or greater.
- B. The on-site bypass pumping supervisor is required to attend the pre-construction meeting and construction progress meetings.

## **PART 2 PRODUCTS**

### 2.1 BYPASS PUMPING PIPING

- A. Bypass pumping shall be HDPE and conform to the following requirements:
  - 1. All polyethylene (HDPE) pipes shall meet the requirements of ASTM F714. DR rating of the pipe shall be sufficient to withstand the pressure and leakage test outlined below.
  - 2. HDPE Pipe shall be furnished in standard laying lengths not exceeding 50 feet.
  - 3. Joining system: The HDPE pipe shall be joined with butt, heat fusion joints. All joints shall be made in strict compliance with the manufacturer's recommendations and ASTM 2657. Where required, flange connections, mechanical joint connections and butt connections using bolted mechanical couplers shall be provided from a pipe stub with a polyethylene and steel stiffener. Flanged connections shall be provided from a pipe stub and a steel back-up flange. Back flanges shall be primed and painted in corrosion protected paint. Quick connect couplings will not be permitted on HDPE bypass piping.
  - 4. HDPE fittings shall be fully pressure rated to match the pipe DR pressure rating. All fittings shall be molded or fabricated by the same manufacturer as the pipe. HDPE fittings shall be joined using butt, heat fusion and/or electrofusion. Adhesives and solvent cements shall not be permitted
- B. The Contractor may request permission from the Engineer to use a limited amount of alternate pipe material and/or an alternate joining system, such as quick connect couplings, in situations where traffic control requirements or other parameters make the use of fused HDPE impractical. Such requests must be made in writing and include the followings:
  - 1. Product information on the alternate pipe materials and/or joining system
  - 2. Show where the alternate materials will be used in the bypass pumping schematic
  - 3. Explain why use of the alternate materials is necessary to successfully execute the Work.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION AND PREPARATION**

- A. Supply pumps, conduits, power and other equipment to divert the flow of sewage around the section in which Work is to be performed. It is the intent of these Specification to require adequate bypass pumping as required regardless of the flow condition.
- B. Gather sewer system information such as flow rates, elevations and layout of the sewer system. This information may be requested from the Owner if it is available. Supplement and/or verify all Owner -provided information with survey, flow monitoring or other means.
- C. It shall be the Contractor's responsibility to monitor flows at key locations over a period of at least one week to determine the peak flow rate when that peak occurs.
- D. Establish adequate bypass pumping sufficient to meet the conditions above while anticipating severe weather conditions and increases in peak flows during rain events.

### **3.2 TESTING**

- A. Perform leakage and pressure tests of the bypass pumping discharge piping using clean water prior to the actual operation. The pressure and leakage test shall be conducted at one-and-a-half times the maximum pressure the system will experience based on the approved Bypass Pumping Plan for a period of two hours. No leakage is permitted during this test.
- B. When traffic control or other project requirements will allow, perform a pump test prior to performing any work on the sewer lines that are being bypassed. Demonstrate during the test that the pumping system is in good working order and is sufficiently sized to successfully handle the required flows. The pump test shall include pumping through a weekly peak event. Adequate personnel shall be on hand during this test, such as pump monitors and others stationed at key locations so that they may assess whether the pumping system is working properly and adequately sized to handle the flows. Be prepared to remove the plug and allow flows to pass through the bypassed sewer lines if the bypass system is found to be inadequate.
- C. The Engineer will be given 24 hours notice prior to testing
- D. In situations where the above testing requirements are not feasible due to traffic control requirements or other parameters, the Contractor may request permission to deviate from these testing requirements and to propose alternative testing that would better suit the requirements of the Project. Such a request must be made in writing to the Engineer, complete with explanation of why the required testing is not feasible and the alternate testing methods that are proposed.

### 3.3 METHODS AND PROCEDURES

- A. Each bypass pumping operation shall include the components and systems to accomplish the bypass in accordance with these Specifications and the special Project Conditions.
- B. Provide on-site manual oversight of all bypass pumping operations 24 hours per day, 7 days per week when the bypass pumping system is in operation.
- C. Flows from private, commercial, and industrial users shall be handled during the Work without interruption.
- D. A maximum surcharge level of 1' above the top of the pipe will be allowed. Mark suction pipes to indicate the allowable surcharge level and monitor the surcharge level on at least an hourly basis and more frequently during peak flow events.
- E. The 24-hour monitoring person shall be properly trained, experienced, and mechanically qualified such that they can quickly and effectively address any potential emergency and non-emergency situations associated with the pumps and bypass pumping system that must remain in operation for an extended period.
- F. Portions of the Work may require that upstream pump stations be placed out of service for prolonged periods. In these instances, construct a temporary bypass sewer that shall discharge into either the original piping DOWNSTREAM of the affected area, or into an adjacent gravity sewer identified that flows to an unaffected pump station.
- G. Construct and maintain all temporary bypass sewers and be responsible for all bypass pumping of sewage that may be required to prevent backing up of sewage and allow appropriate conditions for proper inspection, rehabilitation, testing or drainage during force main rehabilitation, replacement of reconnections to existing sewers. Immediately remove and properly dispose of all offensive matter spilled during the bypass pumping at his own expense. The Contractor shall also be responsible for paying any fines imposed as a result of spills or overflows that occur as a result of the bypass pumping operations.
- H. Provide a redundant bypass pump, intake and discharge conduit, and other equipment necessary to provide continuous wastewater flow and prevent the backing up of sewage in the case of emergencies at all times. This redundant system shall be plumbed into the suction manhole. A 100% redundant capacity system shall be available on site at all times to be used in the event of a bypass pump failure.
- I. Bypass pumping operations shall not interfere with traffic flow on streets or cross railroad tracks without prior written consent from the appropriate agencies or jurisdictions.
- J. Primary bypass pumps shall be critically silenced when used in residential settings or areas where excessive noise levels would create a disturbance. Redundant bypass pumping does not have to be critically silenced.

- K. Driveway ramps may only be used when the following precautions are taken:
1. Place pressure gages on the discharge line before and after the first road ramp downstream of the pumps. Check and record the pressure every 30 minutes during bypass pumping. Should pressures change, indicating that clogging has commenced, then flush the system, remove and clean the inlet side of the road ramp, and retest the system when the current bypass pumping operation has completed.
  2. Flush the ramps out with water at least every three days to clean the ramp of debris, including removal and cleaning of the inlet side of the road ramp to be free from accumulated debris.

### 3.4 CLEANING AND PROTECTION

- A. Repair at Contractor's own expense, any damage to public or private property caused by his operations.
- B. Should damage of any kind occur to the existing sewers and appurtenances, the Contractor shall, at his own expense make repairs to the satisfaction of the Engineer and the Owner.
- C. Immediately notify the jurisdictional authority should a sanitary sewer overflow (SSO) occur and take the necessary action to clean up and disinfect the spillage to the satisfaction of the jurisdictional authority and/or other governmental agency. If sewage spilled onto public or private property, the Contractor shall wash down, clean up, and disinfect the spillage to the satisfaction of the property owner, jurisdictional authority, and/or other governmental agency.
- D. Do not permit to overflow, bypass, pump or by any other means convey drainage to any land, street, storm drain or water course.
- E. Take care to prevent damage to existing structures. Discharge piping to gravity sewer systems shall be designed in such a manner as to prevent discharge from contacting manhole walls or benching and full discharge shall go into downstream pipe so as to minimize turbulence. Contractor is responsible for any damage to manholes.
- F. Cease bypass pumping operations and return flows to the new and/or existing sewer when directed by the Owner. During bypass pumping, no wastewater shall be leaked, dumped, or spilled in or onto any area outside the existing wastewater system. When bypass pumping operations are complete, all bypass piping shall be flushed with fresh water and drained into the wastewater system prior to disassembly.

### END OF SECTION