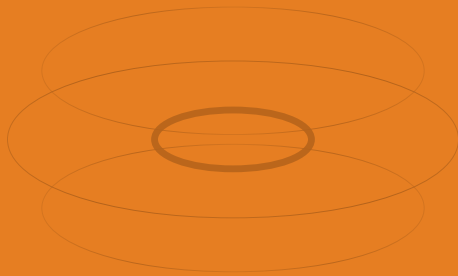


OWNER

Alternates and Options Pricing



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ISSUE SUMMARY AND APPROVAL

This page records each issue of EST-EST-004. The preparer, reviewer and approver sign for each revision.

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1. INTRODUCTION

This report prices the six bid alternates of CON-RPT-002, Contractor Scope of Work and Bid Form, and one design option, deleting line heater H-101. Each price is the change to the total installed cost: contractor work carries overhead, profit, tax, markup and bonds, Owner-furnished material carries freight and tax, and every figure is escalated like the base estimate (3.4 %). Where an alternate changes the schedule, TORUS reran the critical path and included the change in time-dependent cost. Table 1-1 summarizes the results; a negative value is a saving.

Table 1-1: Alternates and Options

ID	Alternate	Change to total installed cost (USD)	Recommendation
ALT-1	Meter skid canopy: Contractor supply and install (base) versus skid-vendor supply	540	Neutral; decide on vendor supply
ALT-2	AUT instead of RT for NPS 10 and 12 girth welds	9,711	Take only for schedule value
ALT-3	Owner procures MSS SP-75 fittings and flanges early (RFQ-15, OFM transfer)	-193,380	Accept
ALT-4	Permanent perimeter fence installed at the start of work in place of temporary fencing	228	Accept
ALT-5	Crushed limestone to gradation in lieu of the specified aggregate	-15,040	Accept if equivalent
ALT-6	T-101 vapor control: enclosed combustor ($\geq$ 95 % control) with closed vent system	183,715	Exercise only if HOLD H-20 requires it
OPT-NH	Option: delete line heater H-101 (no heating)	-1,084,663	Only under the stated conditions

2. BID ALTERNATES

2.1. ALT-1, METER SKID CANOPY

The base bid has the contractor supply and erect the canopy over the meter skid. If the skid vendor supplies the steel and roof deck instead, the contractor still erects it after the skid is set, and the vendor's shop fabrication margin and freight roughly offset the contractor's markup. The change is 540 USD, so the choice should rest on the vendor's offer and on who carries the fit-up risk to the skid.

2.2. ALT-2, AUTOMATED ULTRASONIC TESTING

Replacing radiography with automated ultrasonic testing on the 134 NPS 12 field and spool welds adds 9,711 USD, because the mobilization of an automated system outweighs the lower price per weld at this count. The skid's NPS 10 welds are the vendor's. Automated testing removes the radiation exclusion zones and gives results within the shift, so it is worth taking only if those schedule benefits are valued above the premium.

2.3. ALT-3, OWNER PURCHASE OF FITTINGS AND FLANGES

The schedule shows that the contractor's 18-week lead on high-yield fittings and flanges, ordered only after the construction award, drives spool fabrication and then the whole critical path. If the Owner orders the \$159,035 of fittings and flanges at design approval, they arrive before the award. The performance test moves 2.8 weeks earlier (January 18, 2028 instead of February 7, 2028), the contractor's field time falls by the same amount, and the saving in time-dependent cost of \$182,906 outweighs the cost of the Owner's buying effort. The net saving is 193,380 USD. TORUS recommends it.

2.4. ALT-4, PERMANENT FENCE AT THE START

Installing the permanent fence after rough grading, as the schedule already plans, avoids about 600 ft of temporary panel fence around the laydown for 7.2 months, and an allowance of \$10,000 covers repair after crane and heavy-haul access. The net change is 228 USD, essentially neutral; it is recommended for security and livestock control.

2.5. ALT-5, CRUSHED LIMESTONE SURFACING

A regional limestone to gradation is assumed to cost \$3.50 per ton less delivered than the specified aggregate, on 3,517 tons, saving 15,040 USD. It is acceptable only if it meets SPC-SPC-005 for gradation, abrasion and plasticity. The crushed rock in the electrical area is excluded, because its resistivity is part of the grounding design.

2.6. ALT-6, TANK VAPOR CONTROL

The base design keeps T-101 below the federal storage-vessel emission threshold with an enforceable limit of 350 bbl per year of liquids. If the liquids rate at the filter separator (HOLD H-20) cannot stay within that limit, the tank needs vapor control. TORUS priced an enclosed combustor with at least 95 % control, a closed vent system of about 120 ft of 2 in line, pilot fuel from the fuel gas skid, a foundation, power and three signals to the remote terminal unit, the initial compliance test, and the engineering and air registration update. The combustor is fired equipment, so it is placed at least 100 ft from the tank loadout and 50 ft from the analyzer shelter, as the spacing rules for the heater require. The capital cost is 183,715 USD; pilot gas and inspections add an operating cost that is not included.



3. OPTION: DELETE LINE HEATER H-101

3.1. COST OF THE OPTION

Deleting the line heater would save 1,084,663 USD. Table 3-1 shows the deducted elements. The fuel gas preheater would stay, because the standby generator's fuel still passes the first-cut regulator, and a low-temperature trip on the control valve outlet and a hazard review would be added.

Table 3-1: Cost of Deleting H-101

Element	Cost (USD)
Heater package, heater instruments, relief valve and Class 900 flanges (Owner-furnished, before freight and tax)	625,480
Heater inlet, outlet and bypass valves (share of the NPS 12 valve line)	88,500
Heater foundation material	22,480
Heater setting, foundation and instrument labor	38,436
Half of the heater-area piping (bypass loop, heater connections, fuel line), labor and material	101,129
Heater bath glycol	36,930
Total deduct, with markups, freight, tax, heavy haul, vendor service, inspection and a smaller crane	1,095,480
Add: low-temperature trip logic and safety review, hazard review and management of change, tees for a future heater	46,344

3.2. CONDITIONS

The heater exists to keep the gas leaving the control valves warm enough that hydrates and liquid cannot form. The control setpoint is the larger of the 40 °F tariff minimum and 10 °F above the hydrate and hydrocarbon dewpoints: 43.5 °F at 750 psig rising to 51.1 °F at 1,150 psig. TORUS calculated the Joule-Thomson cooling across the control valves with the GERG-2008 equation of state for the design gas. Table 3-2 shows, for each operating case, the outlet temperature with 45 °F winter inlet gas and the inlet temperature that would meet the setpoint without heat.

Table 3-2: Control Valve Outlet Temperature Without Heating

Case	Valve inlet (psig)	Valve outlet (psig)	Setpoint (°F)	Outlet at 45 °F inlet (°F)	Inlet needed (°F)
C1	1,145	750	43.5	18	68
C2	1,045	950	47.3	39	53
C4	1,095	1,000	48.2	39	54
C5	895	750	43.5	35	53
C7	1,095	850	45.4	29	60

Table 3-3: Largest Pressure Cut That Meets the Setpoint Without Heating

Outlet pressure (psig)	Setpoint (°F)	With 45 °F inlet (psi)	With 60 °F inlet (psi)
750	43.5	22	262
950	47.3	0	214
1,150	51.1	0	161

Table 3-3 shows why the heater cannot simply be removed: with 45 °F gas the station could cut only about 22 psi at 750 psig and nothing at 950 psig and above, while the design cut in winter is about 400 psi. Deletion is acceptable only if all of the following are demonstrated in a hazard review: the station inlet temperature is guaranteed at or above the ‘inlet needed’ values year-round (about 68 °F in the governing winter case), or the upstream compression controls its discharge pressure to follow the trunkline so that the winter pressure cut stays within the limits of Table 3-3; the gas stays within 7 lb/MMscf water and the dewpoint used in PRO-CAL-003 (HOLD H-12, H-13); the receiving pipeline operator accepts the arrangement (HOLD H-01); and the Owner accepts the winter throughput limit that the added low-temperature trip will impose. A buried upstream lateral in 45 °F winter ground will not deliver 68 °F gas unless it is short and the compressor discharge is kept hot. Unless these conditions can be met, TORUS recommends keeping H-101; with the heater out in winter the valve outlet falls to about 18 °F, below the hydrate point and the tariff minimum.

4. CONCLUSIONS

TORUS recommends accepting ALT-3 (a saving of 193,380 USD and 2.8 weeks), ALT-4 and ALT-5 if the limestone meets the specification, deciding ALT-1 on the skid vendor's offer, and holding ALT-2 and ALT-6 as options. ALT-6 should be carried as a 183,715 USD exposure until the liquids rate is known. The line heater should stay in the design unless the upstream operating conditions above can be guaranteed.

