LIQUID NITROGEN TANK SPECIFICATIONS

A. <u>Liquid Nitrogen Tank</u>

a. Physical Requirements:

i. Minimum Capacity: 1750 gallons
ii. Maximum Allowable Working Pressure (MAWP): 500 psig (or greater)
iii. Weight (full): 40,000 pound maximum
iv. Minimum Design Temperature: -320 degrees Fahrenheit
v. Pallet-mounted and Forklift-transportable
vi. Nominal Evaporation Rate (NER): 0.6% per day maximum (LOX)
vii. Flow Capability: 3,500 scfh minimum
viii. Max total height (including pallet): 144 in

b. General Requirements:

i. Shall include differential pressure liquid level gage designed to indicate the fluid level up to the maximum filling level of the tank. Gage must be capable of withstanding the MAWP of the tank.
ii. Shall include pressure gage.
iii. Shall include pressure safety element/rupture disc(s) to protect the inner vessel against over pressurization.
iv. Shall include relief valve(s) to protect the inner vessel against over pressurization, set to relieve before the pressure safety element/rupture disc.
v. Shall include pressure safety element to protect the outer jacket against over pressurization due to failure or leakage of the inner vessel.
vi. Shall include a pressure building coil to build vapor pressure in the tank.
vii. Shall include a vacuum gage tube to read the vacuum inside the annular space between the inner vessel and the outer jacket. The vacuum gage is to be a Hastings Instrument model DV-6R.
viii. Vaporizer shall be mounted on same pallet as tank and capable of 3,500 scfh minimum. Shall supply an outlet temperature of 10 degrees Fahrenheit approach to ambient at 350 psig working pressure with an available 30 psig pressure drop.
ix. All system components and associated piping (see sections **b** and **c**) must be mounted on the pallet along with tank.

c. Tank is to be equipped with the following valves and their associated piping and connections (all valves, piping and associated components must be designed for use with cryogenic liquid nitrogen and/or capable of withstanding the cryogenic temperatures involved).

i. Vacuum line shut-off valve to provide a means of re-establishing the vacuum in the annular space if necessary.
ii. Isolation valves for the liquid level gage and the pressure gage.

iii. Manually operated pressure building coil valve to control the flow through the pressure building coil.
iv. The fill connection on the fill line is to be outfitted with a 1-1/2” cryogenic nitrogen connection number NI-150 CGA fitting.
v. Gas supply connection shall be ½” FNPT

d. Tank construction shall comply with the following codes, standards and specification (certificates of compliance are required):

i. Inner vessel is to be fabricated of type 300 series stainless steel and designed in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Division I.
ii. Outer jacket is to be fabricated of stainless steel and designed for full vacuum in accordance with CGA-341, Standard for Insulated Cargo Tank Specification for Cryogenic Liquids.
iii. All piping shall be designed in accordance with ANSI B31.3.

e. Three sets of technical manuals (as well as a digital copy) are to be supplied for the tank. The contents of a complete set of technical manuals shall include, as a minimum, the following:

i. Complete operating instructions.
ii. Complete maintenance, service and repair instructions.
iii. Complete parts list identifying part manufacturers and part numbers for each item.
iv. Piping schematic for the tank.
v. Sketches/drawings of the tank.
vi. Any other associated data that might be used for operations, maintenance and repair of the tank.
vii. Each manual shall be bound or otherwise securely enclosed in an oil and moisture resistant binder. Each binder cover shall indicate manufacturers name, contract number, model and serial number of the tank for which it covers.