SECTION 33 11 55 (CHANGE ORDER)

FABRICATION OF STEEL PIPE

PART 1 – GENERAL

1.01 SUMMARY

A. Contractor shall provide all labor, material, and equipment to fabricate and furnish lined and coated steel pipe. Steel pipe, specials and fittings shall be fabricated in accordance with provisions of this section. All materials used for pipe fabrication, including lining and coating, shall be in compliance with ANSI/NSF-61 requirements.

B. Pipe details are shown on the Drawings.

C. Thickness of steel coils and plates for fabrication of steel pipe shall be as indicated on the Drawings.

D. Shop pipe seams shall be full penetration welded butt joints.

E. Inside diameter of the steel pipe cylinder shall be not less than indicated on the Drawings.

F. Field pipe joints shall be complete joint penetration (CJP) butt welded joints as indicated on the Drawings and as hereinafter specified; except that butt-strap field joints shall be used where required for closures as shown on drawings or for other purposes, as directed by the City Representative.

G. Fabrication Standards: The fabrication of steel pipe and appurtenant steel work shall conform to the requirements of AWWA C200. Requirements set forth in these specifications and on the Drawings shall take precedence over provisions in referenced codes and specifications.

H. The Contractor shall coordinate with the pipe manufacturer to provide specified lining and coating on the pipe.

1.02 RELATED SECTIONS

A. Documents affecting work of this section include, but are not necessarily limited to, general conditions, supplementary conditions, and Division 1 of these specifications.

B. Section 00 48 10 – Clean Water State Revolving Fund Contract Requirements

C. Section 01 11 00 - Summary of Work

D. Section 09 97 72 – Coating and Lining

E. Section 26 42 40 - Corrosion Control

F. Section 33 11 50 – Installation of Steel Pipeline

G. Section 33 11 56 – Field Welding of Steel Pipe

H. Section 33 12 24 – Pipe Appurtenances

1.03 REFERENCES

A. ASTM A29 – Standard Specifications for Steel Bars, Carbon and Alloy, Hot-Wrought

B. ASTM A36 – Standard Specification for Carbon Structural Steel

C. ASTM A283 – Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes and Bars

D. ASTM A1018/A1018M– Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Carbon, Commercial, Drawing, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength

E. ASTM A516- Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service

F. AWWA C200 - Standard for Steel Water Pipe 6 Inches and Larger

G. AWWA C206 - Field Welding of Steel Water Pipe

H. AWWA C207 – Steel Pipe Flanges for Waterworks Service – Sizes 4 In. Through 144 In. (100 mm Through 3,600 mm)

I. AWWA C208 – Dimensions for Fabricated Steel Water Pipe Fittings

J. AWWA C210 – Liquid-Epoxy Coatings and Linings for Steel Pipe and Fittings

K. AWWA C222 – Polyurethane Coatings and Linings for Steel Pipe and Fittings

L. AWWA M11 - Steel Water Pipe – A Guide for Design and Installation

M. Section VIII - ASME Boiler and Pressure Vessel Code.

N. AWS D1.1 - Structural Welding Code – Steel

O. ASME B16.5 – Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard

P. ASME B16.47 – Large Diameter Steel Flanges: NPS 26 through NPS 60, Metric/Inch Standard

1.04 DEFINITIONS

A. Fittings and Specials: Including, but not limited to fittings, closure pieces, bends, elbows, reducers, tees, wyes, bifurcations, crosses, outlets, manifolds, nozzles, wall sleeves, bulkheads, and other piping and appurtenances fabricated from steel plate, sheet, or coils as required to provide the Work. Specials shall also include piping above ground or inside structures.

B. Acronyms:

1. CJP: Complete Joint Penetration
2. CWI: Certified Welding Inspector
3. MT: Magnetic Particle Testing
4. NDE: Nondestructive Examination
5. NDT: Nondestructive Testing
6. PJP: Partial Joint Penetration
7. PQR: Procedure Qualification Report
8. PT: Liquid Penetrant Testing
9. RT: Radiographic Testing
10. UT: Ultrasonic Testing
11. VT: Visual Testing
12. WPQ: Welder/Welding Operator Performance Qualification
13. WPS: Welding Procedure Specification

1.05 DESIGN REQUIREMENTS

A. Specials and Fittings:

1. Design Steel bulkhead for working pressure rating of 350 psi.
    a. 36" Welded steel main "Future Sutro Outlet Project "shown on Plan No. WD-2775-2C shall have working pressure rating of 250 psi.
2. Design reinforcement.
3. Design in accordance with AWWA Manual M11, AWWA C200, and AWWA C208.

B. Pipe Layout: Design complete pipeline layout, in accordance with AWWA Manual M11:

1. General:
    a. Base stationing and elevation convention as shown on Drawings.
    b. Maximum Laying Lengths:
        1. Not limited, unless specifically shown.
        2. Select lengths to accommodate installation operation.
2. Include, as Minimum:
    a. Specific number, location, and direction of each pipe, joint, and fitting or special. Number each pipe in installation sequence
    b. Station and top elevation at changes in grade or horizontal alignment.
    c. Station and top elevation to which bell end of each pipe will be laid.
    d. Elements of curves and bends, both in horizontal and vertical alignment.
    e. Location of mitered pipe sections, beveled ends for alignment conformance, butt straps, and deep bell lap joints for temperature stress control.
    f. Location of closures, cutoff sections for length adjustment, temporary access manways, vents, and weld lead outlets for construction convenience.
        1. Provide for adjustment in pipe laying headings and to conform to indicated stationing.
        2. Changes in location or number will require City Representative approval.
    g. Location of bulkheads, both those shown and as required, for hydrostatic testing of pipeline.

C. Welding Procedure Specification (WPS):

1. Qualified by testing in accordance with ASME BPVC SEC IX for shop welds and AWS D1.1 for field welds. AWS D1.1 prequalified welding

procedures are not allowed.

2. PQRs conducted on unlisted base metal (most coil products are unlisted base metals) to be production welded as required in the referenced welding Code shall be traceable to each heat lot (aka, heat).

3. Written WPS required for welds, both shop and field.

4. WPS used to shop fabricate pipe shall be qualified in accordance with ASME BPVC SEC IX and shall include Supplementary Essential Variables when material is greater than ½" thickness. Charpy tests conducted in weld metal and heat affected zone shall meet base metal requirements specified herein.

D. Stulling (Strutting):

1. Design stulling for pipe, specials, and fittings such that damage is avoided during handling, storage, and installation.

2. Design such that pipe deflection is prevented and to support backfill, plus backfilling and compaction equipment loads.

1.06 SUBMITTALS

A. Steel material test reports (MTRs) showing data consistent with specified requirements for each heat of steel proposed for use.

B. Written WPS (Welding Procedure Specification), PQR (Procedure Qualification Record), NDT (Non-Destructive Testing) procedures.

C. Current WPQ (Welder Performance Qualification)

D. CWI (Certified Welding Inspector) certificates

E. NDT (Non-Destructive Testing) Personnel Certificates

F. Design calculations for bulkhead.

G. Design calculations for fittings and specials including opening reinforcement details of collars, wrappers, and crotch plates.

H. Shop Drawings necessary for pipeline installation during the planned shutdowns, as listed in Specification 01 11 00, shall be submitted to the City Representative within 8 weeks after Notice to Proceed.

I. Shop Drawings: Submit under Section 33 11 50 Installation of Steel Pipeline.

1.07 QUALITY CONTROL

A. Contractor shall review and understand these specifications prior to fabricating any steel pipe.

B. Contractor shall only use qualified personnel and appropriate tools and materials to fabricate the steel pipe in the shop. The personnel used shall be properly trained in handling the material and have thorough knowledge in operating the fabrication equipment. All tools shall be properly maintained and shall be inspected at least once per day for proper maintenance.

C. Each fabricated piece of pipe or special shall be individually identified and marked using a unique symbol. This symbol shall be assigned and used for that specific piece for the entire construction process.

D. Inspection of Manufacturing Process: Inspection and testing shall be according to AWWA C200. The Contractor shall keep a log of pipe manufacturing from start to finish showing all quality control procedures, inspections, tests, rejections, rework, etc. Provide all logs and certificates to the City Representative.

E. City may inspect all phases of pipe fabrication work and will witness all tests in addition to Contractor's inspections and quality control. Provide three (3) weeks prior notification for City Representative to be present for fabrication.

F. Visual Inspection: Contractor shall perform 100% VT of steel pipe, specials and fittings. Fabricated pipe shall be visually inspected: before the lining is installed, when stockpiled, and as it is loaded for transport for final installation. If any damage is found at any of these inspections, the damage shall be repaired to the satisfaction of the City Representative otherwise the work is rejected. Inspector shall be CWI.

G. Contractor shall provide radiographic inspector certified in accordance with SNT Level II to perform and interpret Radiographic Tests (RT). The Contractor shall provide radiographic inspector certified in accordance with an SNT Level III to prepare NDT procedures for Radiographic Tests (RT) per ASME Section V.

H. Non-Destructive Testing of Factory Welded Joints

1. Welds: 100 percent visually examined by CWI to criteria in ASME BPVC SEC VIII, Division 1.
2. Butt Joint Welds: Spot radiographically examine pipe in accordance with ASME BPVC SEC VIII, Div. 1, Par. UW-52. 100% radiographically examine butt joint welds not subjected to shop hydrostatic testing. Ultrasonically examine welds that, in opinion of City Representative,

cannot readily be radiographed.

3. Fillet Welds: 100 percent examine using magnetic particle inspection method in accordance with ASME BPVC SEC VIII, Division 1.

4. Groove Welds: 100 percent ultrasonically examine those that cannot be readily radiographically spot examined in accordance with ASME BPVC SEC VIII, Division 1, UW-53.

5. Air test collars, wrappers, double-welded butt straps in accordance with AWWA C206, except as follows:

   a. Perform test after shop fabrication and before the application of protective coatings.

6. The location of non-destructive inspection shall be determined at the discretion of the City Representative.

7. Defective welds by non-destructive examination shall be repaired if, in the opinion of the City Representative, this is possible, otherwise the section will be rejected.

8. Additional non-destructive examination of the rejected welds shall be made after repairs are completed.

9. Non-destructive inspection shall be performed by the Contractor as work incidental to the fabrication and installation of the pipeline, and no direct payment will be made therefor.

I. Test of production welds. In addition to non-destructive inspections, the Contractor shall prepare test specimens for determining the quality of longitudinal, circumferential, and spiral welds in the fabrication of welded steel pipe and pipe specials as required in AWWA C200, and to perform the specified tests, all at his own expense.

1. The test specimens and their testing shall conform to the requirements of Section 4 of AWWA Standard C-200; provided, however, that the number of tests shall not be less than one for every 300 feet of pipe, unless in the opinion of the City Representative, satisfactory welds are not being obtained.

2. Weld specimens from test plates welded to ends of pipe sections may be furnished in lieu of weld specimens cut from the pipe.

3. Two coupons of each grade and thickness of steel used in fabrication of pipe shall be delivered to the City Representative.

J. Shop Hydraulic Pressure Test: In accordance with AWWA C200 Section 5.2, except as follows:

1. Each section of steel pipe, including tapers and specials with crotch plate

after completion of fabrication and welding in the shop, shall be subjected in the shop to a hydrostatic pressure test specified herein.

2. Hydrostatic test shall be made prior to the application of any protective coating or lining.

3. Air shall be vented from the pipe before the test pressure is applied.

4. The test pressure shall be held on each section not less than five minutes, and in any event shall be held for a sufficient length of time to permit inspection of all joints.

5. Fittings and Special

   a. Hydrostatically test all fittings and specials to a minimum pressure equal to 125% of design pressure regardless of whether or not straight pipe sections used were previously tested.

   b. For fittings and specials with crotch plate reinforcement, hydrostatically test to a minimum pressure equal to 150% of design pressure even if fabricated from previously hydrostatically tested straight pipe.

   c. For elbows fabricated from previously hydrostatically tested straight pipe, 100 percent full circumference RT all welds per ASME BPVC SEC VIII, Division 1.

6. The design pressure shall be assumed to be 350 psi.

7. After shop fabrication and before the application of protective coatings, all steel manholes and outlets shall be subjected to the soap or compressed air tests. Shop double welded lap joints can be tested by applying a 40 psi of air into the annular space between the two filler welds through a pre-drilled and tapped 1/8 inch or 1/4 inch NPS hole and maintaining for 5 minutes. If the pressure drops below 40psi, paint the welds with a soap solution to locate the leaks.

K. For cement mortar lined and/or coated steel pipe, fabrication and cement lining operations shall be performed at a single manufacturing facility.

L. All pipes and specials 24-inches in diameter and larger shall be manufactured within the same manufacturing facility.

M. Pipe manufacturing facility shall be certified to ISO-9001 standards, or otherwise manufacturer shall be a member in good standing of the Steel Pipe Fabricators Association (SPFA).

N. All pipe material dimensions and show drawings shall be in English units (i.e., feet, inches, pounds, psi, ksi, etc.). If pipeline is manufactured using SI units,

Contractor shall be responsible to translate them to English units and shall be solely responsible for any translation errors.

O. Refer to AWWA C200, Section 5 for additional quality control provisions.

PART 2 – PRODUCTS

2.01 GENERAL

A. Pipe:
1. Manufacturing of steel pipe, fittings, and specials shall be under direction of one pipe Supplier.
2. Pipe manufacturer's responsibility shall include, at a minimum, coordinating work of other suppliers for fittings and specials.

B. Unless shown otherwise, for pipes over 30 inches in diameter the diameter shown shall be considered finished inside diameter after lining. For pipes 30 inches in diameter and less the diameter shown shall be per ASME B36.10.

C. Pipe shall have out-of-roundness not exceeding 1%. The out-of-roundness is calculated by using the difference between maximum and minimum diameters, divided by the average of these diameters.:

2.02 MATERIALS

A. Steel:
1. Coils for fabricating spiral welded steel pipe shall be continuous cast process, fully-killed, fine grained practice conforming to physical, manufacturing and testing requirements of AWWA C200 and ASTM A1018/A1018M, SS Grade 40, Modified.
   a. Steel Chemistry: Aluminum: 0.020 percent minimum.
   b. When thickness exceeds ½", coils shall meet Charpy V-notch toughness tests of 25 lbf-ft at a test temperature of 30 degrees F; coils shall be tested at the same frequency, location and orientation as tension testing.
2. Plates for fabricating non-spiral welded steel pipe, collars, wrapper plates, crotch plates, fittings and specials shall be fully-killed, fine grained practice, pressure vessel steel conforming to physical, manufacturing and testing requirements of ASTMA516 Grade 70. The plates shall be Charpy V-Notch toughness tested in accordance with AWWA C200, Table 1 Note, with the exception that average Charpy energy shall be greater than 40 J (30 ft-lb) or average CTOD toughness greater than 0.2 mm. There shall be no more than three longitudinal seams per cylinder.

B. Weldability: Maximum carbon equivalent of 0.45, as measured using AWS D1.1, Annex XI, Guideline on Alternative Methods for Determining Preheat Formula.

C. Pipe Coating and Lining:

1. For steel pipe installed by open cut excavation, as shown in the Drawings: Dielectric interior Lining and exterior Coating of steel cylinder pipe per Section 09 97 72 except as specified herein or as specified in the Drawings.

D. Pipe, special, fittings, and valve are nominal inside diameter unless otherwise noted. Nominal inside diameters shall be minimum net inside clear lined diameter.

E. Fittings: Fittings shall be made of hydrostatically tested cylinders of the same material and minimum thickness as the pipe, except that elbows shall have greater thickness if necessary to compensate for steel concentrations. They shall be designed by the pipe manufacturer by the method stated in the AWWA Pipe Manual M11. Unless otherwise noted or detailed on the Drawings, fitting dimensions shall conform to AWWA C208. Radius, R, to pipe centerline shall be 2.5 pipe diameters, D.

F. Steel Pipe Flanges up to 24-inches: Steel ring flat face flanges conforming ASME B16.5 Class 300. Bolts shall be sized in accordance with ANSI B16.5 Class 300 unless noted otherwise on the Drawings. Welding shall conform to ASME BPVC SEC VIII and SEC IX. The inside diameter of all flanges shall be no more than 3/16 inch greater than the outside diameter of the steel cylinder. Flanges shall be welded to the cylinder without warping and the flange face perpendicular to the longitudinal axis of the cylinder.

1. Steel pipe flanges on 36” Future Sutro Outlet pipe shall conform to AWWA C207 Class E standard. Working pressure shall be 250 psi for steel pipe shown on Plan NO. WD-2775-2C

G. Steel Blind Flanges up to 24-inches: Steel blind flat face flanges conforming to ASME B16.5 Class 300 with bolt holes drilled in conformance with ANSI B16.5 Class 300 to match equipment or other pipeline items as shown in the Drawings. Bolts shall be sized in accordance with ANSI B16.5 class 300 unless noted otherwise on the Drawings.

1. Blind flanges shall have two handles installed for lifting.

H. Steel Pipe Flanges greater than 24-inches: Steel ring flanges conforming to ASME B16.47 Series A Class 300. Bolts shall be sized in accordance with ASME B16.47 Series A unless noted otherwise on the Drawings. Welding shall conform to ASME BPVC SEC VIII and SEC IX.

I. Steel Blind Flanges greater than 24-inches: Steel blind flanges conforming to ASME B16.47 Series A Class 300 with bolt holes drilled in conformance with ASME B16.47 Series A to match equipment or other pipeline items as shown in the Drawings. Bolts shall be sized in accordance with ASME B16.47 Series A unless noted otherwise on the Drawings.

J. Gaskets, Bolts and Nuts: Per Section 33 12 24 – Pipe Appurtenances.

PART 3 – EXECUTION

3.01 PREPARATION OF STEEL PLATES

A. Plate and Coil Edges

1. The ends and edges of pipe sections for butt welds shall be accurately cut to exact dimensions.
    a. The dimensions and shape of the edges of the plates to be joined by welding and the gap between said plates shall be such as to allow thorough fusion and complete penetration, and the edges of plates shall be properly formed to accommodate the various welding conditions.
    b. Projecting burrs shall be removed.
    c. Hammering shall not be used to shape the edges preparatory to welding.
2. Plates shall be cut true to line so that the edges, when in position for welding, shall be straight, parallel, and in contact on longitudinal seams.
    a. The maximum gap between edges shall be no more than 3/16 of an inch in the case of circumferential seams.

B. Rolling

1. The plates shall be edge broken and cold rolled to true cylinders of the required diameter.
    a. There shall be no heating or hammering for straightening or curving and the necessary forming at angles.
    b. Scale and other foreign matter accumulating on the plate during rolling shall be continually removed by air blast so that it will not be rolled into the surface of the plate.

c. The surfaces of breaker dies and rolls shall be kept clear of all bits of metal or other accumulated materials during forming operations.

d. Each section of pipe shall be formed to a true circle of the specified diameter throughout its entire length so as to produce a finished pipe truly round and free from dents, kinks, and abrupt changes in curvature.

e. The average inside diameter, as determined by circumferential measurement, may vary from the theoretical circumference from minus zero to plus 3/8-inch.

2. No forming process will be permitted in which the plates or any portion thereof, are bent or otherwise formed during any state of the process to curvature of appreciably smaller radius

3.02 ASSEMBLY AND PREPARATION FOR WELDING

A. Plates shall be assembled for welding in a manner that will not damage or injure the edges of the plates to be welded.

1. Edges of plates to be welded shall be thoroughly cleaned, in an approved manner, to remove all rust, paint, mill scale, oil, grease or other injurious matter.

2. Plates shall be properly aligned and held firmly in position with the gap between plates conforming to the requirements of article 3.01.A.2 specified hereinbefore so that complete penetration and fusion will be assured at the bottom of butt welded joints.

3. Tack welds, used to hold the plates in position, shall be removed, to the extent required by the City Representative, before the automatic welding of seams.

4. The offset in abutting edges shall not exceed 1/16 of an inch at circumferential seams and spiral seams and shall not exceed 1/32 of an inch at longitudinal seams.

5. For plates over ½ inch in thickness where the thicknesses of two adjacent plates are different by more than 1/8 of an inch, the thicker plate shall be trimmed to a smooth taper extending for a distance of at least four times the offset between abutting surfaces.

6. Welding procedures and filler material must meet Charpy V Notch values as noted in AWWA C200 table 1 with the exception that average Charpy energy shall be greater than 40 J (30 ft-lb) or average CTOD toughness greater than 0.2 mm.

B. For spiral seam pipe preparation, assembly, and offset tolerances shall be in accordance with the requirements of AWWA C200.

3.03 SHOP WELDING

A. General

1. Welding work shall be performed in accordance with specified requirements in AWWA C200 and ASME BPVC Sec. IX and herein.
    a. Welding shall be done by automated submerged arc welding or other process approved by the City Representative.
        1) The size and type of electrode used and the current and voltage required is subject to the approval of the City Representative.
        2) Rusted or otherwise damaged electrodes shall not be used; violation of this provision shall be sufficient cause for rejection of the work.
        3) Welds shall be of uniform composition, neat, smooth, full strength, and ductile.
        4) Welds shall be made with a technique that will minimize distortion and residual stress.
2. There shall be no greater evidence of oxidation in the metal of the weld than in the metal of the un-welded plate.
    a. Any pipe section which shows irregularities in shape after welding may be re-rolled to make it cylindrical, but in no case shall it be reformed by hammering.
    b. No reforming will be permitted of pipe sections which, after welding, are found to have abrupt changes in curvature at longitudinal seams, unless such welds are subsequently removed and re-welded following the reforming operation.
    c. Back gouging on both automatic and manual welding, whether for repairs or for preparation of groove for original weld, shall be inspected before being filled with weld metal.

B. Longitudinal or Spiral Joints

1. Joints shall be butt-joint welded by an approved fully automatic welding process.
    a. Joint welds shall be continuous for the full length of the seam, and shall be built up uniformly at the center of the weld to form

reinforcement on both sides of the plate.

b. The finished bead on the inside and outside of the pipe shall have the dimensions indicated on the Drawings.

c. The weld and penetration shall be of sufficient width so that both edges to be joined shall be entirely incorporated into the weld regardless of possible inaccuracy in line of travel of the automatic electrode.

d. If the normal welding process is interrupted and resumed, special care shall be taken to obtain full penetration and thorough fusion.

e. Where welding is interrupted by faulty machine operation, such portion of the weld as designated by the City Representative shall be removed before resuming welding operations.

f. Seams shall have an efficiency of at least 100 percent of the specified minimum strength of the plate forming the pipe cylinder.

C. Shop Circumferential Joints

1. Shop circumferential joints shall be butt joint welded and shall conform to the requirements for longitudinal joints specified herein before; except that mitered circumferential joints in bends and welded steel plate specials need not be made by automatic welding method, provided the other methods used are approved by the City Representative.

D. Correction of Weld Defects

1. Repair of welds shall be as outlined in AWWA C206, Section 4.7 and approved by the City Representative.

2. Defective welds shall, in general, be repaired by manual welding; except that the repair of defects in automatic welds shall be made on automatic welding machines where, in the City Representative's opinion, the defect is so extensive as to make a manual repair undesirable.

3. Under no circumstances, will caulking of defective welds be permitted.

E. Welders

1. All welding shall be performed by skilled welders qualified as specified in AWWA C200 and ASME IX.

F. Pipe Marking:

1. Legibly mark installation sequence number on pipe, fittings, and specials in accordance with piping layout.

2. Special pipe sections and fittings shall be marked at each end with notation “FIELD TOP CENTERLINE”.

3. The word “TOP” shall be painted or marked on outside top spigot of each pipe section.

4. Mark “TOP MATCH POINT” for compound bends per AWWA C208 so end rotations can be easily oriented in field.

3.04 CLOSURES AND SHORT SECTIONS

A. Closure and Short Sections

1. Closing courses and short sections of pipe shall be furnished by the Contractor as found necessary in the field, or as required by the City Representative.

2. Closing courses and short sections of pipe shall not be less than 2-feet in length.

3. Closing courses shall, for the purpose of payment, be considered as straight pipe and no additional allowance will be made thereof.

B. Butt Strap Joints

1. Butt strap joints will be used for welding joints on closure pieces, and elsewhere as permitted by the City Representative.

C. Field Measurements

1. The Contractor is responsible for all necessary field measurements required for specials and closures.

3.05 FLANGED PIPES

A. Flanged joints shall be made up tight with care being taken to avoid undue strain in flanges, fittings and other accessories. Bolt holes shall be aligned for each flanged joint. Bolts shall be full size for bolt holes; use of undersize bolts to make up for misalignment of bolt holes or for any other purpose will not be permitted. Adjoining flange faces shall not be out of parallel to such a degree that the flanged joint cannot be made watertight without overstraining the flange. Any flanged pipe or fitting whose dimensions do not allow the making of a proper flanged joint as specified herein shall be replaced by one of the proper dimensions. Clean flanges prior to making joints. Buried flanged pipe connections shall be made with the smallest practical “bell” hole. After the joint is completed take special care to completely fill the “bell” hole under and around the pipe with

compacted backfill.

3.06 TRANSPORTATION AND DELIVERY OF PIPE

A. After the pipe has been coated, lined and cured, as provided in Section 09 97 72 Coating and Lining, the Contractor shall stull, load, and haul the pipe to the site of the work not more than ten (10) calendar days in advance of laying the pipe, unless otherwise approved by the City Representative.

1. Handling and Delivery:
   a. During loading, transportation and unloading, every precaution shall be taken to prevent damage to the pipe.
   b. Install stulling for pipe, specials, and fittings in accordance with accepted submittal and as soon as practical after pipe is fabricated or, for shop lined pipe, after lining has been applied.
   c. Securely bulkhead or otherwise seal ends of pipe, specials, and fittings prior to loading at manufacturing Site.
   d. Pipe ends shall remain sealed until installation.
   e. After the application of external coating, the pipe shall be handled only by means of accepted hooks on the ends, by means of accepted belt slings, or padded scoop.
   f. Trucks or trailers used for transportation of pipe to the jobsite shall be provided with padded cradles curved to fit and support at least an arc of 60 degrees of the outside of the pipe.
   g. Padding sufficiently thick and stiff to prevent scoring of the coating shall be used under tie chains.
   h. Damage to pipe, fittings, or specials, including linings and coatings, found upon delivery to Job Site shall be repaired to City Representative's satisfaction or removed from Site and replaced.
   i. During transportation and until the time to field install the pipes, the ends of all pipe shall be sealed with a reinforced plastic cover.

2. Storage:
   a. a. Support pipe securely to prevent accidental rolling and to avoid contact with mud, water, or other deleterious materials.
   b. Support on sand or earth berms free of rock exceeding 3 inches in diameter.
   c. Rolling the pipe on the coated surface will not be permitted. However, the pipe may be rolled on sleepers in contact with only the bare ends of the pipe.

3.07 TEMPORARY ACCESS MANHOLE FOR CONSTRUCTION

A. Contractor can install extra Temporary manhole(s) at locations requested with the acceptance of the City Representative. These manholes are for ease of construction during welding. Contractor shall show these manholes locations in the submittal for fabrication of steel pipe. No extra payment will be made on these manholes. These manholes shall be capped per Contract Drawings at end of construction. See Section 33 11 50 Installation of Steel Pipeline.

END OF SECTION