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UNITED STATES
ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION

OAK RIDGE OPERATIONS
P. O. BOX E
OAK RIDGE, TENNESSEE 37830

AREA CODE 615
TELEPHONE 483-8611

December 1, 1975

Dr. Lester Machta, Director
U. S. Department of Commerce
National Oceanic and Atmospheric Administration
Environmental Research Laboratories
Silver Spring, Maryland 20910

Dear Dr. Machta:

REQUEST FOR C_8F_{16} RELEASE DATA

In response to your November 12, 1975 request, the annual release data for perfluorodimethylcyclohexane (C_8F_{16}) are listed in the attached table. We believe them to be accurate to within 10%.

Although we have no means by which to quantify releases associated with the manufacture of the C_8F_{16}, it is likely that some, as well as possible intermediate compounds, may have been released. The fluorination of the intermediate to produce the C_8F_{16} was done by DuPont at Deep Water Dye Works in New Jersey.

The future annual releases from Oak Ridge are estimated to be 350 pounds. Since C_8F_{16} is a unique compound and we are unaware of any existing manufacturer, it is unlikely there are any present users. We are also unaware of any past users, either domestic or foreign. Since C_8F_{16} was used initially over 30 years ago as a coolant, and since there is now a wide variety of coolants commercially and competitively available, it is probably remote that there would be future large-scale users.

Also enclosed is a chemical data sheet listing several of the properties of C_8F_{16} and the structural formula as well as a graph of its vapor pressure, a graph of its vapor density versus pressure for a variety of temperatures, and a graph of its liquid density versus temperature. This fully fluorinated compound is quite stable. It was interesting to note an article in the September 1, 1975 issue of Chemical and Engineering News reviewing the work of National Bureau of Standards researchers investigating the photon-chlorofluorocarbon interaction. The summary reports that, although there is evidence of breaking the carbon-chlorine bond, there has been no

R. G. Jordan, UCCND-Y-12

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evidence of cleavage of carbon-fluorine bond. Such evidence tends to further support the stability of C_8F_{16}.

We share your interest in the fate of chlorinated fluorocarbons in the atmosphere and their effect, if any, on the ozone layer. We hope the enclosed release data will be helpful to your study.

Sincerely,

Vincent J. D'Amico
for R. J. Hart
Manager

OSE:JFW

Enclosure:
1. Sch. of C_8F_{16} Releases since 1944
2. Properties of Liquid Coolant
3. Vapor Pressure of C_8F_{16}
4. Vapor Density
5. Liquid Density

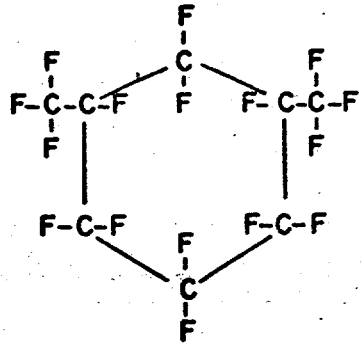
C_8F_{16} RELEASES SINCE 1944
(Pounds)

1944-45	236,801
1946	80,052
1947	90,238
1948	153,668
1949	135,773
1950	146,632
1951	163,920
1952	227,826
1953	192,238
1954	142,508
1955	137,957
1956	138,213
1957	134,996
1958	132,134
1959	93,872
1960	49,007
1961	56,219
1962	40,434
1963	42,636
1964	16,328
1965	8,600
1966	8,600
1967	8,600
1968	8,600
1969	8,600
1970	8,600
1971	8,600
1972	8,600
1973	8,600
1974	8,600
1975	55,040
Total 1944-1975	2,552,492 lbs.
Annually in future	350

Enclosure 1

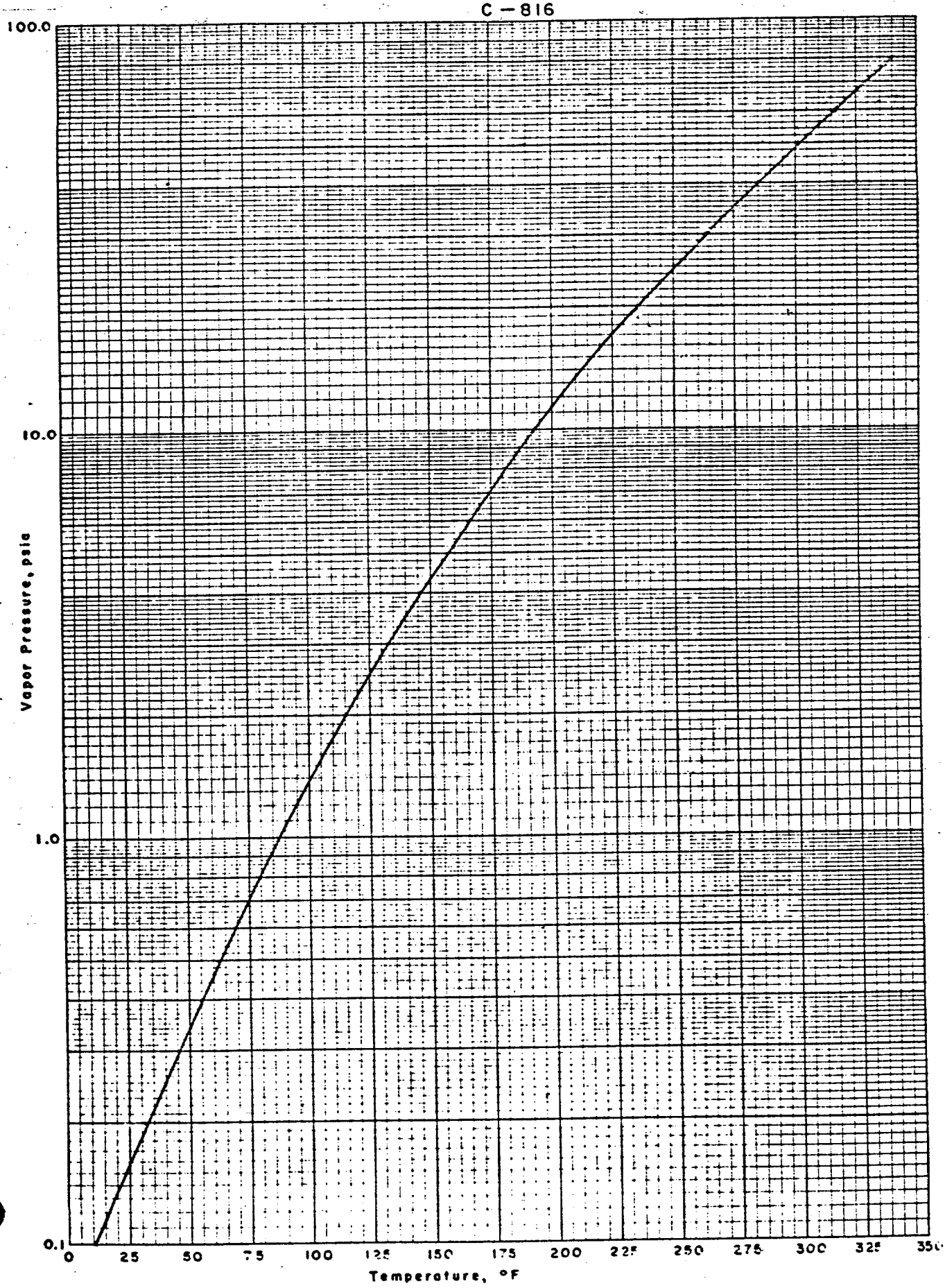
PROPERTIES OF LIQUID COOLANT

C-816

Chemical Name	Perfluoro-dimethylcyclohexane
Chemical Formula	C_8F_{16}
Structural Formula	
Molecular Weight	400
Melting Point	-41.8 °F -41.0 °C
Boiling Point	216 °F 102 °C
Density at 60 °F	116.3 lbs./cu. ft. 1.87 gms./c.c.
C_p Specific heat of vapor	0.203 BTU/lb/°F 0.203 cal./gm./°C
C_p/C_v (vapor)	1.025
Heat of Vaporization at 216 °F	37.2 BTU/lb
Thermal Conductivity at 120 °F (vapor)	5.36×10^{-3} BTU/hr./ft./°F 2.22×10^{-5} cal./sec./cm./
at 77 °F (liquid)	0.0726 BTU/hr./ft./°F 3.00×10^{-4} cal./sec./cm.

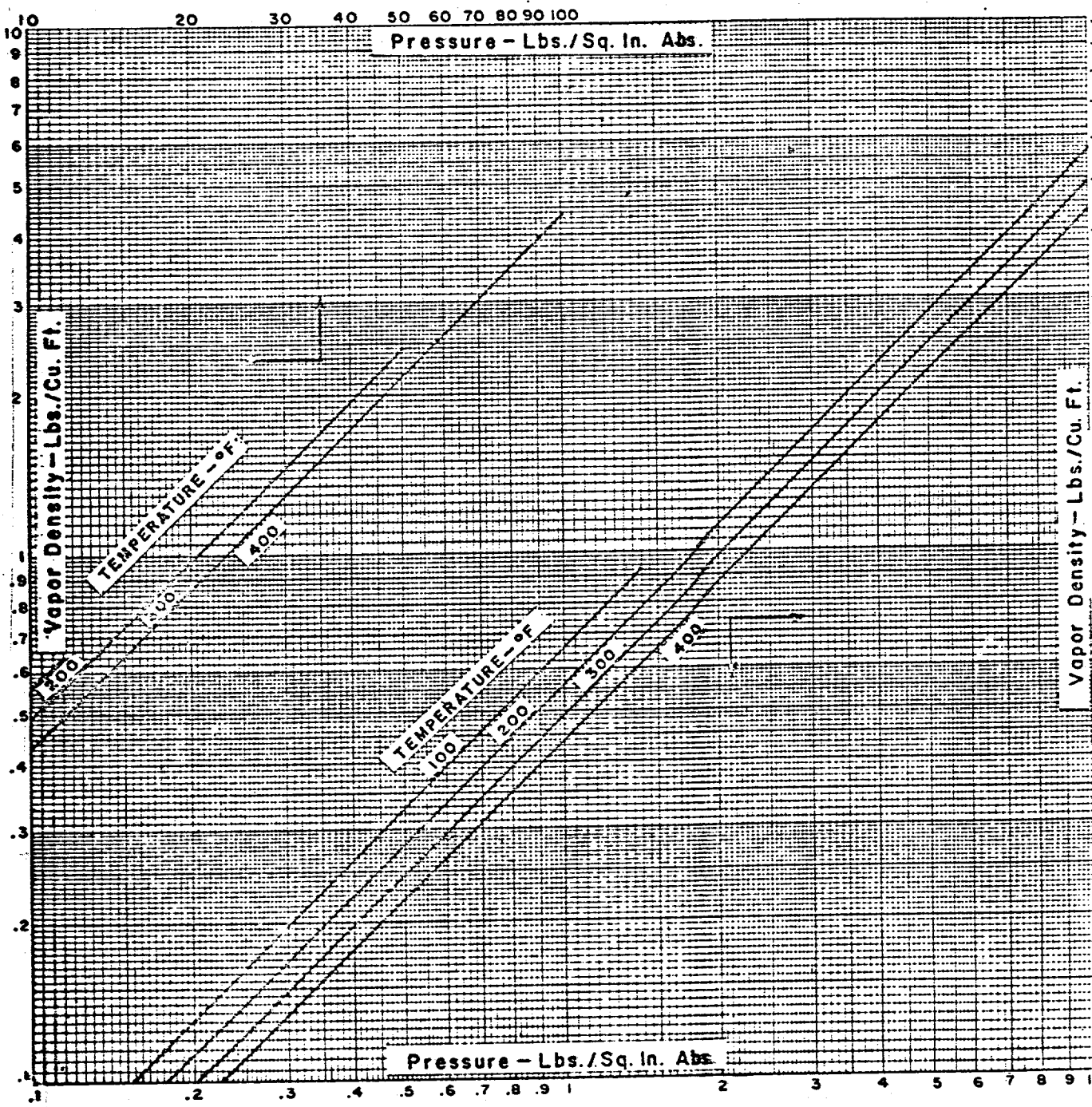
Encl. 2

VAPOR PRESSURE OF PERFLUORODIMETHYLCYCLOHEXANE
C – 816

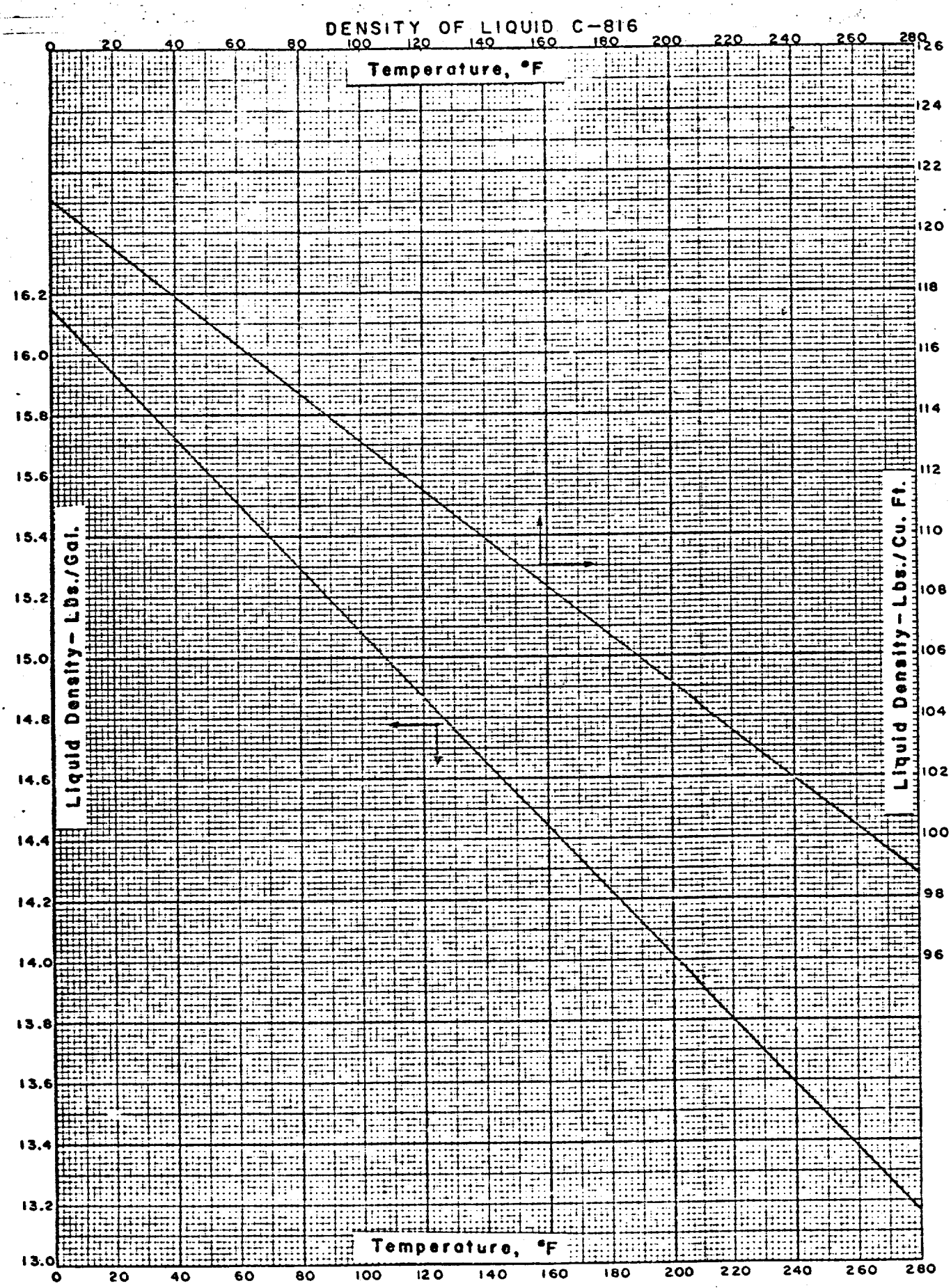


Encl. 3

DENSITY OF GASEOUS C-816



Encl. 4


DENSITY OF LIQUID C-816
Temperature, °F
Liquid Density - Lbs./Gal.
Liquid Density - Lbs./Cu. Ft.
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280
16.2 16.0 15.8 15.6 15.4 15.2 15.0 14.8 14.6 14.4 14.2 14.0 13.8 13.6 13.4 13.2 13.0
126 124 122 120 118 116 114 112 110 108 106 104 102 100 98 96

Encl. 5