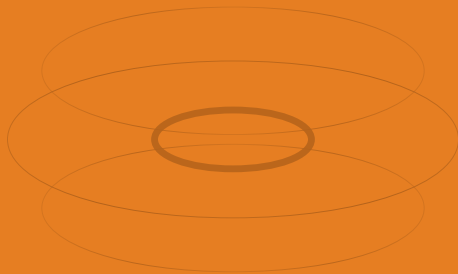


OWNER

Basis of Design

[REDACTED], 120 MMSCFD Receipt Interconnect



Document No.: [REDACTED] GEN-DB-001

Rev. A, Issued for Review

Date: September 29, 2026

Project: [REDACTED]



TORUS

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

N O T I C E

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ISSUE SUMMARY AND APPROVAL

This page records each issue of GEN-DB-001. 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	General			

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1. INTRODUCTION

1.1. PURPOSE

This Basis of Design sets the design criteria for the (). Every engineering document in the Revision A package is prepared against it. Where a discipline document and this basis disagree, this basis governs until it is revised.

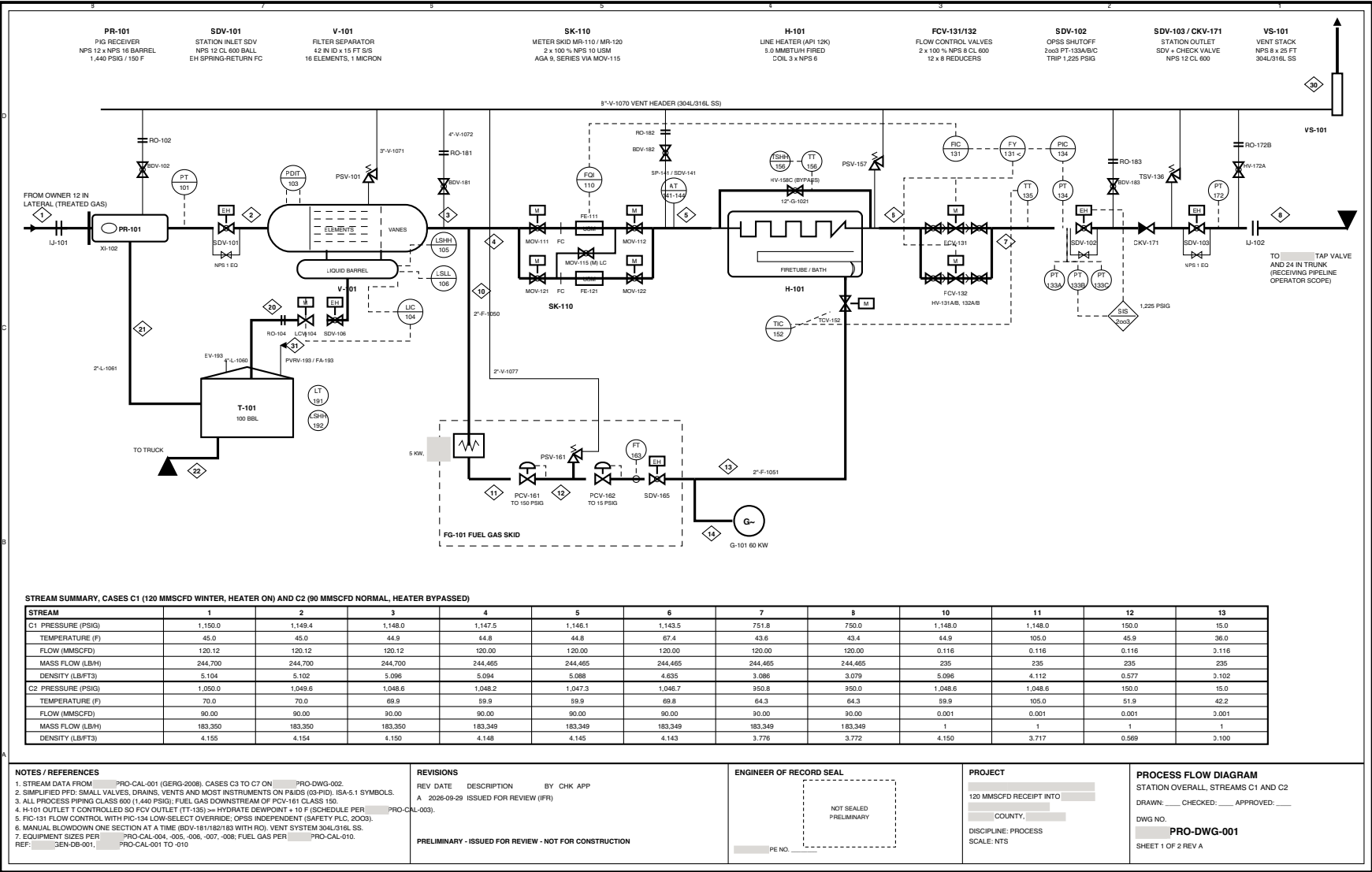
1.2. PROJECT DESCRIPTION

The Owner will build a custody-transfer in County, . The station will receive treated, dehydrated natural gas from the Owner's upstream 12-inch lateral and deliver it into a operated by , the receiving pipeline operator, through a new 12-inch hot tap. The design capacity is 120 MMSCFD.

Gas enters through a pig receiver and a filter separator that removes solids and free liquids. It is then measured on two 100 % ultrasonic meter runs, which can be placed in series to verify one meter against the other. Gas quality is analyzed continuously. The gas is then heated in an indirect water-bath line heater, so that the pressure cut across the control valves cannot form hydrates or drop out liquid. Two 100 % control valves set the delivery rate, with an outlet pressure override. An overpressure shutdown system, independent of the control system, protects the receiving trunkline. The gas finally passes a check valve and an insulating joint on its way to the tap.

Figure 1-1 shows the process flow.

Figure 1-1. Process Flow Diagram



1.3. SCOPE AND INTERFACES

The package covers everything between the inlet insulating joint IJ-101 and the outlet insulating joint IJ-102. This includes the site, buildings, power, communications and cathodic protection, and the buried outlet lateral from IJ-102 to the flange of the receiving pipeline operator's tap valve. Table 1-1 sets out the responsibility for each interface.

Table 1-1: Scope Boundaries

Item	Responsible party
Upstream 12-inch lateral from the Owner's treating facility to IJ-101	Owner, under a separate project
Station from IJ-101 to IJ-102, including site, buildings, power, communications and cathodic protection	This package
12-inch outlet lateral from IJ-102 to the tap valve flange, about 96 ft buried	This package
12-inch hot tap fitting on the 24-inch trunkline, tap valve, the operator's RTU and remote shutoff at the tap	Receiving pipeline operator; this package shows the interface only
Operation of custody measurement, witness testing, data link to the operator's gas control	Per the Interconnect and Operating Agreement (HOLD H-01). This package assumes the Owner builds and owns the station, the operator witnesses all meter verifications, and the operator receives real-time flow, pressure and quality data
Utility power to the station transformer	Local electric cooperative (HOLD H-10)

1.4. STATUS OF THIS REVISION

Revision A is issued for review. Values marked HOLD are assumptions that must be confirmed before the package is issued for construction. They are listed in Section 11 with the party responsible for each.

2. SITE AND ENVIRONMENTAL CONDITIONS

The site lies in the Basin in County. Its final coordinates and elevation depend on the survey and on the receiving pipeline operator's confirmation of the trunkline route. The conditions in Table 2-1 are used for design until then.

Table 2-1: Site and Environmental Design Conditions

Parameter	Value	Source or status
County / state	County,	Basin (SCOOP area)
Indicative coordinates	34.95 N, 97.93 W	Final location by survey and route confirmation (HOLD H-02)
Datum	NAD83 State Plane South (US ft), NAVD88	
Site elevation	1,150 ft MSL (nominal)	HOLD H-02
Local atmospheric pressure	14.10 psia (at 1,150 ft)	Calculated, standard atmosphere
Lease tract	350 ft (E-W) x 300 ft (N-S), 2.41 acres	HOLD H-03
Fenced station	250 ft x 200 ft	
trunkline	Runs east-west, centerline about 60 ft north of the north fence, inside a 50 ft right-of-way	HOLD H-04
Access	New 20 ft gravel access road, about 600 ft, from the section-line county road on the east	HOLD H-05
Upstream lateral	Enters the tract from the south	
Ambient design temperature	-5 °F minimum, 110 °F maximum	ASHRAE / NOAA records, City
ASHRAE design points ()	99.6 % heating 12 °F; 0.4 % cooling 99 °F DB / 74 °F MCWB	
Minimum design metal temperature (above-grade)	-20 °F	
Ground temperature at 4 ft	45 °F winter minimum, 75 °F summer maximum	
Solar radiation (blocked-in thermal relief)	1,000 W/m ²	
Basic wind speed	108 mph, Risk Category II, Exposure C (ASCE 7-22)	Confirm by ASCE Hazard Tool at final coordinates (HOLD H-06)
Ground snow load	10 psf	HOLD H-06

Parameter	Value	Source or status
Ice	0.5 in radial with 30 mph concurrent wind	HOLD H-06
Seismic	Site Class D (default); SS = 0.12 g, S1 = 0.06 g, SDC B. Note induced seismicity in central ; do not rely on SDC A exemptions	HOLD H-06
Frost depth	12 in; minimum foundation depth 18 in below grade	
Rainfall	NOAA Atlas 14 Vol. 8, station; tabulated in CIV-CAL-002	
Soils	Assumed Permian red-bed lean clay (CL) over weathered sandstone. Allowable bearing 2,000 psf, moderate expansion potential	Geotechnical investigation required (HOLD H-07)
Soil resistivity	1,500 ohm-cm assumed (corrosive)	Wenner survey required (HOLD H-08)
Flood zone	Assumed FEMA Zone X (outside 100-yr floodplain)	HOLD H-09

Central has experienced induced seismicity. The structural design therefore does not rely on the exemptions available in Seismic Design Category A, even where the site data would allow them.

3. CODES, STANDARDS AND REGULATIONS

The station is designed to the transmission requirements of 49 CFR Part 192, whatever its final regulatory classification. This keeps the design valid whether the station is ultimately classified as transmission or as regulated gathering (HOLD H-18). The latest edition in force on the design date governs unless Table 3-1 states an edition.

Table 3-1: Codes, Standards and Regulations

Group	Code, standard or regulation
Federal / state regulation	49 CFR Part 192, Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards (design to transmission-line requirements irrespective of gathering classification)
Federal / state regulation	49 CFR Part 191 (reporting), Part 199 (drug and alcohol), 192 Subpart N (operator qualification)
Federal / state regulation	 Administrative Code Title 165, Chapter 20 (, Gas and Hazardous Liquid Pipeline Safety)
Federal / state regulation	40 CFR Part 60 Subpart OOOOb (methane and VOC, new sources) and Subpart JJJJ (spark-ignition engines, for the standby generator)
Federal / state regulation	 DEQ air quality rules, 252:100 (permit-by-rule / de minimis determination)
Federal / state regulation	 DEQ OPDES general permit OKR10 (construction stormwater)
Federal / state regulation	OSHA 29 CFR 1910 and 1926
Federal / state regulation	 Underground Facilities Damage Prevention Act (OKIE811)
Pipe, piping, pressure equipment	ASME B31.8-2022 Gas Transmission and Distribution Piping Systems
Pipe, piping, pressure equipment	API 5L 46th ed. (line pipe), API 6D (pipeline valves), API 6DSS not used
Pipe, piping, pressure equipment	ASME B16.5, B16.9, B16.34, B16.47 not used, B16.20 (gaskets), B16.25 (weld ends)
Pipe, piping, pressure equipment	MSS SP-44, SP-75 (high-test fittings), SP-97 (branch outlets)
Pipe, piping, pressure equipment	ASME BPVC Section VIII Div. 1 (filter separator, pig receiver barrel, heater coil manifolds); Section IX (welding qualification)
Pipe, piping, pressure equipment	API 1104 22nd ed. (welding of pipelines)
Pipe, piping, pressure equipment	API 12K (indirect-type oil-field heaters), API 12F (shop-welded tanks) if steel tank

Group	Code, standard or regulation
Pipe, piping, pressure equipment	API RP 1102 (crossings), API RP 2201 (hot tapping)
Measurement	AGA Report No. 9 (2022) Measurement of Gas by Multipath Ultrasonic Meters
Measurement	AGA Report No. 8 Part 1 (2017, Detail) and Part 2 (GERG-2008)
Measurement	AGA Report No. 10 Speed of Sound
Measurement	API MPMS Ch. 14.1 (sampling), 14.5 / GPA 2172 (heating value), 21.1 (electronic gas measurement), 22.2 (differential/testing protocols where applicable), Ch. 13 (statistics), Ch. 5.8 not used
Measurement	GPA 2261, GPA 2286, GPA 2145, GPA 2166, GPA 2198
Measurement	ASTM D5454 (water vapor), ASTM D4084 / D7165 (H ₂ S)
Measurement	Standard conditions for all volumes: 14.73 psia and 60 F
Pressure relief and safety	API 520 Part I and II, API 521, API 526, API 527
Pressure relief and safety	IEC 61511 / ISA 84.00.01 (OPSS safety instrumented function)
Pressure relief and safety	API RP 500 (area classification), NFPA 70 (2023 NEC), NFPA 780 (lightning), NFPA 30, NFPA 54 (fuel gas in buildings), NFPA 85 not applicable; burner management per API RP 556 guidance and API 12K
Pressure relief and safety	API 1164 (pipeline SCADA cybersecurity); TSA Pipeline Security Guidelines
Civil / structural	ASCE 7-22, ACI 318-19, AISC 360-22, IBC 2021 (as adopted by the Uniform Building Code Commission; HOLD H-11 for adopted edition), Standard Specifications (aggregate)
Electrical / CP	NFPA 70 (2023), NFPA 70E, IEEE 80, IEEE 142, IEEE 1100, IEEE 485
Electrical / CP	AMPP SP0169 (formerly NACE, control of external corrosion), AMPP SP0177 (AC mitigation), AMPP SP21424 (AC corrosion criteria) where applicable; 49 CFR 192 Subpart I

Volumes are reported at base conditions of 14.73 psia and 60 °F.

4. GAS COMPOSITION AND QUALITY

4.1. DESIGN COMPOSITIONS

The design composition represents treated, dehydrated Mid-Continent residue gas. Lean and rich cases bound it for equipment sizing and for testing the gas quality shut-in logic. Table 4-1 gives the three compositions. They will be replaced by the extended analysis from the Owner's treating facility when it is available (HOLD H-12).

Table 4-1: Design Gas Compositions, mole %

Component	Design (mol %)	Lean case (mol %)	Rich case (mol %)
Methane	88.50	94.00	83.60
Ethane	6.00	3.00	8.50
Propane	2.20	0.60	3.60
i-Butane	0.40	0.10	0.70
n-Butane	0.50	0.10	0.90
i-Pentane	0.12	0.03	0.25
n-Pentane	0.10	0.02	0.20
n-Hexane (C6+ lumped)	0.10	0.02	0.15
Nitrogen	1.20	1.20	1.10
Carbon dioxide	0.88	0.93	1.00
Total	100.00	100.00	100.00

The properties in Table 4-2 were calculated with the GERG-2008 equation of state and the GPA 2172 method.

Table 4-2: Calculated Gas Properties

Case	MW	SG	Zb	HHV (Btu/scf, dry, 14.73 psia, 60 F)	Wobbe
Design	18.464	0.6375	0.99743	1,103.7	1,382
Lean	17.162	0.5926	0.99782	1,031.7	1,340
Rich	19.687	0.6798	0.99703	1,168.8	1,418

The rich case exceeds the 1,150 Btu/scf heating value limit in Table 4-3. It is an off-specification envelope, used to size equipment and to test the gas quality shut-in. It is not a conforming delivery.

4.2. DELIVERY QUALITY

Table 4-3 lists the gas quality the station must deliver. These limits are typical of receipt specifications on Mid-Continent gathering systems. They will be replaced by the governing tariff or interconnect specification of the receiving pipeline operator (HOLD H-13).

Table 4-3: Gas Quality at Delivery

Parameter	Limit
Gross heating value	970 to 1,150 Btu/scf (dry, 14.73 psia, 60 F)
Water vapor	7 lb/MMscf maximum
H2S	0.25 grain/100 scf (about 4 ppmv) maximum
Total sulfur	5 grain/100 scf maximum
CO2	2.0 mol % maximum
Total inerts (CO2 + N2)	4.0 mol % maximum
O2	10 ppmv maximum
Hydrocarbon dewpoint	15 F maximum at any pressure up to MAOP (cricondentherm basis)
Delivery temperature	40 F minimum, 120 F maximum
Free liquids, solids	None



5. OPERATING ENVELOPE AND DESIGN CASES

The Owner's compression and treating facility discharges into the upstream lateral at 900 to 1,150 psig. The trunkline operates at 750 to 1,050 psig at the tap, and its maximum allowable operating pressure (MAOP) is taken as 1,200 psig (HOLD H-04). The seven cases in Table 5-1 bound the design. Each governs at least one piece of equipment. Case C1 sets the heater duty, C5 the meter velocity, C6 the minimum outlet temperature, and C3 the control valve turndown.

Table 5-1: Design Cases

Case	Description	Flow (MMSCFD)	Station inlet P (psig)	Inlet T (F)	Outlet (trunk) P (psig)	Heater
C1	Design maximum, winter, maximum pressure cut	120	1,150	45	750	On
C2	Normal operation	90	1,050	70	950	Off
C3	Minimum flow (turndown)	10	1,000	60	950	Off
C4	Summer maximum temperature	120	1,100	120	1,000	Off
C5	Minimum metering pressure, maximum flow (governs meter velocity)	120	900	60	750	On
C6	Heater-out winter upset (governs minimum outlet temperature and hydrate risk)	120	1,150	45	750	Off
C7	Rich gas, design max	120	1,100	60	850	On

The station pressure-drop budget at 120 MMSCFD, excluding the control valves, is 20 psi with a clean filter. It is allocated as 2 psi for the filter separator when clean (elements are changed at 10 psi), 3 psi for a meter run and 10 psi for the heater coil.

The line heater holds the control valve outlet at or above a setpoint that rises with outlet pressure, from 43.5 °F at 750 psig to 51.1 °F at 1,150 psig. The setpoint is the larger of 40 °F, the hydrate formation temperature plus 10 °F, and the hydrocarbon dewpoint plus 10 °F. A fixed 40 °F setpoint would not give the 10 °F hydrate margin at the higher outlet pressures, because the hydrate temperature of tariff-specification gas rises to about 41 °F.

6. DESIGN CONDITIONS AND MATERIALS

All process piping between IJ-101 and IJ-102 is designed for 1,440 psig, the ASME B16.5 Class 600 rating for carbon steel. The overpressure shutdown system limits what reaches the 1,200 psig trunkline. The design factor is 0.50 throughout. This envelopes 49 CFR 192.111 and ASME B31.8 for meter and regulator station piping, and it is also applied to the buried outlet lateral. Table 6-1 summarizes the design conditions and materials.

Table 6-1: Design Conditions and Materials

Parameter	Value
Design pressure, station process piping	1,440 psig from -20 to 133 °F; 1,420 psig at 150 °F (Class 600 flange rating)
Heater outlet line 1022	Additional design point 1,360 psig at 200 °F (heater bath upset)
Heater coil	1,440 psig at 250 °F; coil nozzles and companion flanges Class 900
Design temperature, above grade / buried	-20 to 150 °F / 32 to 120 °F
Line pipe	API 5L X52 PSL2, Charpy impact tested at -20 °F
Buried outlet lateral 1042	NPS 12, 0.500 in wall, for the road crossing load
Small bore, NPS 2 and under	ASTM A106 Grade B seamless; Sch 160 to NPS 3/4, Sch 80 to NPS 2
Forgings and valve bodies	ASTM A105N with Charpy testing at -20 °F (A350 LF2 alternate); valve bodies A352 LCC or A350 LF2
Vent and blowdown system (spec S1)	Class 150 stainless steel, 304/304L or 316/316L, minimum design -150 °F, downstream of every restriction orifice and relief valve outlet, and VS-101
Hydrostatic test	2,160 psig minimum (1.5 x MAOP) at the high point for 8 hours; not to exceed the 2,220 psig Class 600 flange test limit at the low point
Nondestructive examination	100 % radiography or ultrasonic testing of all butt welds, carbon and stainless; 100 % magnetic particle or dye penetrant testing of fillet and socket welds
Coating, buried	Fusion-bonded epoxy 14 to 16 mils, abrasion-resistant overlay at bores
Coating, above grade	Zinc-rich epoxy primer, epoxy intermediate, polyurethane topcoat
Valve operators	Electric and self-contained electro-hydraulic only; no gas-driven pneumatic devices

Gas-driven pneumatic devices are excluded so that the station meets the zero-emission requirement of 40 CFR 60 Subpart OOOOb without relying on compliance-date extensions.

The vent system is stainless because gas expanding through the blowdown orifices reaches -65 °F in normal blowdown and about -120 °F after a heater outage. Both are below the -20 °F limit of carbon steel.

7. STATION CONFIGURATION

7.1. PROCESS TRAIN

The station is a single train with two metering runs and two control valves. Table 7-1 lists the major equipment. The full tag register is in Appendix A, and the P&ID line and tag register, PRO-LST-101, is the complete list.

Table 7-1: Major Equipment

Tag	Description	Size and rating
PR-101	Inlet pig receiver, quick-opening closure with pressure warning interlock	NPS 12 x NPS 16 barrel, Class 600
V-101	Horizontal two-stage filter separator, 1 micron coalescing elements	42 in ID x 15 ft S/S, NPS 24 liquid barrel, 1,440 psig
SK-110	Meter skid: two NPS 10 ultrasonic meter runs (MR-110, MR-120), headers and series crossover, under a sunshade canopy	About 48 ft x 14 ft
H-101	Indirect-fired water-bath line heater, API 12K	6.0 MMBtu/h firebox, 600 ft ² firetube; NPS 6 coil, three parallel paths; about 34 ft overall
FCV-131 / 132	Flow control valves, duty and standby, electric actuators, three-stage low-noise trim	NPS 8 Class 600 in NPS 12 branches
SDV-101 / 102 / 103	Inlet, overpressure and outlet shutdown valves, electro-hydraulic, spring-return fail-closed	NPS 12 Class 600; SDV-102 strokes in 4 s or less
CKV-171	Outlet check valve, axial nozzle	NPS 12 Class 600
FG-101	Fuel gas skid with electric preheater E-161 (5 kW), two-cut regulation and fuel meter	Supplies H-101 and G-101
VS-101	Vent stack with helical strakes on the top 8 ft	NPS 8, 25 ft
T-101	Liquids tank with emergency vent, truck loadout and containment	100 bbl, API 12F
B-101 / B-102	Analyzer shelter; control and electrical building	12 x 10 ft; 24 x 12 ft
G-101	Standby natural gas generator	60 kW

7.2. FUEL GAS

Fuel gas is taken downstream of V-101 and upstream of the custody meters, so fuel never passes through the custody meters and is never delivered as measured gas. The first-cut regulator would chill the gas to about -32 °F in winter, below the metal temperature limit. Electric preheater E-161 therefore heats the fuel gas to 105 °F before the first cut.

8. CONTROL, SHUTDOWN AND MEASUREMENT

8.1. RATE AND PRESSURE CONTROL

The flow controller holds the nominated rate. An outlet pressure controller overrides it through a low-select, so the outlet never exceeds 1,150 psig. One control valve is duty and the other standby. The standby valve takes over automatically if the duty valve's position deviates from its demand.

8.2. OVERPRESSURE PROTECTION

Three pressure transmitters downstream of the control valves vote two-out-of-three in a safety PLC that is independent of the control system. At 1,225 psig they close SDV-102 and SDV-103. 49 CFR 192.201 limits the pressure a protective device may allow to the lower of MAOP plus 10 % (1,320 psig) and the pressure producing 75 % of SMYS. For the assumed trunkline the 75 % SMYS pressure governs at 1,290 psig.

The worst case is both control valves failed wide open with a 1,440 psig supply. The station then passes about 1,150,000 lb/h and the outlet pressure rises at about 7 psi/s at the trip point. From a 1,225 psig trip the process safety time is 8.9 s. SDV-102 strokes fully in 4 s or less, which holds the peak to about 1,260 psig, 30 psi under the limit. A trip at 1,250 psig was rejected, because it left 5.8 s, less than the 6.0 s response of the safety function. The trip is 45 psi above the highest outlet pressure override setting (1,180 psig), enough to cover transmitter error and control overshoot without spurious trips. This result depends on at least 0.62 mile of trunkline between block valves being available to absorb the flow (HOLD H-04).

The overpressure trip is a SIL 2 safety instrumented function, and SDV-102 is partial-stroke tested every quarter.

8.3. EMERGENCY SHUTDOWN

A station emergency shutdown closes SDV-101 and SDV-103, the fuel gas and sample shutoffs, and the liquid dump shutoff SDV-106, and trips the heater. It is initiated by:

- any of four pushbuttons;
- confirmed gas in a building;
- fire at the heater;
- loss of control power;
- a remote command from the receiving pipeline operator.

Blowdown is manual after an emergency shutdown, one section at a time.

8.4. MEASUREMENT

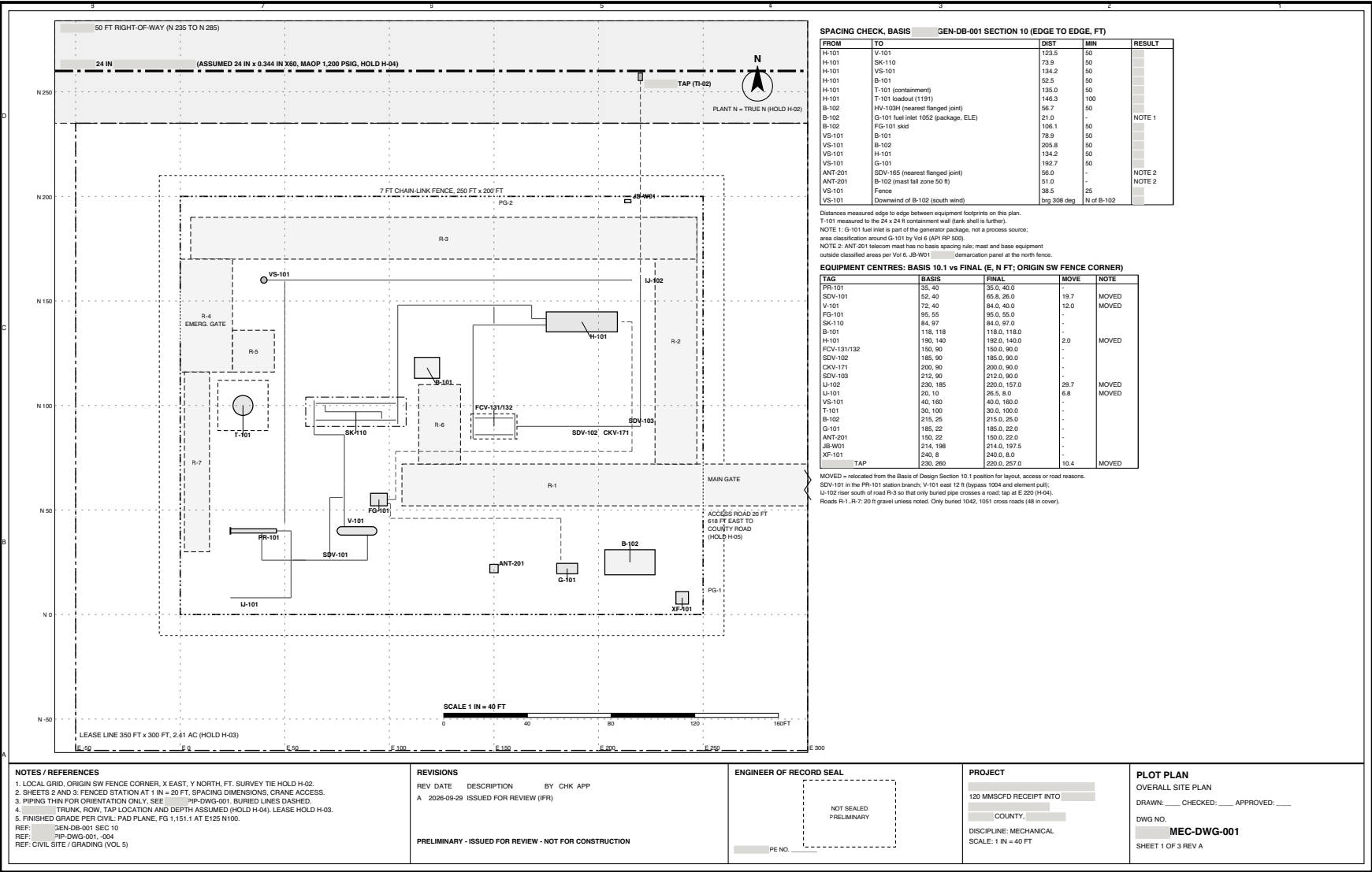
Custody measurement uses two NPS 10 multipath ultrasonic meters, each with a flow conditioner and a flow-calibrated meter tube. The standby run is kept pressurized with its outlet valve open, because a run isolated at both ends would overpressure in the sun. At least quarterly, the standby run is placed in series with the duty run to verify one meter against the other. The two must agree within 0.3 %. Volume and energy are computed with AGA 8 using the live composition from the gas chromatograph. The expected uncertainty ($k = 2$) is 0.40 % on volume and 0.51 % on energy between 20 and 120 MMSCFD.



9. PLOT PLAN AND SPACING

Figure 9-1 shows the station layout. The fired heater stands at least 50 ft from the filter separator, meter skid, analyzer shelter, liquids tank and vent stack, and at least 100 ft from the tank loadout. The control building stands outside every classified area. The vent stack stands at least 50 ft from buildings and fired equipment, north of the control building. The prevailing summer wind is from the south, so it carries a vented plume away from the control building. All above-grade process piping stays south of the north internal road, so the road crosses only buried pipe.

Figure 9-1. Plot Plan



10. SPARING AND AVAILABILITY

The station is designed to keep delivering through the failure of any single active component that the Owner can reasonably spare. Table 10-1 shows how each system meets this.

Table 10-1: Sparing Philosophy

System	Configuration
Meter runs	2 x 100 %
Control valves	2 x 100 %
Filter separator	1 x 100 %, with a locked-closed full-flow bypass. Use of the bypass requires the operator's approval, because unfiltered gas then reaches the meters
Line heater	1 x 100 %, with bypass. Bypass is the normal summer mode
Gas chromatograph	1 x 100 %. On failure the flow computer uses the last good or agreed fixed composition
Power	Utility, plus 60 kW standby generator, plus 8-hour UPS for control and safety systems
Communications	Primary cellular and secondary licensed radio or satellite path



11. ENVIRONMENTAL AND PERMITTING BASIS

The line heater and standby generator are the only combustion sources. Station emissions are expected to fall below DEQ major-source and permitting thresholds. The route is a permit exemption or permit-by-rule, to be confirmed with the DEQ. Liquids flashing into T-101 release about 1,000 scf of gas per barrel. The tank stays below the 6 tpy VOC threshold of Subpart 0000b up to about 435 bbl/yr of liquids, against an expected 52 to 260 bbl/yr from pigging and filter separator dumps. The base design therefore adopts an enforceable limit of 350 bbl/yr (4.9 tpy VOC), with tank vapor control carried as a bid alternate.

The disturbed area is between 1 and 5 acres, so construction stormwater coverage and a pollution prevention plan are required. Whether coverage comes from EPA Region 6 or from the DEQ depends on the facility's jurisdiction (HOLD H-17). T-101 holds more than 1,320 gallons of oil, so the site needs a spill prevention, control and countermeasure plan. The American burying beetle range review and a desktop cultural and wetlands review are required before construction.



12. OPEN ITEMS

Table 12-1 lists the assumptions that must be confirmed before the package is issued for construction, and the party responsible for each.

Table 12-1: Holds

Hold	Item	Needed from
H-01	Interconnect and Operating Agreement: meter ownership, witness rights, verification frequency, allowable uncertainty, data link	Owner and receiving pipeline operator
H-02	Final site coordinates and elevation	Survey
H-03	Lease tract boundaries and easements	Owner
H-04	Trunkline designation, diameter, wall, grade, MAOP (assumed NPS 24, 0.344 in, X60, 1,200 psig), class location, depth, tap location and block valve spacing	Receiving pipeline operator
H-05	County road access permit and driveway location	County
H-06	Site-specific ASCE 7 hazard data	Engineer of Record
H-07	Geotechnical report	Geotechnical engineer
H-08	Soil resistivity and AC interference surveys	Corrosion engineer
H-09	FEMA flood zone confirmation	Civil engineer
H-10	Electric utility provider, service voltage, available fault current and line extension	Utility
H-11	IBC edition adopted in at the time of permit	Engineer of Record
H-12	Extended gas and liquid analysis	Owner
H-13	Gas quality and measurement specifications of the receiving pipeline operator	Receiving pipeline operator
H-14	Operator's RTU point list and communications interface	Receiving pipeline operator
H-15	Certified vendor data	Vendors, after award
H-16	Upstream lateral MAOP and pigging program	Owner
H-17	Stormwater and hydrotest discharge permitting authority	Owner
H-18	Regulatory classification of the station and the receiving line	Owner and receiving pipeline operator
H-19	Water Resources Board registration of the deep anode well	Corrosion contractor
H-20	Liquids production rate at V-101	Owner

APPENDIX A. INSTRUMENT AND VALVE TAG REGISTER



The tags below are the principal instruments and valves. The P&ID line and tag register, PRO-LST-101, lists every tag.

INLET AND PIG RECEIVER (101 TO 102)

Tag	Service
PT-101	Station inlet pressure (upstream of SDV-101), SCADA
TT-101 / TW-101	Station inlet temperature
PI-101	Inlet local pressure gauge
SDV-101, ZSO-101, ZSC-101, HS-101	Inlet shutdown valve with open/closed limit switches and local/remote/reset station
XI-102	Pig passage signaler at PR-101 barrel
PI-102	PR-101 barrel pressure gauge
BDV-102	PR-101 barrel vent (manual, to VS-101)

FILTER SEPARATOR (103 TO 106)

Tag	Service
PDIT-103	V-101 filter section differential pressure
PI-103	V-101 local pressure gauge
LT-104 / LIC-104 / LCV-104	V-101 sump level transmitter, controller, electric-actuated dump valve to T-101
LG-104	V-101 sump level gauge (magnetic)
LSHH-105	V-101 high-high level (trips SDV-101)
LSLL-106	V-101 low-low level (closes LCV-104, gas blow-by protection)
PSV-101	V-101 relief, fire case (set 1,440 psig), discharge to VS-101

METERING (110 TO 129)

Tag	Service
FE-111 / FT-111	Run 1 ultrasonic meter (multipath, AGA 9)
FC-111	Run 1 flow conditioner (perforated plate, AGA 9 installation-effects tested)
PT-111	Run 1 static pressure (at meter pressure tap)
TT-111 / TW-111	Run 1 temperature (2 to 5 D downstream of meter)
TW-112	Run 1 test thermowell
MOV-111 / MOV-112	Run 1 inlet / outlet isolation, electric motor-operated, double block and bleed

Tag	Service
FE-121 / FT-121, FC-121, PT-121, TT-121 / TW-121, TW-122, MOV-121 / MOV-122	Run 2, identical to run 1
MOV-115	Series-verification crossover valve (places runs in series, normally closed, locked)
FQI-110	Dual-run flow computer (API 21.1, AGA 8, AGA 9 diagnostics), in B-102

CONTROL AND OVERPRESSURE PROTECTION (131 TO 139)

Tag	Service
FCV-131 / FCV-132	Flow control valves (duty / standby), electric modulating
ZT-131 / ZT-132	Control valve position feedback
FIC-131	Flow controller (rate set by nomination), with pressure override from PIC-134 (low-select)
HV-131A/B, HV-132A/B	Manual isolation valves around each control valve
PT-133A / PT-133B / PT-133C	OPSS pressure transmitters (2oo3 voting), downstream of control valves, on safety PLC
SDV-102, ZSO-102, ZSC-102	OPSS shutdown valve
PT-134 / PIC-134	Outlet pressure control override transmitter and controller (BPCS)
TT-135 / TW-135	Control valve outlet temperature (hydrate monitoring, heater trim)
TSV-136	Thermal relief, blocked-in section between SDV-102 and SDV-103

ANALYZERS AND SAMPLING (141 TO 146)

Tag	Service
AE-141 / AT-141	Gas chromatograph, C6+ BTU (C1 to C5, N2, CO2, C6+), sample probe downstream of meter runs
AT-142	Water vapor analyzer (tunable diode laser)
AT-143	H2S analyzer (lead-acetate tape or TDL)
AT-144	O2 analyzer (electrochemical, ppm range)
SMP-146	Flow-proportional composite sampler (API 14.1) with sample cylinder
SP-141	Pressure-reducing sample probe (insertion, per API 14.1 and GPA 2166 guidance)

LINE HEATER (151 TO 158)

Tag	Service
TT-151	H-101 bath temperature

Tag	Service
TIC-152 / TCV-152	Gas outlet temperature control, trims burner fuel valve (setpoint from TT-135 cascade)
BMS-150	Burner management system (flame safeguard, ignition, low-fire / high-fire)
BE-153	Flame detector (UV / flame rod)
LSL-154	Low bath level (burner trip)
TSHH-155	High-high bath temperature (burner trip)
TT-156 / TW-156	Heater gas outlet temperature
PSV-157	Heater coil relief (thermal / fire), set 1,440 psig
HV-158A/B/C	Heater inlet, outlet and bypass valves

FUEL GAS (161 TO 165)

Tag	Service
PCV-161	First-cut regulator (to 150 psig)
PCV-162	Second-cut regulator (to burner and generator supply pressure)
PSV-161	Fuel gas low-pressure relief (protects downstream of PCV-161)
FT-163	Fuel gas meter (Coriolis), Owner allocation
PT-164	Fuel gas pressure
SDV-165	Fuel gas shutoff (closes on station ESD and BMS trip)

Fuel gas is taken **downstream of V-101 and upstream of the custody meter runs**, so that fuel never passes through the custody meters and is not delivered to .

OUTLET (171 TO 175)

Tag	Service
CKV-171	Outlet check valve
SDV-103, ZSO-103, ZSC-103	Outlet shutdown valve
PT-172	Station outlet pressure (downstream of SDV-103), SCADA
TT-173 / TW-173	Station outlet temperature
PI-174	Outlet local gauge
IJ-102	Outlet insulating joint

VENT, BLOWDOWN, DRAINS (181 TO 194)

Tag	Service
VS-101	Vent stack
BDV-181 / RO-181	Inlet section blowdown (IJ-101 to meter run inlet), manual ball + restriction orifice

Tag	Service
BDV-182 / RO-182	Meter and heater section blowdown
BDV-183 / RO-183	Outlet section blowdown (SDV-102 to SDV-103)
T-101	Liquids tank
LT-191	T-101 level (radar)
LSHH-192	T-101 high-high level (closes LCV-104 and alarms)
PVRV-193 / FA-193	T-101 pressure-vacuum relief valve and flame arrestor

STATION SAFETY AND UTILITIES (201 TO 215)

Tag	Service
HS-201 to HS-204	Station ESD pushbuttons: main gate, B-102, meter skid, heater
GD-205 / GD-206	Combustible gas detectors in B-101
GD-207	Combustible gas detector in B-102 (HVAC intake)
FSL-208	B-101 ventilation fan failure
XS-209	Utility power failure / ATS position
XA-210	UPS common alarm
ZS-211	Gate / building intrusion