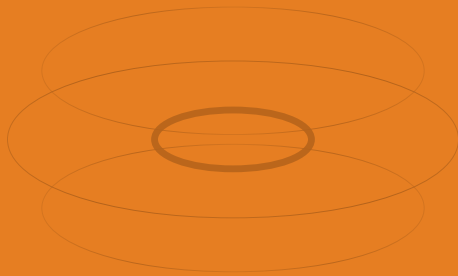


OWNER

Piping Fabrication and Installation

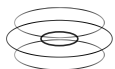


Document No.: [REDACTED] SPC-SPC-006

Rev. A, Issued for Review

Date: September 29, 2026

Project: [REDACTED] [REDACTED]



TORUS

[REDACTED], [REDACTED] County, [REDACTED]

ISSUE SUMMARY AND APPROVAL

This page records each issue of SPC-SPC-006. The preparer, reviewer and approver sign for each revision.

Rev.	Date	Issue purpose	Description
A	2026-09-29	Issued for Review	First issue

Contributors

Rev.	Discipline	Prepared by	Reviewed by	Approved by
A	Specifications			

SECTION PC-SPC-006
PIPING FABRICATION AND INSTALLATION

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes the receipt, inspection, storage, handling, fabrication, erection and installation of all process, fuel gas, vent and drain piping of the , from inlet insulating joint IJ-101 to outlet insulating joint IJ-102, and of the buried outlet lateral from IJ-102 to the outlet flange of the tap valve of (the receiving pipeline operator):
1. Material receiving, mill test report (MTR) review, heat number traceability and positive material identification (PMI).
 2. Handling and storage of Owner-furnished material (OFM) and Contractor-furnished material (CFM).
 3. Shop and field fabrication of spools, cutting, bevelling, fit-up and dimensional control.
 4. Field cold bending of buried line pipe.
 5. Trenching, bedding, padding, lowering-in, backfill, compaction, trench breakers, warning tape and pipeline markers.
 6. Erection of above-grade piping on supports, and setting of in-line valves and specialty items.
 7. Bolted joint assembly to ASME PCC-1, with a joint integrity and flange management system.
 8. Installation of monolithic insulating joints IJ-101 and IJ-102.
 9. Internal cleaning before testing, and preservation until commissioning.
 10. Work near the live trunkline and any other live facility.
 11. Fabrication and erection of the Class 150 stainless steel vent and blowdown piping (piping class S1) and of vent stack VS-101.
- B. The buried outlet lateral 12"-G-1042-A6 runs from IJ-102 at plot coordinates (220, 152.5) and the outlet riser at (220, 160) to the tap at (220, 257). It is about 96 ft long plus the riser, crosses internal road R-3 below grade, and is 0.500 in wall API 5L X52 PSL2 pipe with 0.500 in wall 3R riser bends. The final tap location is HOLD H-04.
- C. Line numbers, sizes, piping classes (A6, A1, D1, S1 and T1) and design conditions are defined in MEC-LST-001, Line List, and PIP-SPC-001, Piping Material Specification. Class 600 flanges and valves are rated 1,440 psig from -20 to 133 °F and 1,420 psig at 150 °F (ASME B16.5, Group 1.1). Pipe and fittings are rated for 1,440 psig at 150 °F.
- D. Related sections:
1. SPC-SPC-001, General Requirements and Definitions.
 2. SPC-SPC-002, Site Preparation, Clearing and Earthwork.

3. SPC-SPC-007, Welding; SPC-SPC-008, Nondestructive Examination.
4. SPC-SPC-009, External Coating of Buried Pipe and Field Joints; SPC-SPC-010, Above-Ground Painting.
5. SPC-SPC-011, Hydrostatic Testing, Dewatering and Drying; SPC-SPC-012, Tie-in, Hot Tap Coordination and Purging.
6. SPC-SPC-014, Instrumentation Installation, Tubing and Calibration (tubing downstream of the first root valve).
7. SPC-SPC-017, Mechanical Equipment Setting.
8. SPC-SPC-019, Inspection and Test Plan; SPC-SPC-020, Construction Records and Turnover.

E. Work by others: the hot tap fitting, the tap valve, the hot tap operation and all welding on the trunkline are by the receiving pipeline operator. The upstream Owner lateral south of IJ-101 is a separate Owner contract.

1.02 REFERENCES

A. Codes and regulations, latest edition in force on the date of the contract unless an edition is stated:

1. 49 CFR 192 Subpart D (design of pipeline components), Subpart E (welding) and Subpart G (general construction requirements: 192.303 to 192.327).
2. 49 CFR 192.517 and 192.619 (test records and maximum allowable operating pressure records) and 192.707 (line markers).
3. ASME B31.8-2022, Gas Transmission and Distribution Piping Systems.
4. ASME PCC-1-2022, Pressure Boundary Bolted Flange Joint Assembly.
5. ASME B16.5, B16.9, B16.11, B16.20 and B16.25 (flanges, butt-welding fittings, forged fittings, metallic gaskets, butt-welding ends).
6. MSS SP-25, SP-58, SP-75 and SP-97 (marking, pipe supports, high-test fittings, branch outlets).
7. API Specification 5L, 46th Edition, Line Pipe; API RP 5L1 (railroad transport of line pipe); API RP 1102, Steel Pipelines Crossing Railroads and Highways.
8. PFI ES-3, Fabricating Tolerances.
9. ASTM A380 and A967 (cleaning and passivation of stainless steel); ASTM C136, D698, D2487, D4327, D6938 and G57 (soil tests); ASTM E1476 (metals identification).
10. Underground Facilities Damage Prevention Act, 63 O.S. 142.1 et seq.
11. 29 CFR 1926 Subpart P, Excavations.

B. Project documents:

1. GEN-DB-001, Basis of Design.

2. MEC-LST-001, Line List; MEC-LST-003, Valve List; MEC-LST-004, Tie-in List.
3. PIP-SPC-001, Piping Material Specification.
4. PRO-DWG-101 to PRO-DWG-111, Piping and Instrumentation Diagrams.
5. MEC-DWG-001, Plot Plan; PIP-DWG-001 to PIP-DWG-003, Piping General Arrangement; PIP-DWG-004, Tie-in and Outlet Lateral; PIP-DWG-006, Typical Pipe Support Details; PIP-DWG-007, Soil-to-Air Transition, Road Crossing and Buried Piping Details.
6. MEC-CAL-001, Pipe Wall Thickness; MEC-CAL-003, Hydrostatic Test Calculation; MEC-CAL-004, Piping Flexibility and Stress Screening; MEC-CAL-005, Pipe Support Spans and Support Loads.
7. CP-CAL-001, Cathodic Protection Design; ELE-CAL-005, Station Grounding and Bonding Design.
8. PRO-CAL-008, Blowdown, Vent Header and Vent Stack Calculation.
9. CIV-RPT-002, Stormwater Pollution Prevention Plan; CON-RPT-003, Construction HSE Plan.

C. Where this section and a referenced code differ, the more stringent requirement shall govern. The Contractor shall raise any conflict by request for information under SPC-SPC-001.

1.03 DEFINITIONS

- A. Joint ID: the unique identifier of a bolted flange joint, in the form FJ-(line number)-(nn).
- B. Tolerance zone: the area within 24 in on either side of the marked location of an underground facility, as defined by the one-call law.
- C. Trunkline exclusion zone: 25 ft on either side of the located trunkline centerline, or any wider zone the receiving pipeline operator requires (HOLD H-04).
- D. Padding: select fine material placed around and 12 in over coated pipe.

1.04 SUBMITTALS

- A. The Contractor shall submit the items in Table 1-1 for the action shown. Work covered by a submittal shall not start until the submittal is returned accepted.

Table 1-1: Submittal Schedule

No.	Submittal	Timing	Action
06-01	Piping construction execution procedure: fabrication location, sequence, equipment, lifting of spools	21 days before fabrication	EOR and Owner review
06-02	Material receiving, storage, traceability and heat number transfer procedure	21 days before material receipt	EOR approval

No.	Submittal	Timing	Action
06-03	CFM mill test reports, certificates of conformance and PMI procedure	With each delivery, before use	Owner review
06-04	Field cold bend procedure, bending machine data and bend qualification record	14 days before bending	EOR approval
06-05	Spool isometrics with weld numbers, heat numbers and dimensions	14 days before fabrication of each spool	EOR approval
06-06	Trenching, bedding, padding and backfill procedure, with padding source, gradation and resistivity tests	14 days before trenching	EOR approval
06-07	Excavation plan within the trunkline exclusion zone: hand and vacuum methods, potholing, equipment crossings, mats	21 days before the work	EOR approval and receiving pipeline operator release
06-08	Bolted joint assembly procedure to ASME PCC-1, with calculated target bolt stress and torque or tension for each size and class, lubricant, tools and pattern	14 days before the first bolt-up	EOR approval
06-09	Bolting technician qualifications (ASME PCC-1 Appendix A or equivalent training)	Before the first bolt-up	Owner review
06-10	Torque wrench and tensioner calibration certificates	Before use	Owner review
06-11	Pipe support installation procedure, with shimming and grouting method	14 days before erection	EOR review
06-12	Insulating joint receiving test results and storage method	On receipt	Owner and EOR review
06-13	Internal cleaning procedure and cleanliness acceptance method	14 days before cleaning	EOR approval
06-14	Daily piping report: welds made, pipe tally, heat numbers laid, depth of cover, backfill tests	Daily	Information
06-15	As-built survey of buried piping	Before backfill of each section, and final	Owner and EOR review
06-16	Flange register (3.13)	Continuous; complete before hydrostatic test	Owner review
06-17	Stainless (S1) fabrication procedure: segregated area, tool control, cutting and grinding methods, cleaning and passivation, protection in transport and erection	21 days before S1 fabrication	EOR approval
06-18	VS-101 installation procedure: lifting, anchor bolt tightening, strake orientation, base drain valve and collection pan	14 days before erection	EOR review

1.05 QUALITY ASSURANCE

- A. The Contractor's piping quality control inspector shall hold API 1169 certification or have five years of pipeline construction inspection experience, and the inspector of welding activities shall be an AWS Certified Welding Inspector. The inspector shall inspect and record every activity in PART 3 and shall maintain the pipe tally, weld map, flange register, bend records, backfill test records and as-built survey.
- B. Only personnel qualified under the Owner's operator qualification program (49 CFR 192 Subpart N) shall perform covered tasks.
- C. The Owner's inspector shall have access to all work at all times and may reject work that does not comply. Acceptance by the Owner's inspector shall not relieve the Contractor of its responsibility for compliance.
- D. Hold and witness points shall be as listed in 3.18 and in SPC-SPC-019.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Receiving inspection. Every item shall be inspected on receipt and the results recorded on QF-06-01, to the criteria in Table 1-2.

Table 1-2: Receiving Inspection

Check	Criterion
Identity	Marking to API 5L or MSS SP-25 matches the packing list and MTR: grade, product specification level, OD, wall, heat number, manufacturer
MTR review	100 % of heats: chemistry and mechanical properties meet API 5L PSL2 and PIP-SPC-001; carbon equivalents CE(IIW) and CE(Pcm) reported; Charpy impact results at -20 °F meet the purchase order; mill hydrostatic test pressure reported
Visual	No dents deeper than 1/4 in; no gouges, notches, arc burns or laminations at the ends; coating damage within repair limits; bevels undamaged with protectors in place
Dimensions	OD and ovality at the ends within API 5L tolerance; wall thickness checked by ultrasonic testing at 4 points per end on 10 % of joints of each heat
Coated pipe	Coating damage logged for repair under SPC-SPC-009
Fittings and flanges	Rating, face finish (125 to 250 µin AARH for spiral wound gaskets) and bore matched to the pipe wall per PIP-SPC-001; no face damage
Forgings	ASTM A105N, normalized, with supplementary Charpy impact testing at -20 °F on the MTR (ASTM A350 LF2 Class 1 accepted as the alternate)
Bolting	ASTM A193 B7 studs and A194 2H nuts unless PIP-SPC-001 states otherwise; coated as specified, heat marked, with certificates
Gaskets	Class 600: ASME B16.20 spiral wound, 316 stainless winding, flexible graphite filler, 316 stainless inner ring, carbon steel centering ring. Class 150 (A1, D1 and S1): flexible graphite sheet with a 316 stainless tangd insert. Class and size marked
Stainless (S1)	Dual-certified 304/304L or 316/316L on the MTR, per PIP-SPC-001 class S1

Check	Criterion
Valves	Tag, rating, trim, end preparation and actuator match MEC-LST-003; shipping blinds in place; API 6D shell and seat test certificates

B. Nonconforming material shall be tagged red, segregated and reported on a nonconformance report within 24 hours. A dent, gouge or other defect in line pipe shall be dispositioned under 49 CFR 192.309: the affected length shall be cut out as a cylinder, and a grinding repair is permitted only where the remaining wall, verified by ultrasonic testing, stays above the minimum wall in MEC-CAL-001 and the EOR accepts it.

C. Positive material identification. The Contractor shall perform PMI by X-ray fluorescence (ASTM E1476) on 100 % of alloy items: stainless instrument valves and tube fittings, gasket inner rings (one per box of 25), any stainless or alloy flange or fitting, and every S1 pipe length, fitting, flange and weld under SPC-SPC-008. Carbon steel pipe and fittings shall be identified by MTR and marking, with PMI only where the marking is illegible or the Owner's inspector requests it. Verified items shall receive a green paint dot next to the heat number.

D. Traceability. Heat numbers shall be transferred by low-chloride paint marker, never by hard stamping, to every cut piece before cutting, and recorded on the spool isometric and the pipe tally. The pipe tally shall record for each joint its number, heat number, length, wall, coating number and final location (with the weld numbers on each side). Traceability shall meet the traceable, verifiable and complete standard of 49 CFR 192.517 and 192.619.

E. Storage and handling shall meet Table 1-3.

Table 1-3: Storage and Handling

Item	Requirement
Pipe stacking	On padded skids or sand berms at least 4 in above grade, with at least three supports per joint; no more than three tiers of NPS 12 coated pipe unless the coating manufacturer allows more; chocked
Slings	Nylon slings or padded end hooks matched to the bevel; no chains or wire rope on coated pipe; no dragging
Bevel protection	End caps on all pipe and fittings until fit-up
Valves	On pallets, ends capped, ball valves fully open, actuators protected from weather; electronics in heated storage per the vendor
Gaskets	In original packaging, flat, indoors and dry; never hung on hooks
Bolting	Indoors in original containers, coating undamaged
Insulating joints	Crated, indoors or covered, protected from impact; never lifted with chokers on the pups (3.10)
Stainless (S1)	Off the ground on timber or plastic dunnage, under cover, apart from carbon steel (3.17)
Laydown	Inside the fence per CON-RPT-001; no storage in the trunkline right-of-way

1.07 MEASUREMENT AND PAYMENT

- A. Pay item 06.01, Above-grade station piping, fabrication and installation: lump sum. The price shall include receiving and storage of OFM; supply of CFM fittings, flanges, gaskets and bolting; all S1 stainless vent piping including segregation, cleaning and passivation; the VS-101 base drain valve and collection pan; fabrication, welding under SPC-SPC-007, installation of supports, bolt-up, the flange and blind registers, cleaning and preservation. Nondestructive examination (08.01), painting (10.01), hydrostatic testing (11.01) and supply of support steel (04.02) are paid separately.
- B. Pay item 06.02, Below-grade station piping: per linear foot by NPS, measured along the centerline between fittings as installed. The price shall include trenching, bedding, padding, lowering-in, welding, bends, backfill, compaction, warning tape, markers and the as-built survey. Field joint coating (09.01), nondestructive examination (08.01), rock (06.05) and crossings (06.04) are paid separately.
- C. Pay item 06.03, Outlet lateral from IJ-102 to the tap valve flange: per linear foot, measured along the centerline, including the work of 06.02 and of 3.15. Bolt-up to the tap valve, purging and gas-in are paid under 12.01.
- D. Pay item 06.04, Foreign line and road crossings: each, including potholing, hand and vacuum excavation, support of the exposed foreign line, clearance verification, and any casing or slab shown.
- E. Pay item 06.05, Rock in trench: per cubic yard measured in place to 6 in below pipe grade and 12 in beyond the pipe on each side, only where the rock cannot be removed with a 1 yd³ excavator bucket fitted with rock teeth, as verified by the Owner's inspector. The price shall include removal, disposal and replacement with padding.
- F. Rejected work, re-cleaning, cut-outs and remaking of joints shall be at the Contractor's cost. Traceability, records and compliance with this section shall not be paid separately.

PART 2 PRODUCTS

2.01 SUPPLY OF MATERIALS

- A. Owner-furnished: line pipe NPS 6 to NPS 16 (API 5L X52 PSL2, Charpy impact tested at -20 °F); API 6D valves NPS 2 and larger, including actuated valves (bodies ASTM A352 LCC or A350 LF2; gear operators on NPS 2 and larger Class 600 manual ball valves); check valve CKV-171; control valves; insulating joints IJ-101 and IJ-102; pressure relief valves and TSV-136; and all equipment packages listed in CON-RPT-002.
- B. Contractor-furnished: butt-welding fittings (MSS SP-75 WPHY-52); forged fittings and flanges (ASTM A105N with supplementary Charpy impact testing at -20 °F, ASTM A350 LF2 Class 1 as the alternate, ASTM A694 F52 where the piping class requires); all S1 stainless pipe, fittings, flanges and bolting; gaskets; stud bolts and nuts; small-bore pipe and valves NPS 1-1/2 and smaller; pipe supports and shoes; padding and backfill; warning tape and markers; and

consumables. All CFM shall conform exactly to PIP-SPC-001 for the piping class of the line.

- C. No substitution of material grade, rating, schedule, end preparation, gasket type or bolting grade shall be made without EOR approval through the management of change process of SPC-SPC-001.

2.02 BEDDING AND PADDING MATERIAL

- A. Bedding and padding shall be clean sand or screened native soil meeting Table 2-1. Resistivity is specified because low-resistivity padding increases the current demand on the cathodic protection system.

Table 2-1: Bedding and Padding Material

Property	Requirement	Test
Material	Non-plastic (plasticity index 6 or less), free of organics, rock, clods and debris	ASTM D2487, visual
Maximum particle size	100 % passing the 1/2 in sieve	ASTM C136
Fines	12 % or less passing the No. 200 sieve	ASTM C136
Resistivity	Not less than native soil resistivity at the site (1,500 ohm-cm assumed, HOLD H-08)	ASTM G57
Chlorides and sulfates	Chloride 100 ppm maximum; sulfate 200 ppm maximum	ASTM D4327
Test frequency	One gradation and one resistivity test per source, plus one per 500 yd ³	

2.03 WARNING TAPE, MARKERS AND LOCATE WIRE

- A. Warning tape shall be 6 in wide yellow polyethylene printed “CAUTION HIGH PRESSURE NATURAL GAS PIPELINE” with the Owner’s name and emergency number.
- B. Pipeline markers shall meet 49 CFR 192.707(d).
- C. Where a buried section is electrically isolated and has no cathodic protection test station, a No. 12 AWG copper locate wire with HMWPE insulation shall be provided, subject to EOR approval.

2.04 STAINLESS STEEL VENT PIPING, CLASS S1

- A. Class S1 shall be ASME Class 150 dual-certified 304/304L or 316/316L stainless steel with a minimum design temperature of -150 °F, per PIP-SPC-001. It shall be used for every line downstream of restriction orifices RO-102, RO-181, RO-182 and RO-183 and of the outlets of PSV-101, PSV-157, PSV-161 and TSV-136 (lines 1070 to 1077, 1160, 1161, 1170 and the vent laterals, including 4”-V-1072-S1, 4”-V-1073-S1 and 2”-V-1077-S1), for the orifice downstream flanges, and

for vent stack VS-101. Carbon steel class A1 shall be used only for fuel gas downstream of PCV-161, and no vent line shall be built in class A1.

- B. The reason for stainless steel is temperature: blowdown gas downstream of the orifices reaches -65 to -121 °F (PRO-CAL-008), well below the rating of carbon steel. A carbon steel item found in an S1 line shall be treated as a nonconformance and cut out.
- C. Flanged S1 joints shall use Class 150 raised-face flanges and flexible graphite gaskets with a 316 stainless tapered insert. S1 bolting shall be as PIP-SPC-001 class S1 specifies.

PART 3 EXECUTION

3.01 GENERAL

- A. Construction shall comply with the drawings, PIP-SPC-001, 49 CFR 192 Subpart G and ASME B31.8. A copy of this section and of the approved procedures shall be kept at the work front.
- B. No field change to routing, supports, fittings or elevations shall be made without an approved request for information or management of change under SPC-SPC-001.
- C. Pipe shall be kept clean and dry inside. Open ends shall be capped at the end of each shift and whenever unattended, and night caps on buried pipe ends shall be watertight.

3.02 CUTTING AND END PREPARATION

- A. Pipe shall be cut by machine: band saw, orbital cutter or mechanized oxy-fuel on a track. Manual oxy-fuel cutting shall be used only for rough cuts that are then machined or ground back at least 1/16 in to sound metal.
- B. Weld bevels shall meet ASME B16.25: 37.5° +2.5°/-0° for fittings or 30° +5°/-0° for line pipe, with a root face of 1/16 in ± 1/32 in, unless the approved welding procedure states otherwise.
- C. Joints between members of unequal wall, including the 0.500 in wall lateral where it meets thinner station components at IJ-102 and at the tap valve spool, shall be tapered to ASME B31.8 Appendix I no steeper than 1:4 (14°), without reducing the thinner member below its minimum wall.
- D. Every field-cut end of line pipe shall be scanned ultrasonically for laminations over a 1 in band under SPC-SPC-008 before bevelling.

3.03 FIT-UP

- A. Fit-up shall meet Table 3-1. The Owner's limits on internal offset are tighter than the API 1104 values because the station operates at 50 % of specified minimum yield strength and the Owner wants root quality consistent with 100 % volumetric examination.

Table 3-1: Fit-up Tolerances

Parameter	Tolerance
Root gap	Per the welding procedure, typically 1/16 to 1/8 in
Internal offset, same nominal wall	1/16 in maximum around the circumference; 1/8 in maximum at any point over no more than 20 % of the circumference
Longitudinal seams of welded pipe	Offset at least 3 in, and in the upper half of horizontal pipe (10 to 2 o'clock) where practicable
Spacing of girth welds	At least one pipe diameter or 6 in, whichever is greater, unless the EOR approves closer spacing
Attachments and branches	No welded attachment within 3 in of a girth or seam weld; no branch within one diameter of a girth weld without EOR approval
Line-up clamps	Internal clamps on NPS 10 and larger where access allows, not removed until the root bead is complete; external clamps not removed until at least 50 % of the root is complete in equally spaced segments
Tack welds	By qualified welders to the production procedure; cracked tacks ground out
Temporary attachments	Not permitted on pressure parts without EOR approval; if approved, removed by grinding, examined by magnetic particle testing and checked for wall by ultrasonic testing

3.04 SPOOL FABRICATION

A. Spools shall comply with PFI ES-3 and with Table 3-2, which governs where it is tighter.

Table 3-2: Spool Fabrication Tolerances

Dimension	Tolerance
Face-to-face, center-to-face, center-to-center	± 1/8 in
Flange face perpendicular to the pipe axis	1/32 in per ft of flange OD, 3/64 in maximum across the face
Flange bolt-hole rotation	1/16 in maximum at the bolt circle
Branch location along the run	± 1/8 in
Lateral offset of branches or flanges	± 1/16 in
Overall spool length over 10 ft	± 1/4 in
Valve and instrument connection orientation	± 1°

B. Where the isometric shows a field closure, the spool shall be shipped with one end square cut 6 in long.

3.05 BENDS

A. Above-grade and in-station piping shall change direction only by factory fittings (MSS SP-75 elbows) or factory induction bends. Field cold bends, miters and wrinkle bends shall not be used above grade.

- B. Buried station piping and the outlet lateral may be field cold bent within the limits of ASME B31.8 paragraph 841.2.3 and 49 CFR 192.313, as Table 3-3 summarizes.

Table 3-3: Field Cold Bend Limits

NPS	Minimum radius	Maximum deflection per pipe-diameter length of arc
12 and smaller	18 D	3.2°
14	21 D	2.7°
16	24 D	2.4°

- C. A bend shall have no wrinkles, buckles, kinks or flattened areas. Ovality shall not exceed 2.5 % of nominal OD anywhere in the bend, verified by passing a gauging plate of 95 % of nominal ID or by caliper. No girth weld shall lie within the arc or within one diameter of a tangent point, the longitudinal seam shall be near the neutral axis, and the coating shall be holiday tested after bending under SPC-SPC-009.
- D. The first bend of each size, wall and pipe source shall be qualified on QF-06-04. Wall thinning at the outside of the bend, measured ultrasonically, shall not exceed 2 % of nominal and shall never go below the minimum wall in MEC-CAL-001.
- E. Mitered joints shall not be used. 49 CFR 192.233 permits limited miters, but the Owner does not, because a miter concentrates stress at the station's design factor.

3.06 TRENCHING

- A. Before any excavation, the Contractor shall submit an OKIE811 locate request at least 48 hours (excluding weekends and holidays) before digging, post the ticket at the site, verify all marks, and pothole by hand or vacuum every marked facility within 10 ft of the planned trench.
- B. Trench width shall be the pipe OD plus at least 12 in on each side, to allow padding and compaction, and wider where 29 CFR 1926 Subpart P requires. Trench walls shall be sloped, benched or shored under the competent person's plan in CON-RPT-003.
- C. Cover to the top of the coated pipe shall be at least that in Table 3-4.

Table 3-4: Minimum Cover

Location	Minimum cover
Normal soil, station and outlet lateral	36 in
Under roads, drainage ditches and culverts, including internal road R-3	48 in
Under a county or public road, if crossed	Per API RP 1102 and the county permit; not less than 60 in below the road surface and 36 in below the ditch bottom (HOLD H-05)

Location	Minimum cover
Rock, if encountered	36 in; less only with EOR approval and an engineered protection slab

D. The trench bottom shall be on uniform grade, free of rock, clods and debris larger than 1/2 in, with 6 in of bedding under the pipe. Water shall be removed before lowering-in, and dewatering discharge shall follow
 CIV-RPT-002.

E. Clearance between the pipe and any other underground structure or foreign pipeline shall be at least 12 in (49 CFR 192.325). At crossings of the trunkline or other pipelines the new pipe shall pass below with at least 24 in clearance, unless the operator of the foreign facility permits less in writing (HOLD H-04). Where 12 in cannot be achieved, the EOR shall specify protection and a cathodic protection test station.

F. Open trench shall not exceed the length that can be backfilled in two working days, and shall be barricaded, with a wildlife escape ramp at each end.

3.07 BEDDING, PADDING AND LOWERING-IN

A. Bedding shall be at least 6 in thick below the pipe, and padding shall extend to 12 in above the top of the pipe, placed by hand or by padding machine with no free drop of more than 2 ft onto coated pipe. Rockshield or foam padding shall be used only with EOR approval.

B. The coating shall be holiday tested immediately before lowering-in under
 SPC-SPC-009 and all holidays repaired.

C. Pipe strings shall be lowered with at least two padded slings or cradles spaced so that stresses stay elastic, without dropping or skidding along the trench wall. The pipe shall rest uniformly on the bedding, without bridging or overbends, and shall not be pulled against the trench wall.

D. The Owner's inspector shall release each section for lowering-in (hold point HP-06-05) and for backfill (hold point HP-06-06).

3.08 BACKFILL AND COMPACTION

A. Backfill above the padding shall be excavated native material free of rocks larger than 6 in, placed in loose lifts of no more than 8 in (hand compaction) or 12 in (mechanical), at a moisture content within -2 % to +3 % of optimum.

B. Compaction shall meet Table 3-5.

Table 3-5: Backfill Compaction

Location	Requirement	Test frequency
Under roads, foundations and within 5 ft of structures	95 % of maximum dry density, ASTM D698	One test per lift per 100 ft, at least one per crossing
Elsewhere inside the fence	90 %, ASTM D698	One test per 200 ft per 2 ft of depth

Location	Requirement	Test frequency
Outside the fence, pasture	85 %, ASTM D698, crowned 6 in for settlement	One test per 300 ft

- C. No compaction equipment heavier than 10 tons shall work over the pipe until there is 24 in of cover, and no vibratory compaction shall be used directly over the pipe until 12 in of padding is in place.
- D. Topsoil shall be replaced under SPC-SPC-002.

3.09 TRENCH BREAKERS, WARNING TAPE AND MARKERS

- A. Trench breakers of sandbags filled with padding material, or of polyurethane foam, shall be installed on slopes over 5 %, at each side of every crossing, and at the entry and exit of the insulating joint risers. Spacing shall not exceed 300 ft on slopes of 5 to 15 %, 200 ft on slopes of 15 to 25 %, and 100 ft on steeper slopes.
- B. Warning tape shall be continuous over all buried gas piping, 18 in below finished grade and at least 12 in above the top of the pipe.
- C. Buried steel piping is located by direct connection at the cathodic protection test stations, so no separate tracer wire is required except as 2.03 C provides.
- D. Pipeline markers shall be installed under 49 CFR 192.707 where piping crosses the fence, at road crossings, where the outlet lateral leaves the fence, and at the interconnect. Test stations shall be installed per CP-CAL-001.

3.10 INSULATING JOINTS IJ-101 AND IJ-102

- A. On receipt the Contractor shall verify the vendor's factory hydrostatic and dielectric test certificates and shall measure insulation resistance with a 1,000 V DC megohmmeter. The resistance shall be at least 25 megohm (typical, confirm with vendor data, HOLD H-15) and shall be recorded on QF-06-06.
- B. Insulating joints shall be lifted with nylon slings around the pipe body at the two pups, never across the insulating section, and shall not be dropped, twisted or bent. The vendor's minimum pup length shall be kept so that welding heat does not reach the insulating body; where it cannot, the weld shall be cooled as the vendor's procedure requires.
- C. Interpass temperature shall not exceed the lower of the welding procedure value and 400 °F, measured by contact pyrometer 3 in from the joint body.
- D. The insulation test shall be repeated after welding and after the hydrostatic test, to the criterion of 3.10 A. After backfill, isolation effectiveness shall be tested per CP-CAL-001.
- E. Each joint shall be installed at its soil-to-air riser with the insulating body above grade and accessible, protected by the surge protective device specified in CP-CAL-001 and ELE-CAL-005. No grounding conductor, pipe support or conduit shall bridge the joint, because a bridge defeats the isolation that the cathodic protection design relies on.

3.11 ABOVE-GRADE ERECTION AND SUPPORTS

- A. Supports shall be installed at the locations and of the types shown in PIP-DWG-006, MEC-CAL-004 and MEC-CAL-005 before the hydrostatic test. No temporary support shall remain at mechanical completion.
- B. The bottom of pipe on supports shall be 18 to 36 in above grade.
- C. Erection shall meet Table 3-6.

Table 3-6: Erection Tolerances

Item	Tolerance
Pipe centerline, horizontal	± 1/2 in
Elevation, bottom of pipe	± 1/4 in
Slope of drain lines (D1 and liquid service)	At least 1/8 in per ft toward T-101, with no pockets
Plumb of vertical risers	1/8 in per 10 ft
Support shims	1/2 in total maximum; steel shims tack welded to the support, never to the pipe
Guide gaps	Per drawing, typically 1/16 in each side

- D. Wear pads or shoes shall be installed as detailed. Non-conductive, UV-resistant isolation pads shall be installed between pipe and support steel where CP-CAL-001 requires electrical isolation or where needed to prevent crevice corrosion, and between every S1 line and carbon steel support steel (3.17).
- E. Equipment nozzles on V-101, H-101, PR-101, SK-110 and FG-101 shall not be used as anchors for fit-up. Piping connected to equipment shall be fitted without forced alignment: with the bolts removed, the flange faces shall be parallel within 1/32 in and centered within 1/16 in, and the bolts shall enter the holes freely by hand. Nozzle loads shall not exceed the vendor's allowables (HOLD H-15).

3.12 BOLTED FLANGE JOINT ASSEMBLY

- A. The bolted joint assembly procedure (submittal 06-08) shall calculate a target assembly bolt stress for each size and class by the method of ASME PCC-1 Appendix O, considering gasket seating and crush limits, flange rotation and bolt yield, and shall convert it to torque with the nut factor of the specified lubricant, or to tensioner pressure with the tool's load-transfer factor. Class 600 joints use spiral wound gaskets and Class 150 joints use flexible graphite gaskets with a tanged insert, so the values shall be calculated for each gasket type. Typical target stress for B7 studs is 40 to 70 ksi on the root area. Generic torque charts shall not be used, because they ignore the gasket and flange limits that govern joint tightness.
- B. Before assembly the Contractor shall confirm and record on QF-06-07 that the gasket seating surfaces are clean with no radial scratch deeper than the serrations or across more than half the

seating width, and that flange alignment is within 1/32 in for face parallelism, 1/16 in for centerline offset and 1/8 in for bolt-hole offset.

- C. A new gasket shall be used for every assembly, and spiral wound gaskets shall never be reused. Studs and nuts shall be new or inspected, with full thread engagement and at least one full thread and no more than three threads beyond the nut. Hardened washers shall be used where the procedure requires. Lubricant shall be applied to the threads and nut bearing faces only, never to gasket faces.
- D. Bolts shall be tightened in the ASME PCC-1 legacy cross pattern, or an alternative pattern that ASME PCC-1 permits, in at least these passes: hand tight and snug (no more than 20 % of target), 20 to 30 %, 50 to 70 %, 100 %, then circular passes at 100 % until no nut turns. Hydraulic tensioning shall be used for studs 1-1/2 in diameter and larger, or where the procedure requires it.
- E. Torque wrenches and tensioners shall be calibrated within the previous 6 months to ± 3 % accuracy.
- F. The final flange gap shall be measured at 4 points (8 points for NPS 12 and larger) and shall vary by no more than 0.020 in around the circumference.
- G. Temporary gaskets and test blinds used during the hydrostatic test shall be removed and permanent gaskets installed after testing, with a new record and a leak test at gas-in under SPC-SPC-018.

3.13 FLANGE MANAGEMENT AND JOINT INTEGRITY

- A. Every bolted joint shall receive a Joint ID marked on the isometric and a durable weatherproof tag on one stud. Tag color shall show status: red for a joint assembled hand tight or temporarily (including a test blind), released by the Contractor; yellow for a joint tightened to final value and verified by Contractor quality control; and green for a joint verified by the Owner's inspector and proven leak-tight at the hydrostatic or in-service leak test.
- B. The flange register (submittal 06-16) shall list every joint with its Joint ID, line, size, class, gasket type and lot, bolt heat and coating, lubricant, tool serial number and calibration date, target torque or tension, technician, date, quality control and Owner sign-off, and leak test result. The register is a turnover record under SPC-SPC-020.
- C. A joint broken after green tagging shall revert to red and shall be remade and re-recorded.
- D. Test blinds, spades and temporary gaskets shall be logged in a separate blind register with blind number, location, installation and removal dates and signatures. The removal of every blind before gas-in shall be verified by a walkdown (hold point HP-06-10).

3.14 INTERNAL CLEANING

- A. Before the hydrostatic test, each test section shall be cleaned of mill scale, weld spatter, slag, water and debris. Above-grade spools shall be cleaned by air blow at an outlet velocity of at least 100 ft/s, or by swabbing. Buried pipe and the outlet lateral shall be cleaned by at least two foam

pig runs (bare foam, then brush or crisscross polyurethane) until the pig arrives with no more than a light film of dust and no free debris or water.

- B. Instruments, control valve internals, meter tubes, ultrasonic meter transducers, flow conditioners and relief valves shall be removed or isolated and replaced with spools or blinds for cleaning and testing, under SPC-SPC-011. V-101 shall be isolated from the field test because it is shop tested at 2,225 psig.
- C. The Owner's inspector shall witness the final cleaning run or air blow. A painted plywood target at the blow outlet shall show no more than three impacts larger than 1/16 in per square foot.

3.15 WORK NEAR THE LIVE TRUNKLINE AND OTHER LIVE FACILITIES

- A. The trunkline is live, operating at 750 to 1,050 psig with a maximum allowable operating pressure of 1,200 psig (HOLD H-04). The requirements below are the minimum; the receiving pipeline operator's requirements shall govern where they are stricter (HOLD H-01 and H-04).
- B. Before any work within 50 ft of the trunkline the Contractor shall have an OKIE811 ticket, give the receiving pipeline operator at least 72 hours' notice, have the trunkline located and marked, pothole at 50 ft intervals and at every crossing to verify depth, and obtain the operator's written release (hold point HP-06-02).
- C. Within the trunkline exclusion zone no mechanized excavation shall take place within 10 ft of the located pipe edge. Within the tolerance zone, excavation shall be by hand or vacuum only, and the pipe shall be exposed by hand before any mechanized work proceeds along its line. A representative of the receiving pipeline operator shall be present for all excavation in the exclusion zone.
- D. Equipment shall cross the trunkline only at designated crossings on crane mats or an engineered ramp, with the crossing load, cover and pipe stress checked by the EOR and accepted by the receiving pipeline operator. No material storage, spoil, parking or crane outrigger shall be placed in the right-of-way without that operator's written approval.
- E. The Contractor shall not weld, grind or cut on the trunkline, the hot tap fitting or the tap valve. Hot work near live gas shall comply with SPC-SPC-007 and CON-RPT-003.
- F. Combustible gas shall be monitored continuously with a four-gas meter in any excavation within 50 ft of live gas piping, and work shall stop at 10 % of the lower explosive limit.
- G. If the trunkline or its coating is contacted or damaged, the Contractor shall stop work, notify the receiving pipeline operator and the Owner at once, and shall not backfill until that operator has inspected and released the location. Damage shall be reported as the damage prevention act requires.

3.16 PRESERVATION

- A. Piping that will not be commissioned within 30 days of drying shall be sealed under a dry nitrogen blanket at 5 to 15 psig under SPC-SPC-011, with the pressure recorded weekly.

3.17 STAINLESS STEEL VENT PIPING AND VS-101

- A. Segregation. S1 material shall be stored and handled apart from carbon steel, with no contact with carbon steel slings, racks, chains or forks; nylon slings and padded forks shall be used. Only low-chloride, low-sulfur markers shall be used, with no hard stamping on walls thinner than 0.25 in. These measures prevent embedded iron, which rusts and pits the stainless surface.
- B. Tools. Tools for stainless steel shall be dedicated and identified by a color band: stainless wire brushes, aluminum oxide or zirconia discs that have never touched carbon steel, and clean saw blades. Carbon steel brushes, files and discs shall not be used on S1, and screens shall keep sparks and spatter from carbon steel work off S1 surfaces.
- C. Cutting. S1 pipe shall be cut by saw, orbital cutter, abrasive disc or plasma, followed by machining or grinding to remove at least 1/16 in of the heat-affected edge. Oxy-fuel cutting shall not be used. Bevels shall meet ASME B16.25 and the approved welding procedure.
- D. Fit-up. Internal offset shall not exceed 1/32 in on walls thinner than 0.25 in and 1/16 in otherwise. Tack welds shall be made by qualified welders with the root purge in place.
- E. Flanged joints shall be bolted under 3.12 with bolt loads calculated for the flexible graphite tanged-insert gasket. Restriction orifice plates and their downstream flanges shall be S1 materials.
- F. Supports. S1 lines shall not bear directly on carbon steel. Non-metallic isolation pads, or stainless wear pads welded to the pipe under an approved procedure, and stainless or isolated U-bolts shall be used. Guides and slide supports shall allow for the thermal contraction of the cold vent lines, per PIP-DWG-006 and MEC-CAL-004.
- G. Cleaning and passivation. After fabrication, heat tint, embedded iron and marking residues shall be removed. Heat tint beyond the limits of SPC-SPC-007 shall be removed by pickling paste (ASTM A380) or by mechanical cleaning with stainless-only media, followed by passivation to ASTM A967 (citric or nitric method) and a rinse in water with no more than 50 ppm chlorides. The absence of free iron shall be verified by a ferroxyl or copper sulfate test (ASTM A380) on one location per spool and on 100 % of cleaned welds. S1 piping and VS-101 shall not be painted.
- H. VS-101. The stack is NPS 8 x 25 ft in class S1, with helical strakes on the top 8 ft to suppress vortex-induced vibration. It shall be erected plumb within 1 in over its height, with the strakes oriented as the vendor drawing shows, and its anchor bolts tightened under SPC-SPC-017. Because the stack is sized for one blowdown section at a time, the operating procedures shall require sections to be blown down one at a time.
- I. VS-101 base drain. A drain line from the stack base to T-101 shall not be built, because it cannot drain by gravity. A 2 in S1 drain valve with a threaded plug shall be installed at the stack base low point, and a portable collection pan sized for the drained volume shall be provided, positioned so a vacuum truck can empty it from the road. The valve shall be normally closed and plugged and tagged "VS-101 drain, open only when the vent system is depressurized".
- J. Testing. S1 lines shall be tested under SPC-SPC-011 and examined under SPC-SPC-008.

3.18 FIELD QUALITY CONTROL

- A. The Contractor shall record the work on the following forms, which are turnover records under SPC-SPC-020: QF-06-01 receiving and MTR review; QF-06-02 excavation permit near a live facility; QF-06-03 fit-up; QF-06-04 bend record; QF-06-05 ditch, lowering-in and backfill inspection; QF-06-06 insulating joint test; QF-06-07 flange joint assembly; QF-06-08 compaction log; QF-06-09 cleaning record; QF-06-10 S1 material and tool control; QF-06-11 S1 cleaning and passivation; the pipe tally, flange register, blind register and as-built survey.
- B. The as-built survey of buried piping shall locate every weld, bend point of intersection, crossing, valve and fitting to ± 0.1 ft horizontally and vertically before backfill.
- C. The hold and witness points in Table 3-7 apply. Party codes: C Contractor, O Owner, E EOR, W receiving pipeline operator; H hold, W witness, R review, S surveillance, P perform.

Table 3-7: Hold and Witness Points

ID	Activity	C	O	E	W	Record
HP-06-01	Receiving, traceability, bending, backfill and bolting procedures approved (submittals 06-02, 06-04, 06-06, 06-08) before the related work	P	R	H	-	Submittal log
HP-06-02	Release to excavate within 50 ft of the trunkline: locates, potholes, operator's representative on site	P	H	-	H	QF-06-02
WP-06-01	Receiving inspection and MTR review of OFM line pipe and CFM fittings	P	W	-	-	QF-06-01
WP-06-02	First field cold bend qualification	P	W	R	-	QF-06-04
WP-06-03	Fit-up of the first weld of each procedure and of all tie-in and insulating joint welds	P	W	-	-	QF-06-03
HP-06-03	Trench inspection before lowering-in: depth, width, bottom, clearances, bedding	P	H	-	-	QF-06-05
HP-06-04	Coating holiday test immediately before lowering-in	P	H	-	-	Holiday record, SPC-SPC-009
HP-06-05	Lowering-in release	P	H	-	-	QF-06-05
HP-06-06	Release to backfill: NDE accepted, field joints coated and holiday-free, as-built survey complete	P	H	-	-	QF-06-05, survey
WP-06-04	Compaction tests under roads and structures	P	W	-	-	QF-06-08
WP-06-05	Insulating joint tests on receipt, after welding and after hydrostatic test	P	W	R	-	QF-06-06
WP-06-06	Piping-to-equipment nozzle alignment check with bolts free	P	W	-	-	QF-06-07
HP-06-07	Bolt-up of the first joint of each size and class (procedure demonstration)	P	H	-	-	QF-06-07

ID	Activity	C	O	E	W	Record
HP-06-08	Final internal cleaning run before hydrostatic test	P	H	-	-	QF-06-09
HP-06-09	Flange register complete and all joints yellow-tagged before hydrostatic test	P	H	-	-	Flange register
HP-06-10	Blind register walkdown: all test blinds removed and permanent gaskets installed before gas-in	P	H	R	W	Blind register
HP-06-11	Crossing of the trunkline or a foreign line: clearance verified before backfill	P	H	-	H	QF-06-05, survey
WP-06-07	As-built survey of buried piping before backfill	P	W	R	-	Survey data
WP-06-08	S1 receiving and segregation inspection: dual certification, storage apart from carbon steel, tool control	P	W	-	-	QF-06-10
HP-06-12	S1 spool cleaning, passivation and free-iron test accepted before erection	P	H	R	-	QF-06-11
WP-06-09	VS-101 erection, strake orientation, base drain valve and collection pan	P	W	-	-	Equipment setting record, SPC-SPC-017

3.19 ACCEPTANCE

A. The piping is accepted when it meets every criterion in Table 3-8.

Table 3-8: Acceptance Criteria

Parameter	Criterion	Method
Material traceability	100 % of pipe and fittings traced by heat number to an accepted MTR	Tally and MTR audit
Pipe damage	No dent deeper than 1/4 in on pipe 12 3/4 in OD and smaller, or 2 % of OD on larger pipe (49 CFR 192.309); no gouge, notch or arc burn left in place	Visual, depth gauge
Bend ovality and wall	Ovality 2.5 % of nominal OD or less; thinning 2 % or less and never below minimum wall	Gauge plate or caliper; ultrasonic
Fit-up internal offset	1/16 in typical, 1/8 in local maximum	Hi-lo gauge
Spool dimensions	Table 3-2	Tape, square, level
Cover	36 in, and 48 in under roads and drainage, to the top of coated pipe	Survey every 50 ft and at each weld
Clearance to foreign structures	12 in or more; 24 in at pipeline crossings unless the operator permits less	Tape, survey
Padding	6 in below and 12 in above the pipe, material per 2.02	Probe, gradation test
Compaction	95 %, 90 % or 85 % of ASTM D698 by location	Nuclear gauge, ASTM D6938

Parameter	Criterion	Method
Warning tape	Continuous, at least 12 in above the pipe	Visual before backfill
Insulating joints	25 megohm or more at 1,000 V DC (typical, HOLD H-15)	Megohmmeter
Erection	Table 3-6	Survey, level
Bolted joints	Record complete; gap variation 0.020 in or less; no leak at hydrostatic test or gas-in	Feeler gauge, test
Cleanliness	No free debris or water at the pig; target plate criterion met	Visual
Nitrogen preservation	5 to 15 psig maintained	Gauge, weekly log
S1 material	100 % dual-certified stainless confirmed by MTR and PMI; no carbon steel item in any S1 line	MTR review, PMI
S1 surface condition	No free iron; heat tint within the SPC-SPC-007 limits; no carbon steel contact at supports	Ferroxyl test, visual
Outlet lateral wall	0.500 in X52 PSL2 pipe and 0.500 in 3R riser bends, confirmed by MTR and tally	MTR, tally
VS-101 drain	2 in drain valve and plug installed; collection pan provided; no drain line to T-101	Walkdown

END OF SECTION

