16710/P013823
Serial: C1-0801180
April 16, 2008

Subj: C&C Marine and Repair, Inc. barges listed in enclosure (1)
Vapor Control System

Encl: (1) List of C&C Marine and Repair, Inc. barges
(2) Shearer & Assoc., Inc. Dwg. No. 070101-3, Rev. 2, "Vapor Control System Arrangement", dated April 1, 2008
(3) Shearer & Assoc., Inc.; Vapor Control System Calculations, dated April 3, 2008
(4) Vapor Collection System List of Cargoes; C&C Marine and Repair, Inc. Hull No 95 through 104 and 111 through 126; dated April 16, 2008
(5) VCS PRIS; C&C Marine and Repair, Inc. Hull No 95 through 104 and 111 through 126; dated April 16, 2008

Copy: Commander, Coast Guard Sector New Orleans w/ enclosures (1) through (3)

To: AC SUICIDE
(504) 585-4609

23 PAGES

U.S. Department of Homeland Security
United States Coast Guard

Commanding Officer
United States Coast Guard
Marine Safety Center

2100 2nd Street, S.W.
Washington, DC 20593-0001
Staff Symbol: MSC-3
Phone: (202) 475-3403
Fax: (202) 475-3920
Email: msc@uscg.mil

16710/P013823
Serial: C1-0801180
April 16, 2008

RECEIVED MAY - 5 2008

Shearer & Assoc.
Attn: Mr. Edward L. Shearer
3663 NASA Road One, #608
Seabrook, TX 77586

Subj: C&C Marine and Repair, Inc. barges listed in enclosure (1)
200' x 35' x 12.5' Unmanned Hull Type I/II/III Tank Barges (O/D)
Grade A (max. 25 psia Reid) & Lower Flammable and Combustible Liquids Identified in 46 CFR Table 30.25-1 or 46 CFR Part 153 Table 2, and Specified Hazardous Cargoes
Rivers; Lakes, Bays, and Sounds; Limited Coastwise on unmanned fair weather voyages only, not more than 12 miles offshore between St. Marks and Carabelle, FL.
Vapor Control System (VCS)

Ref: (a) Coast Guard Marine Safety Center's "Industry Guidelines for Determining the Maximum Liquid Transfer Rate for a Tank Vessel Transferring a Flammable or Combustible Cargo Using a Vapor Control System" dated July 15, 2001

Dear Mr. Shearer:

In response to your letter dated April 3, 2008, we have reviewed the vapor collection system piping plan and the vapor control pressure drop calculations for compliance with 46 CFR Part 39, excluding Subpart 39.40. The vapor control system piping plan, enclosure (2), is "**Approved.**" The installation, workmanship and testing shall be to the satisfaction of the cognizant Officer in Charge, Marine Inspection (OCMI). The pressure drop calculations, enclosure (3), are "**Examined.**" Calculations such as these are not normally marked approved, but are used to verify that the system meets the applicable regulations. The following comments apply:

1. Based on your calculations, this VCS is capable of recovering vapors of the cargoes listed in enclosure (3) at a maximum vapor density of **0.246 lbm/ft^3**, a maximum liquid transfer rate of **2,400 bbl/hr.**

2. The set-point of the overfill shutdown system shall be set no higher than **9 inches** below the tank top of each cargo tank.

3. Several cargoes listed in enclosure (3) are not included in enclosure (4). In accordance with reference (a), the vapor-air mixture weight density may be estimated using equation (6) of reference (a), or the saturated vapor density may be used. In either case, the vapor density of several cargoes, including Pentane (all isomers) (PTY) and Pentene (all isomers) (PTX), exceed the approved vapor density for these vessels. We also note that you have identified Pentene as a Category 1 cargo. With a vapor pressure exceeding 14.7 psia at 115°F, this cargo is classified as Category 5, and your pressure drop calculations must be adjusted accordingly.

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Vapor Control System

4. The oil transfer procedures must be revised to include a table or graph showing the liquid transfer rate versus the pressure drop, as required by 46 CFR 39.30-1(b)(3). This information must be taken from the calculations and tables contained in enclosure (3).

5. The tanks share a common vent header, which would allow mixing of various vapors and liquid cargoes. Note this configuration restricts the types of cargoes that can be carried simultaneously.

6. Enclosure (4) contains VCS Category 2 and 4 cargoes. Polymerization and residue build-up of these cargoes can adversely affect the operation of the vapor control system. The barge's owner must develop a method for internal visual inspection to verify that fouling of VCS components is not occurring, to the satisfaction of the cognizant OCMI.

7. The Cargo Authority Attachment (CAA) for barges "CBC 1305" through "CBC 1318" is now available in the Coast Guard's Marine Information for Safety and Law Enforcement (MISLE). At the time of this review, the name and official numbers for the rest of the vessels listed in enclosure (1) were not available. Once you provide vessel names and official numbers to this office, the Cargo Authority Attachment (CAA) for each vessel will be made available in the Coast Guard's Marine Information for Safety and Law Enforcement (MISLE). The CAA will contain the cargoes found in enclosure (4). Please note that only the local OCMI can issue a vessel's CAA, which is a part of the Certificate of Inspection (COI). Enclosure (5) contains the VCS tank group characteristics and our recommended COI endorsement.

Our Project Number for this vessel is P013823. Please ensure that future correspondence includes the Project Number, and either the Coast Guard (CG) number that appears in the subject line or the Official Number of each barge once assigned. To avoid confusion, the vessel owners are encouraged to provide the CG number to the National Vessel Documentation Center when applying for documentation. If you have any questions concerning our review, please contact Mr. Marcus Ewardo at the number listed above.

Sincerely,

S. L. JOHNSON
Lieutenant Commander, U. S. Coast Guard
Assistant Chief, Tank Vessel and Offshore Division
By direction

(Continued)

Enclosure (1) to MSC Letter Serial C1-0801180 dated April 16, 2008
List of Subject Barges

CBC 1305, O.N. 1208178, C&C MARINE & REPAIR CO. HULL 95
CBC 1306, O.N. 1208179, C&C MARINE & REPAIR CO. HULL 96
CBC 1307, O.N. 1208180, C&C MARINE & REPAIR CO. HULL 97
CBC 1308, O.N. 1208181, C&C MARINE & REPAIR CO. HULL 98
CBC 1309, O.N. 1209735, C&C MARINE & REPAIR CO. HULL 99
CBC 1310, O.N. 1209736, C&C MARINE & REPAIR CO. HULL 100
CBC 1311, O.N. 1209737, C&C MARINE & REPAIR CO. HULL 101
CBC 1312, O.N. 1209742, C&C MARINE & REPAIR CO. HULL 102
CBC 1313, O.N. 1209738, C&C MARINE & REPAIR CO. HULL 103
CBC 1314, O.N. 1209743, C&C MARINE & REPAIR CO. HULL 104
CBC 1315, O.N. 1209740, C&C MARINE & REPAIR CO. HULL 111
CBC 1316, O.N. 1209744, C&C MARINE & REPAIR CO. HULL 112
CBC 1317, O.N. 1209739, C&C MARINE & REPAIR CO. HULL 113
CBC 1318, O.N. 1209745, C&C MARINE & REPAIR CO. HULL 114
NEW CONSTRUCTION, CG934193, C&C MARINE & REPAIR CO. HULL 115
NEW CONSTRUCTION, CG934194, C&C MARINE & REPAIR CO. HULL 116
NEW CONSTRUCTION, CG934195, C&C MARINE & REPAIR CO. HULL 117
NEW CONSTRUCTION, CG934196, C&C MARINE & REPAIR CO. HULL 118
NEW CONSTRUCTION, CG934197, C&C MARINE & REPAIR CO. HULL 119
NEW CONSTRUCTION, CG934198, C&C MARINE & REPAIR CO. HULL 120
NEW CONSTRUCTION, CG934199, C&C MARINE & REPAIR CO. HULL 121
NEW CONSTRUCTION, CG934200, C&C MARINE & REPAIR CO. HULL 122
NEW CONSTRUCTION, CG934201, C&C MARINE & REPAIR CO. HULL 123
NEW CONSTRUCTION, CG934202, C&C MARINE & REPAIR CO. HULL 124
NEW CONSTRUCTION, CG934203, C&C MARINE & REPAIR CO. HULL 125
NEW CONSTRUCTION, CG934204, C&C MARINE & REPAIR CO. HULL 126

Vapor Control System List of Cargoes

for: C&C Marine and Repair Hull 95 through 104 and 111 through 126

Chem Code	Chemical Name	VCS Category
ACT	Acetone	1
ATN	Acetonitrile	3
ACP	Acetophenone	1
ACN	Acrylonitrile	4
ADN	Adiponitrile	1
APU	Alcohol(C12-C16) poly(1-6)ethoxylates	1
AEB	Alcohol(C6-C17)(secondary) poly(7-12)ethoxylates	1
AEE	Aminoethylethanolamine	1
AEC	Amyl acetate (all isomers)	1
AAI	Amyl alcohol (iso-, n-, sec-, primary)	1
BNZ	Benzene	1
BHB	Benzene or hydrocarbon mixtures (having 10% Benzene or more)	1
BHA	Benzene or hydrocarbon mixtures (containing Acetylene and 10% Benzene or more)	1
BTX	Benzene, Toluene, Xylene mixtures (10% Benzene or more)	1
BAL	Benzyl alcohol	1
BFX	Brake fluid base mixtures (containing Poly(2-8)alkylene(C2-C3) glycols, Polyalkylene(C2-C10) glycol monoalkyl(C1-C4) ethers, and their borate esters)	1
BAX	Butyl acetate (all isomers)	1
BAR	Butyl acrylate (all isomers)	2
IAL	Butyl alcohol (iso-)	1
BAN	Butyl alcohol (n-)	1
BAS	Butyl alcohol (sec-)	1
BAT	Butyl alcohol (tert-)	1
BPH	Butyl benzyl phthalate	1
BMH	Butyl methacrylate	2
BUE	Butyl toluene	1
BAE	Butyraldehyde (all isomers)	1
CLS	Caprolactam solutions	1
CRB	Chlorobenzene	1
CRF	Chloroform	3
NCT	Coal tar naphtha solvent	1
CCW	Creosote	1
CRS	Cresols (all isomers)	1
CRX	Cresylic acid tar	1
CTA	Crotonaldehyde	4
CHX	Cyclohexane	1
CHN	Cyclohexanol	1
CCH	Cyclohexanone	1
CYX	Cyclohexanone, Cyclohexanol mixture	1
CHA	Cyclohexylamine	1
CPD	1,3-Cyclopentadiene dimer (molten)	2
CSB	Cyclopentadiene, Styrene, Benzene mixture	1
CMP	p-Cymene	1
IDA	iso-Decaldehyde	1
DAL	n-Decaldehyde	1

Chem Code	Chemical Name	VCS Category
DCE	Decene	1
IAI	iso-Decyl acrylate	2
DAX	Decyl alcohol (all isomers)	1
DBZ	n-Decylbenzene, see Alkyl(C9+)benzenes	1
DAA	Diacetone alcohol	1
DPA	ortho-Dibutyl phthalate	1
DBX	Dichlorobenzene (all isomers)	3
DCH	1,1-Dichloroethane	1
DEE	2,2'-Dichloroethyl ether	1
DPB	1,1-Dichloropropane	3
DPP	1,2-Dichloropropane	3
DPC	1,3-Dichloropropane	3
DPU	1,3-Dichloropropene	4
DMX	Dichloropropene, Dichloropropane mixtures	1
DEA	Diethanolamine	1
DEN	Diethylamine	3
DEB	Diethylbenzene	1
DEG	Diethylene glycol	1
DET	Diethylenetriamine	1
DBU	Diisobutylamine	3
DBL	Diisobutylene	1
DIK	Diisobutyl ketone	1
DIP	Diisopropanolamine	1
DIA	Diisopropylamine	3
DIX	Diisopropylbenzene (all isomers)	1
DAC	N,N-Dimethylacetamide	3
DMB	Dimethylethanolamine	1
DMF	Dimethylformamide	1
DTL	Dimethyl phthalate	1
DOP	Dioctyl phthalate	1
DPN	Dipentene	1
DIL	Diphenyl	1
DDO	Diphenyl, Diphenyl ether mixtures	1
DPE	Diphenyl ether	1
DNA	Di-n-propylamine	3
DPG	Dipropylene glycol	1
DFF	Distillates: Flashed feed stocks	1
DSR	Distillates: Straight run	1
DOZ	Dodecene (all isomers)	1
DDB	Dodecylbenzene, see Alkyl(C9+)benzenes	1
MEA	Ethanolamine	1
EEA	2-Ethoxyethyl acetate	1
ETG	Ethoxy triglycol (crude)	1
ETA	Ethyl acetate	1
EAA	Ethyl acetoacetate	1
EAC	Ethyl acrylate	2
EAL	Ethyl alcohol	1
ETB	Ethylbenzene	1
EBT	Ethyl butanol	1
EBA	N-Ethylbutylamine	3
EBE	Ethyl tert-butyl ether	1

Chem Code	Chemical Name	VCS Category
EBR	Ethyl butyrate	1
ECY	Ethyl cyclohexane	1
ECC	N-Ethylcyclohexylamine	1
ETC	Ethylene cyanohydrin	1
EDA	Ethylenediamine	1
EDC	Ethylene dichloride	1
EGL	Ethylene glycol	1
EMA	Ethylene glycol butyl ether acetate	1
EGY	Ethylene glycol diacetate	1
EGC	Ethylene glycol monoalkyl ethers	1
EPE	Ethylene glycol phenyl ether	1
EGP	Ethylene glycol propyl ether	1
EEP	Ethyl-3-ethoxypropionate	1
EHX	2-Ethylhexanol	1
EAI	2-Ethylhexyl acrylate	2
ETM	Ethyl methacrylate	2
EPR	Ethyl propionate	1
EPA	2-Ethyl-3-propylacrolein	1
ETE	Ethyl toluene	1
FMS	Formaldehyde solution (37% to 50%)	1
FAM	Formamide	1
FFA	Furfural	1
FAL	Furfuryl alcohol	1
GAK	Gasoline blending stocks: Alkylates	1
GRF	Gasoline blending stocks: Reformates	1
GAT	Gasolines: Automotive (containing not over 4.23 grams lead per gallon)	1
GAV	Gasolines: Aviation (containing not over 4.86 grams of lead per gallon)	1
GCS	Gasolines: Casinghead (natural)	1
GPL	Gasolines: Polymer	1
GSR	Gasolines: Straight run	1
GCR	Glycerine	1
HMX	Heptane (all isomers), see Alkanes (C6-C9) (all isomers)	1
HEP	Heptanoic acid	1
HTX	Heptanol (all isomers)	1
HPX	Heptene (all isomers)	2
HPE	Heptyl acetate	1
HMC	Hexamethylenediamine solution	1
HMI	Hexamethyleneimine	1
HXS	Hexane (all isomers), see Alkanes (C6-C9)	1
HXO	Hexanoic acid	1
HXN	Hexanol	1
HEX	Hexene (all isomers)	2
HXG	Hexylene glycol	1
HFN	Hydrocarbon 5-9	1
IPH	Isophorone	1
JPF	Jet fuel: JP-4	1
JPV	Jet fuel: JP-5 (kerosene, heavy)	1
KRS	Kerosene	1
MSO	Mesityl oxide	1

Chem Code	Chemical Name	VCS Category
MTT	Methyl acetate	1
MAM	Methyl acrylate	2
MAL	Methyl alcohol	1
MAC	Methylamyl acetate	1
MAA	Methylamyl alcohol	1
MAK	Methyl amyl ketone	1
MBE	Methyl tert-butyl ether	1
MBK	Methyl butyl ketone	1
MBU	Methyl butyrate	1
MCK	Methylcyclopentadiene dimer	1
MDE	Methyl diethanolamine	1
MEK	Methyl ethyl ketone	1
MEP	2-Methyl-5-ethylpyridine	1
MHK	Methyl heptyl ketone	1
MIK	Methyl isobutyl ketone	1
MMM	Methyl methacrylate	2
MNA	Methyl naphthalene (molten)	1
MPR	2-Methylpyridine	3
MSR	alpha-Methylstyrene	2
MNS	Mineral spirits	1
MPL	Morpholine	1
MRE	Myrcene	1
NAG	Naphtha: Heavy	1
PTN	Naphtha: Petroleum	1
NSV	Naphtha: Solvent	1
NSS	Naphtha: Stoddard solvent	1
NVM	Naphtha: Varnish makers and painters (75%)	1
NPM	1- or 2-Nitropropane	1
NAX	Nonane (all isomers), see Alkanes (C6-C9)	1
NON	Nonene (all isomers)	2
NNS	Nonyl alcohol (all isomers)	1
NNP	Nonyl phenol	1
NPE	Nonyl phenol poly(4+)ethoxylates	1
OAX	Octane (all isomers), see Alkanes (C6-C9)	1
OAY	Octanoic acid (all isomers)	1
OCX	Octanol (all isomers)	1
OTX	Octene (all isomers)	2
OTW	Oil, fuel: No. 2	1
OTD	Oil, fuel: No. 2-D	1
OFR	Oil, fuel: No. 4	1
OFV	Oil, fuel: No. 5	1
OSX	Oil, fuel: No. 6	1
OIL	Oil, misc: Crude	1
ODS	Oil, misc: Diesel	1
OLB	Oil, misc: Lubricating	1
ORL	Oil, misc: Residual	1
OTB	Oil, misc: Turbine	1
PIO	alpha-Pinene	1
PIP	beta-Pinene	1
PAG	Poly(2-8)alkylene glycol monoalkyl(C1-C6) ether	1
PAF	Poly(2-8)alkylene glycol monoalkyl(C1-C6) ether acetate	1

Chem Code	Chemical Name	VCS Category
PLB	Polybutene	1
PEB	Polyethylene polyamines	1
PGC	Polypropylene glycol	1
MPA	iso-Propanolamine	1
PAX	Propanolamine (iso-, n-)	1
IAC	iso-Propyl acetate	1
PAT	n-Propyl acetate	1
IPA	iso-Propyl alcohol	1
PAL	n-Propyl alcohol	1
PBY	Propylbenzene (all isomers)	1
IPX	iso-Propylcyclohexane	1
PPG	Propylene glycol	1
PGN	Propylene glycol methyl ether acetate	1
PTT	Propylene tetramer	1
PRD	Pyridine	1
SSH	Sodium sulfide, hydrosulfide solution (H2S 15 ppm or less)	1
STX	Styrene (crude)	2
STY	Styrene monomer	2
SFL	Sulfolane	1
TTG	Tetraethylene glycol	1
TTP	Tetraethylenepentamine	1
THF	Tetrahydrofuran	1
THN	Tetrahydronaphthalene	1
TOL	Toluene	1
TCB	1,2,4-Trichlorobenzene	1
TCM	1,1,2-Trichloroethane	1
TCL	Trichloroethylene	1
TCN	1,2,3-Trichloropropane	3
TCP	Tricresyl phosphate (less than 1% of the ortho isomer)	1
TEA	Triethanolamine	1
TEN	Triethylamine	3
TEB	Triethylbenzene	1
TEG	Triethylene glycol	1
TET	Triethylenetetramine	1
TPS	Triethyl phosphate	1
TRE	Trimethylbenzene (all isomers)	1
TRP	Trixylenyl phosphate	1
UDC	Undecene	1
UND	1-Undecyl alcohol	1
VAM	Vinyl acetate	2
VNT	Vinyltoluene	2
XLX	Xylenes (ortho-, meta-, para-)	1

Chem Code	Chemical Name	VCS Category

Vapor Control System (VCS) Categories

Category 1: (No additional VCS requirements above those for benzene, gasolines and crude oil) All requirements applying to the handling of oil and hazardous materials in Titles 33 and 46 Code of Federal Regulations (CFR) apply to these cargoes. Those specifically dealing with vapor control systems are in 33 CFR 155.750, 33 CFR 156.120, 33 CFR 156.170, 46 CFR 35.35 and 46 CFR 39. The cargo tank venting system calculations (46 CFR 39.20-11) and the pressure drop calculations (46 CFR 39.30-1(b)) must use appropriate friction factors, vapor densities and vapor growth rates.

Category 2: (Polymerizes) Polymerization and residue build-up of these cargoes can adversely affect the vessel by fouling safety componenets and restricting vapor flow which could lead to cargo tank overpressurization. The vessel's owner must develop a method of ensuring all VCS safety components are functional and polymer build-up is not causing an unsafe condition due to increased pressure in the vapor control piping and cargo tanks. The method shall be acceptable to the local Officer in Charge, Marine Inspection. This is in addition to the requirements of Category 1. Please note that a material not normally considered a monomer can be a problem in detonation arrester.

Category 3: (Highly toxic) VCSs for these toxic cargoes cannot use a spill valve or rupture disk as the primary means to meet the overfill protection requirement of 46 CFR 39.20-9. This requirement is in addition to the requirements of Category 1.

Category 4: (Polymerizes and highly toxic) Must comply with requirements of Categories 1, 2 and 3.

Category 5: (High vapor pressure) VCS pressure drop calculations for cargoes with a vapor pressure greater than 14.7 psia at 115 F must take into account increased vapor-air mixture densities and vapor growth rates as compared to Category 1cargoes. Consult the Marine Safety Center's VCS Guidelines for further information. This requirement is in addition to the requirements of Category 1.

Category 6: (High vapor pressure and highly toxic) Must comply with requirements of Categories 1, 3 and 5.

Category 7: (High vapor pressure and polymerizes) Must comply with requirements of Categories 1, 2 and 5.

Marine Safety Center Vapor Control System (VCS) Plan Review Information Sheet (PRIS)

Vessel Name	CBC 1305 through CBC 1330	Shipyard	C&C Marine and Repair, Inc.
Official Number	Unassigned	Hull Number	95-104 and 111-126

1. This sheet consolidates critical VCS parameters for MSC Staff Engineers and CG Field Inspectors dealing with Vapor Control Systems. CG Inspectors should verify the vessel's VCS design is consistent with the information listed in boxes 2, 6, 7 & 8 prior to updating the vapor control endorsement on the vessel's Certificate of Inspection. For cases where the information in the VCS PRIS does not reflect the vessel's design the CG Inspector should contact the Marine Safety Center.

2. Tank Maximum Design Working Pressure	3.25	psig
3. Authorized Maximum Cargo Transfer Rate(s)	2400	bbl/hr loading
	2400	bbl/hr discharging
4. Authorized Maximum Cargo Density	0.246	lbm/ft^3
5. Authorized VCS Categories	1 through 4	

6. Cargoes with the highest vapor density and/or pressure drop:
   a. Cargo Name DDB
   b. Cargo Name GAK

7. Pressure Vacuum Valve:

Manufacturer	~~BERGEN~~ TANKTECH
Size	KLPH-6
CG Approval	162.017/144

Settings in psig:

Pressure-side	2
Vacuum-side	0.5

8. VCS Pipe Sizes:

Approx. Inside Diameter	
Longitudinal Header (inches)	8
Transverse Header (Inches)	8

Required Venting Capacity of Pressure-Side of P/V valve	5094	bbl/hr (air)
Required Venting Capacity of Vacuum-Side of P/V valve	2400	bbl/hr (air)

9. Tank Overfill Protection System (check appropriate box or boxes)

a. High Level/Tank Overfill Alarm	X	Type	BERGEN
b. Overfill Control Shutdown	X	Type	BERGEN
c. Spill Valve		Type	N/A
d. Rupture Disk		Type	N/A

Setting in psig: N/A

10. Closed Gauging — Verify the vessel has closed gauging that satisfies 46 CFR 39.20-3 and 151.15-10(c).

11. Instructions/Guidelines for the OCMI:

11a. The following is the Marine Safety Center's recommended COI endorsement

Only those hazardous cargoes named in the vessel's Cargo Authority Attachment, Serial # C1-0801180 dated 4/16/2008, may be carried and then only in the tanks indicated.
When the vessel is carrying cargoes containing greater than 0.5% benzene, the person in charge is responsible for ensuring the provisions of 46 US Code of Federal Regulations Part 197, Subpart C are applied.
In accordance with 46 CFR Part 39, excluding part 39.40, this vessel's vapor control system has been inspected to the plans approved by Marine Safety Center letter Serial # C1-0801180 dated 4/16/2008, and found acceptable for collection of bulk liquid cargo vapors annotated with "Yes" in the CAA's VCS column.

11b. The MSC approval letter/s must be available at the OCMI's request.

11c. Verify isolation valve at the vapor connection flange is manually operable and designed in a way it is "clearly" open or closed.

11d. Previous applicable approval letters:

None	

VCS Approval Letter: C1-0801180 dated 4/16/2008 MSC Plan Reviewer: Marcus Ewardo

VAPOR CONTROL SYSTEM CALCULATIONS

for

200' X 35' X 12'- 6" DOUBLE SKIN TANK BARGES

HULLS 95 THROUGH 104 AND 111 THROUGH 126

for

C & C MARINE AND REPAIR, INC.

February 22, 2008

REVISED APRIL 24, 2008

Subject to comments in
Marine Safety Center letter of

APR 16 2008

EXAMINED

Prepared by: Shearer & Assoc., Inc.
3663 NASA Road One
#608
Seabrook, TX 77586
(281) 532-2080

TABLE 1 (HIGHEST GROWTH RATE CARGO)

	CHRIS CODE	NAME	VCS CAT	LIQ SG	VAPOR PRESS	VAPOR SG	VAPOR AIR WEIGHT DENSITY	VAPOR GROWTH RATE	PRESSURE DROP TO PV VALVE IN VCS(psig) (LOADING)	VAPOR VOLUMETRIC FLOW RATE (bbl/h)	AIR EQUIVALENT VOLUMETRIC FLOW RATE	PRESSURE DROP TO SHORE CONNECTION IN VCS (psig) (LOADING)*	PRESSURE DROP TO PV VALVE IN VCS(psig) (UNLOADING)	PRESSURE DROP TO SHORE CONNECTION IN VCS (psig) (UNLOADING)*
1	ACT	Acetone	1	0.79	10	2	0.130	1.2000	0.007	1920	2401	0.011	0.009	0.013
2	GAK	Gasoline Blended Stocks: Alkylates	1	0.75	12.5	3.4	0.224	1.2500	0.014	2000	3282	0.021	0.016	0.024
3	GRF	Gasoline Blended Stocks: Reformate	1	0.8	12.5	3.4	0.224	1.2500	0.014	2000	3282	0.021	0.016	0.024
4	GAT	Gasolines: Automotive (containing not over 4.23 grams	1	0.74	12.5	3.4	0.224	1.2500	0.014	2000	3282	0.021	0.016	0.024
5	GAV	Gasolines: Aviation (containing not over 4.86 grams lea	1	0.71	12.5	3.4	0.224	1.2500	0.014	2000	3282	0.021	0.016	0.024
6	GCS	Gasolines: Casinghead	1	0.67	12.5	3.4	0.224	1.2500	0.014	2000	3282	0.021	0.016	0.024
7	GPL	Gasolines: Polymer	1	0.75	12.5	3.4	0.224	1.2500	0.014	2000	3282	0.021	0.016	0.024
8	GSR	Gasolines: Straight Run	1	0.75	12.5	3.4	0.224	1.2500	0.014	2000	3282	0.021	0.016	0.024
9	HXS	Hexane (all isomers)	1	0.66	7	3	0.149	1.1400	0.008	1824	2440	0.012	0.009	0.013
10	HXA	Hexene	1	0.68	7	3	0.149	1.1400	0.008	1824	2440	0.012	0.009	0.013
11	JPT	Jet Fuels: JP-3	1	0.8	6.61	4.5	0.223	1.1702	0.012	1872	3086	0.019	0.014	0.021

LIQUID TRANSFER RATE vs PRESSURE DROP
(HIGHEST GROWTH RATE CARGO)

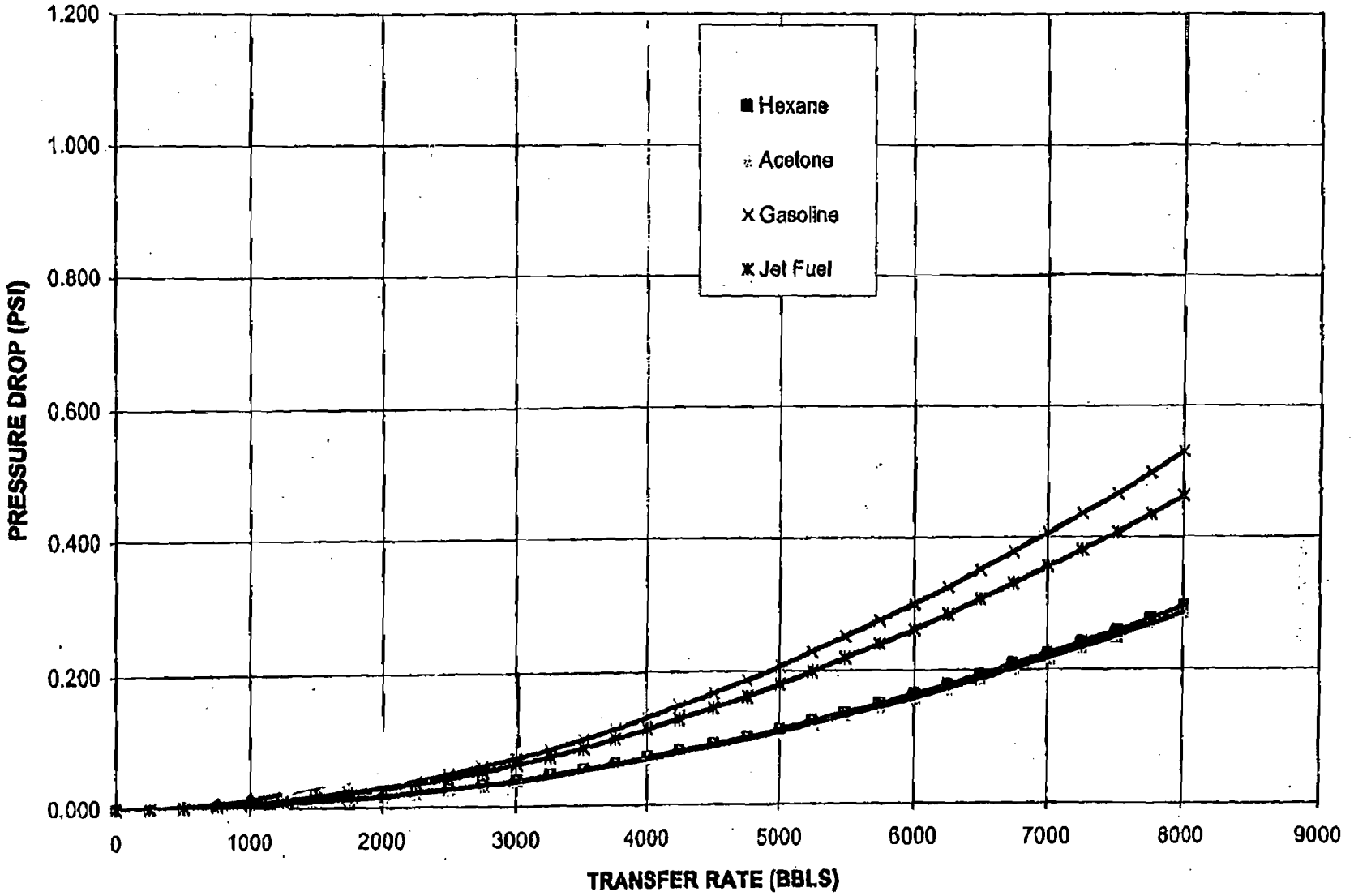


TABLE 2 (SUBCHAPTER "D" CARGOES)

CHRIS CODE	NAME	VCS CAT	LIQ SG	VAPOR PRESS	VAPOR SG	VAPOR AIR WEIGHT DENSITY	VAPOR GROWTH RATE	PRESSURE DROP TO PV VALVE IN VCS(psig) (LOADING)	VAPOR VOLUMETRIC FLOW RATE (bbl/h)	AIR EQUIVALENT VOLUMETRIC FLOW RATE	PRESSURE DROP TO SHORE CONNECTION IN VCS (psig) (LOADING)*	PRESSURE DROP TO PV VALVE IN VCS(psig) (UNLOADING)	PRESSURE DROP TO SHORE CONNECTION IN VCS (psig) (UNLOADING)*
1	NOT USED												
2 ACP	Acetophenone	1	1.03	0.5	4.14	0.092	1.0120	0.008	2326	2448	0.012	0.024	0.036
19 AAT	Amyl Acetate (iso-)	1	0.88	0.33	4.46	0.086	1.0066	0.007	2315	2368	0.011	0.022	0.034
20 AAJ	Amyl Alcohol (iso-, n-, sec-, primary) (See also IAA)	1	0.82	0.3	3.04	0.086	1.0060	0.007	2314	2353	0.011	0.022	0.033
21 AAN	Amyl Alcohol (n-)	1	0.82	0.3	3.04	0.086	1.0060	0.007	2314	2353	0.011	0.022	0.033
23 APM	Amyl Alcohol, Primary	1	0.82	0.3	3.04	0.086	1.0060	0.007	2314	2353	0.011	0.022	0.033
24 ASE	Amyl Alcohol, (sec-)	1	0.82	0.3	3.04	0.086	1.0060	0.007	2314	2353	0.011	0.022	0.033
26 IAA	Amyl Alcohol, (iso-)	1	0.82	0.3	3.04	0.086	1.0060	0.007	2314	2353	0.011	0.022	0.033
34 BAL	Benzyl Alcohol	1	1.05	0.1	3.73	0.084	1.0020	0.007	2305	2322	0.011	0.021	0.032
40 BAX	Butyl Acetate (iso-, n-)	1	0.87	0.6	4	0.091	1.0120	0.008	2326	2442	0.012	0.023	0.036
42 BTA	Butyl Acetate (sec-)	1	0.89	1.5	4	0.104	1.0300	0.009	2369	2652	0.014	0.028	0.042
44 IAL	Butyl Alcohol (iso-)	1	0.81	0.9	2.6	0.090	1.0180	0.008	2341	2434	0.012	0.023	0.035
46 BAS	Butyl Alcohol (sec-)	1	0.81	1.3	2.6	0.093	1.0260	0.008	2360	2494	0.012	0.024	0.037
47 BAT	Butyl Alcohol (tert-)	1	0.78	2.6	2.6	0.104	1.0560	0.010	2429	2718	0.015	0.029	0.044
48 BPH	Butyl Benzyl Phthalate	1	1.12	0.01	10.8	0.083	1.0002	0.007	2300	2300	0.010	0.021	0.032
58 BUE	Butyl Toluene	1	0.86	0.1	5.11	0.086	1.0020	0.007	2305	2331	0.011	0.021	0.032
64 CLS	Caprolactam Solutions	1	1.02	0.05	3.9	0.084	1.0010	0.007	2302	2311	0.011	0.021	0.032
70 CUM	Cumene	1	0.86	0.60	4.20	0.092	1.0120	0.008	2326	2450	0.012	0.024	0.036
72 CHX	Cyclohexane	1	0.78	4.5	2.9	0.123	1.0900	0.012	2507	3052	0.018	0.037	0.056
73 CHN	Cyclohexanol	1	0.95	0.15	3.45	0.086	1.0030	0.007	2307	2330	0.011	0.021	0.032
74 CPD	1,3-Cyclopentadiene dimer (molten)	1	0.69	0.25	4.66	0.087	1.0050	0.007	2312	2368	0.011	0.022	0.033
76 CMP	Cymene (para-)	1	0.86	0.11	4.62	0.086	1.0022	0.007	2305	2330	0.011	0.021	0.032
77 DHN	Decahydronaphthalene	1	0.89	0.1	4.76	0.086	1.0020	0.007	2305	2328	0.011	0.021	0.032
78 IDA	Decaldehyde (iso-)	1	0.83	0.01	5	0.083	1.0002	0.007	2300	2302	0.010	0.021	0.032
79 DAL	Decaldehyde (n-)	1	0.83	0	5.01	0.083	1.0000	0.007	2300	2299	0.010	0.021	0.032
81 DCE	Decane	1	0.74	0.12	4.8	0.085	1.0024	0.007	2306	2334	0.011	0.021	0.032
82 DAX	Decyl Alcohol (all isomers) (Decanol)	1	0.83	0.01	5.3	0.083	1.0002	0.007	2300	2303	0.010	0.021	0.032
83 ISA	Decyl Alcohol (iso-)	1	0.83	0.01	5.3	0.083	1.0002	0.007	2300	2303	0.010	0.021	0.032
84 DAN	Decyl Alcohol (n-)	1	0.83	0.01	5.3	0.083	1.0002	0.007	2300	2303	0.010	0.021	0.032
85 DBZ	Decylbenzene (n-)	1	0.86	0.01	7.52	0.083	1.0002	0.007	2300	2304	0.010	0.021	0.032
87 DAA	Diacetone Alcohol	1	0.97	0.1	4	0.084	1.0020	0.007	2305	2323	0.011	0.021	0.032
91 DPA	Dibutyl Phthalate (ortho-)	1	1.05	0	9.59	0.083	1.0000	0.007	2300	2299	0.010	0.021	0.032
92 DPT	Dicyclopentadiene, See 1,3-Cyclopentadiene Dimer (mx	2	0.98	0.25	4.55	0.087	1.0050	0.007	2312	2368	0.011	0.022	0.033
93 DEB	Diethylbenzene	1	0.87	0.08	4.62	0.084	1.0018	0.007	2304	2322	0.011	0.021	0.032
94 DEG	Diethylene Glycol	1	1.12	0.01	3.66	0.083	1.0002	0.007	2300	2302	0.010	0.021	0.032
95 DME	Diethylene Glycol Butyl Ether	1	0.95	0.01	5.5	0.083	1.0002	0.007	2300	2303	0.010	0.021	0.032
100 DGA	Diethylene Glycol Ethyl Ether Acetate	1	0.99	0.02	4.62	0.083	1.0004	0.007	2301	2305	0.010	0.021	0.032
101 DGM	Diethylene Glycol Methyl Ether	1	1.03	0.03	4.14	0.083	1.0006	0.007	2301	2307	0.010	0.021	0.032
111 DBC	Diisobutylcarbinol	1	0.81	0.09	4.97	0.085	1.0018	0.007	2304	2327	0.011	0.021	0.032
112 DBL	Diisobutylene	1	0.72	2	3.86	0.110	1.0400	0.010	2392	2751	0.015	0.030	0.045
113 DIK	Diisobutyl Ketone	1	0.81	0.16	4.9	0.086	1.0032	0.007	2307	2347	0.011	0.022	0.033
119 DIX	Diisopropylbenzene (all isomer)	1	0.86	0.03	5.6	0.084	1.0006	0.007	2301	2310	0.011	0.021	0.032
124 DTL	Dimethyl Phthalate	1	1.19	0	6.69	0.083	1.0000	0.007	2300	2299	0.010	0.021	0.032
126 DIF	Dinonyl Phthalate	1	0.97	0.01	14.4	0.084	1.0002	0.007	2300	2309	0.011	0.021	0.032
130 DOP	Dioctyl Phthalate	1	0.98	0	13.47	0.083	1.0000	0.007	2300	2299	0.010	0.021	0.032
131 DPN	Dipentene	1	0.84	0.1	4.9	0.085	1.0020	0.007	2305	2329	0.011	0.021	0.032
132 DIL	Diphenyl	1	0.99	0.01	5.31	0.083	1.0002	0.007	2300	2303	0.010	0.021	0.032
133 DDO	Diphenyl, Diphenyl Ether Mixture	1	1.07	0.01	5.66	0.083	1.0002	0.007	2300	2303	0.010	0.021	0.032
134 DPE	Diphenyl Ether	1	1.07	0.01	5.87	0.083	1.0002	0.007	2300	2303	0.010	0.021	0.032
136 DPG	Dipropylene Glycol	1	1.03	0.07	4.63	0.084	1.0014	0.007	2303	2319	0.011	0.021	0.032
139 DFF	Distillates: Flashed Feed Stocks	1	0.75	2.3	3.4	0.109	1.0460	0.010	2406	2755	0.015	0.030	0.045
140 DSR	Distillates: Straight Run	1	0.73	2.3	3.4	0.109	1.0460	0.010	2406	2755	0.015	0.030	0.045
145 DOZ	Dodecene (all isomers)	1	0.76	0.02	5.81	0.083	1.0004	0.007	2301	2307	0.010	0.021	0.032
146 DOD	Dodecene	1	0.76	0.02	5.81	0.083	1.0004	0.007	2301	2307	0.010	0.021	0.032
147	NOT USED												
155 ETG	Ethoxy Triglycol (crude)	1	1.02	0	6.14	0.083	1.0000	0.007	2300	2299	0.010	0.021	0.032
156 ETA	Ethyl Acetate	1	0.9	4.5	3.04	0.126	1.0900	0.012	2507	3089	0.019	0.037	0.057
157 EAA	Ethyl Acetoacetate	1	1.03	0.2	4.48	0.088	1.0040	0.007	2309	2354	0.011	0.022	0.033

156 EAL	Ethyl Alcohol (Ethanol)	1	0.79	3.5	1.6	0.093	1.0700	0.009	2481	2602	0.013	0.027
160 ETB	Ethyl Benzene	1	0.87	0.8	3.58	0.090	1.0120	0.008	2328	2426	0.012	0.023
161 EBT	Ethyl Butanol	1	0.83	0.12	3.52	0.084	1.0024	0.007	2306	2324	0.011	0.021
162 EBR	Ethyl Butyrate	1	0.88	1	4	0.097	1.0200	0.008	2346	2536	0.013	0.025
163 ECY	Ethyl Cyclohexane	1	0.79	0.5	3.87	0.090	1.0100	0.008	2323	2416	0.011	0.023
166 EGL	Ethylene Glycol	1	1.19	0.01	2.21	0.083	1.0002	0.007	2300	2301	0.010	0.021
169 EMA	Ethylene Glycol Butyl Ether Acetate	1	0.94	0.05	5.52	0.084	1.0010	0.007	2302	2316	0.011	0.021
172 EGY	Ethylene Glycol Diacetate	1	1.1	0.01	5.03	0.083	1.0002	0.007	2300	2302	0.010	0.021
178 EME	Ethylene Glycol Methyl Ether	1	1.1	0.01	4.8	0.083	1.0002	0.007	2300	2302	0.010	0.021
180 EPE	Ethylene Glycol Phenyl Ether	1	1.1	0.01	4.8	0.083	1.0002	0.007	2300	2302	0.010	0.021
184 EHA	2-Ethylhexaldehyde, See Octyl Aldehydes	1	0.82	0.17	4.41	0.086	1.0034	0.007	2308	2345	0.011	0.022
186 EHX	2-Ethylhexanol , see Octanol (all isomers)	1	0.84	0.02	4.5	0.083	1.0004	0.007	2301	2305	0.010	0.021
190 EPR	Ethyl Propionate	1	0.89	3.5	1.6	0.093	1.0700	0.009	2481	2602	0.013	0.027
191 ETE	Ethyl Toulene	1	0.88	0.28	4.15	0.087	1.0056	0.007	2313	2369	0.011	0.022
194 FAM	Formamide	1	1.13	0.1	1.55	0.083	1.0020	0.007	2305	2308	0.010	0.021
195 FAL	Furfuryl Alcohol	1	1.13	0.05	3.4	0.084	1.0010	0.007	2302	2309	0.011	0.021
197	NOT USED											
200	NOT USED											
201	NOT USED											
202	NOT USED											
203	NOT USED											
204 GCR	Glycerine	1	1.26	0	3.17	0.083	1.0000	0.007	2300	2299	0.010	0.021
217 HMX	Heptane (all isomers) (Methylhexane)	1	0.68	2.5	3.45	0.112	1.0500	0.010	2415	2601	0.015	0.031
218 HPT	Heptane (n-)	1	0.68	2.5	3.45	0.112	1.0500	0.010	2415	2601	0.015	0.031
219 HEP	Heptonic Acid	1	0.92	0.01	4.49	0.083	1.0002	0.007	2300	2302	0.010	0.021
220 HTX	Heptanol (all isomers)	1	0.82	0.04	4	0.084	1.0008	0.007	2302	2309	0.011	0.021
221 HTN	Heptanol (all isomers)	1	0.82	0.04	4	0.084	1.0008	0.007	2302	2309	0.011	0.021
222 HPX	Heptene (all isomers)	2	0.7	2.9	3.4	0.116	1.0580	0.011	2433	2871	0.016	0.032
223 THE	Heptene (1-)	1	0.7	2.8	3.4	0.115	1.0560	0.011	2429	2852	0.016	0.032
224 HPE	Heptyl Acetate	1	0.86	0.1	5.5	0.085	1.0020	0.007	2305	2333	0.011	0.021
229	NOT USED											
230	NOT USED											
231 HXO	Hexanoic Acid	1	0.93	0.01	4	0.083	1.0002	0.007	2300	2302	0.010	0.021
232	NOT USED											
234 HEX	Hexane (all isomers)	2	0.67	9	2.9	0.154	1.1600	0.017	2668	3636	0.026	0.052
235 HXE	Hexene (1-)	1	0.67	8.2	2.9	0.156	1.1640	0.017	2677	3670	0.027	0.053
236 HXT	Hexene (2-)	1	0.67	8.2	2.9	0.156	1.1640	0.017	2677	3670	0.027	0.053
238 HXG	Hexylene Glycol	4	0.92	0.01	1.1	0.083	1.0002	0.007	2300	2300	0.010	0.021
243 IPH	Isophorone	1	0.93	0.01	4.76	0.083	1.0002	0.007	2300	2302	0.010	0.021
244 JPO	Jet Fuels: JP-1 (Kerosene)	1	0.8	0.14	4.5	0.085	1.0028	0.007	2306	2337	0.011	0.021
245	NOT USED											
246 JPF	Jet Fuels: JP-4	1	0.81	3.4	4	0.131	1.0680	0.012	2456	3083	0.019	0.037
247 JPV	Jet Fuels: JP-5 (Kerosene, heavy)	1	0.82	0.1	4	0.084	1.0020	0.007	2305	2323	0.011	0.021
249 KRS	Kerosene	1	0.81	0.16	4.5	0.085	1.0030	0.007	2307	2340	0.011	0.022
263 MTY	Methyl Acetate	1	0.92	6.1	2.6	0.129	1.1220	0.013	2581	3213	0.020	0.041
265 MAL	Methyl Alcohol (See Methanol)	1	0.79	6.83	1.1	0.086	1.1328	0.009	2605	2653	0.014	0.028
266 MAC	Methyl Amyl Acetate	1	0.86	0.33	4.07	0.089	1.0066	0.007	2315	2399	0.011	0.023
267 MAA	Methyl Amyl Alcohol	1	0.81	0.43	3.62	0.088	1.0066	0.007	2320	2389	0.011	0.022
271 MBK	Methyl n-Butyl Ketone	1	0.81	0.97	3.5	0.094	1.0194	0.008	2345	2499	0.012	0.025
273 MBU	Methyl Butyrate	1	0.9	1.26	3.53	0.098	1.0252	0.009	2358	2561	0.013	0.026
274 MEK	Methyl Ethyl Ketone	1	0.8	4.5	2.5	0.115	1.0900	0.011	2507	2946	0.017	0.034
275 MTF	Methyl Formal (Dimethyl Formal)	1	0.86	16.42	2.6	0.199	1.3084	0.028	3009	4655	0.043	0.085
276 MHK	Methyl Heptyl Ketone	1	0.83	0.09	4.9	0.094	1.0012	0.007	2303	2317	0.011	0.021
278 MIK	Methyl Isobutyl Ketone	1	0.8	1.15	3.45	0.098	1.0230	0.008	2353	2533	0.013	0.025
281 MNA	1-Methyl Naphthalene	1	1.02	0.01	4.91	0.083	1.0002	0.007	2300	2302	0.010	0.021
283 MPN	2-Methyl-1-Pentene	1	0.69	6.3	2.9	0.139	1.1280	0.015	2590	3352	0.022	0.044
284 MTN	5-Methyl-1-Pentene	1	0.67	6.49	2.9	0.139	1.1606	0.016	2691	3719	0.027	0.054
286 MBE	Methyl Tert-Butyl Ether (MTBE)	1	0.74	0.04	3.1	0.083	1.0008	0.007	2302	2307	0.010	0.021
288 MNS	Mineral Spirits	1	0.78	0.2	4.3	0.086	1.0040	0.007	2309	2351	0.011	0.022
289 MRE	Myrcene	1	0.8	0.17	4.7	0.086	1.0034	0.007	2308	2346	0.011	0.022
296 NSV	Naphtha: Solvent	1	0.97	0.2	3.5	0.085	1.0040	0.007	2309	2341	0.011	0.022
298 NSS	Naphtha: Stoddard Solvent	1	0.78	0.2	4.3	0.086	1.0040	0.007	2309	2351	0.011	0.022
297 NVM	Naphtha: Varnish Maker's and Painters (76%)	1	0.77	0.19	4.3	0.086	1.0038	0.007	2309	2349	0.011	0.022
300 NAX	Nonane (all isomers)	1	0.72	0.27	4.4	0.087	1.0064	0.007	2312	2371	0.011	0.022

301 NAN	Nonane	1	0.72	0.27	4.4	0.087	1.0054	0.007	2312	2371	0.011	0.022	
304 NON	Nonene	1	0.73	0.35	4.3	0.088	1.0070	0.007	2316	2390	0.011	0.022	0.0...
305 NNS	Nonyl Alcohol (all isomers)	1	0.94	0.1	5	0.085	1.0020	0.007	2305	2330	0.011	0.021	0.032
306 NNN	Nonyl Alcohol	1	0.94	0.1	5	0.085	1.0020	0.007	2305	2330	0.011	0.021	0.032
307 NNI	Nonyl Alcohol (iso-)	1	0.94	0.1	5	0.085	1.0020	0.007	2305	2330	0.011	0.021	0.032
309 NNP	Nonyl Phenol	1	0.95	0.01	7.6	0.083	1.0002	0.007	2300	2304	0.010	0.021	0.032
316 OAX	Octane (all isomers)	1	0.7	0.79	3.9	0.094	1.0158	0.008	2336	2482	0.012	0.024	0.037
317 OAN	Octane	1	0.7	0.79	3.9	0.094	1.0158	0.008	2336	2482	0.012	0.024	0.037
318 OAA	Octanoic Acid (all isomers)	1	0.91	0.01	5	0.083	1.0002	0.007	2300	2302	0.010	0.021	0.032
319 OCX	Octanol (all isomers)	1	0.83	0.01	4.48	0.083	1.0002	0.007	2300	2302	0.010	0.021	0.032
320 OTA	Octanol	1	0.83	0.01	4.48	0.083	1.0002	0.007	2300	2302	0.010	0.021	0.032
321 OTX	Octane (all isomers)	2	0.72	0.9	3.9	0.095	1.0180	0.008	2341	2507	0.012	0.025	0.037
322 OTE	Octene (1-)	1	0.72	1	3.86	0.096	1.0200	0.008	2346	2528	0.013	0.025	0.038
324 OCX	Octyl Alcohol (iso-, n-) (all isomers). See Octanol (all is	1	0.83	0.01	4.48	0.083	1.0002	0.007	2300	2302	0.010	0.021	0.032
325 IOA	Octyl Alcohol	1	0.83	0.01	4.48	0.083	1.0002	0.007	2300	2302	0.010	0.021	0.032
364 OTW	Fuel: No. 2	1	0.88	0.56	8	0.101	1.0112	0.009	2326	2570	0.013	0.026	0.039
366 OFR	Fuel: No. 4	1	0.9	0.15	3.4	0.085	1.0030	0.007	2307	2330	0.011	0.021	0.032
367 OFV	Fuel: No. 5	1	0.94	0.15	3.4	0.085	1.0030	0.007	2307	2330	0.011	0.021	0.032
368 OSX	Fuel: No. 6	1	0.95	0.15	3.4	0.085	1.0030	0.007	2307	2330	0.011	0.021	0.032
382 OIL	OIL, Misc: Crude	1	0.85	0.15	3.4	0.085	1.0030	0.007	2307	2330	0.011	0.021	0.032
383 ODS	OIL, Misc: Diesel	1	0.9	0.69	3.4	0.091	1.0136	0.008	2332	2438	0.012	0.023	0.035
389 OLB	OIL, Misc: Lubricating	1	0.9	0.15	1	0.083	1.0030	0.007	2307	2306	0.010	0.021	0.032
403 ORS	OIL, Misc: Resin	1	1.02	0.15	1	0.083	1.0030	0.007	2307	2306	0.010	0.021	0.032
418 OTB	OIL, Misc: Turbine	1	0.87	0.3	5.4	0.089	1.0060	0.007	2314	2398	0.011	0.023	0.034
429 PDC	Pentadecanol, See Alcohols (C13 and above)	1	0.83	0.01	7.86	0.083	1.0002	0.007	2300	2304	0.010	0.021	0.032
432	NOT USED												
437	NOT USED												
442 PIN	Pinene	1	0.86	0.35	4.7	0.089	1.0070	0.007	2316	2399	0.011	0.023	0.034
448 PLB	Polybutene	1	0.91	0.01	79.3	0.087	1.0002	0.007	2300	2350	0.011	0.022	0.033
457 PGC	Polypropylene Glycol	1	1.01	0.1	1	0.083	1.0020	0.007	2305	2304	0.010	0.021	0.032
458 PGM	Polypropylene Glycol Methyl Ether	1	0.92	0.8	3.11	0.091	1.0160	0.008	2337	2445	0.012	0.023	0.036
464 IAC	Propyl Acetate (iso-)	1	0.89	1.8	3.52	0.104	1.0360	0.008	2383	2670	0.014	0.026	0.043
465 PAT	Propyl Acetate (n-)	1	0	1.85	3.52	0.105	1.0370	0.009	2385	2680	0.014	0.028	0.043
466 IPA	Propyl Alcohol (iso-)	1	0.79	3	2.07	0.098	1.0980	0.009	2438	2649	0.014	0.028	0.042
467 PAL	Propyl Alcohol (n-)	1	0.8	1.2	2.07	0.089	1.0240	0.008	2355	2438	0.012	0.023	0.035
468 PBZ	Propylbenzene (n-)	1	0.86	0.2	4.14	0.086	1.0040	0.007	2309	2349	0.011	0.022	0.033
469 IPX	Iso-Propylcyclohexane	1	0.8	0.01	4.35	0.083	1.0002	0.007	2300	2302	0.010	0.021	0.032
473 PPG	Propylene Glycol (1,2-Propandiol)	1	1.04	0.01	2.62	0.083	1.0002	0.007	2300	2301	0.010	0.021	0.032
476 PME	Propylene Glycol Methyl Ether	1	0.92	0.7	3.11	0.090	1.0140	0.008	2332	2427	0.012	0.023	0.035
478 PTT	Propylene Tetramer		0.29	0.02	1	0.083	1.0004	0.007	2301	2300	0.010	0.021	0.032
488 SFL	Sulfolane	1	1.26	0.01	4.14	0.083	1.0002	0.007	2300	2302	0.010	0.021	0.032
493 TTN	Tetradecanol	1	0.82	0	7.39	0.083	1.0000	0.007	2300	2299	0.010	0.021	0.032
494 TTD	1-Tetradecene, See the olefin or Alpha-Olefin Entries	1	0.77	0.01	6.77	0.083	1.0002	0.007	2300	2304	0.010	0.021	0.032
496 TTG	Tetraethylene Glycol	1	1.12	0.01	6.7	0.083	1.0002	0.007	2300	2304	0.010	0.021	0.032
497 THN	Tetrahydronaphthalene	1	0.97	0.04	4.66	0.084	1.0008	0.007	2302	2310	0.011	0.021	0.032
499 TOL	Toluene	1	0.87	1.5	3.14	0.098	1.0300	0.009	2369	2674	0.013	0.026	0.040
502 TCP	Tricresyl Phosphate (less than 1% of the ortho isomer)	1	1.16	0.01	12.69	0.084	1.0002	0.007	2300	2307	0.010	0.021	0.032
503 TRD	Tridecane	1	0.76	0.02	6.4	0.084	1.0004	0.007	2301	2307	0.010	0.021	0.032
505 TDN	Tridecanol , See Alcohols (C13 and above)	1	0.85	0.01	6.91	0.083	1.0002	0.007	2300	2304	0.010	0.021	0.032
506 TDC	1-Tridecene	1	0.77	0.01	6.29	0.083	1.0002	0.007	2300	2303	0.010	0.021	0.032
508 TEB	Triethylbenzene	1	0.86	0.02	5.6	0.083	1.0004	0.007	2301	2309	0.010	0.021	0.032
509 TEG	Triethylene Glycol	1	1.12	0.01	5.17	0.083	1.0002	0.007	2300	2303	0.010	0.021	0.032
510 TRE	Trimethylbenzenes (all isomers)	1	0.89	0.14	4.2	0.085	1.0028	0.007	2306	2335	0.011	0.021	0.033
520 TMB	Trimethyl Benzene (1,2,5-)	1	0.89	0.14	4.14	0.085	1.0028	0.007	2306	2334	0.011	0.021	0.032
521 TMD	Trimethyl Benzene (1,2,3-)	1	0.89	0.14	4.14	0.085	1.0028	0.007	2306	2334	0.011	0.021	0.032
522 TME	Trimethyl Benzene (1,2,4-) (Pseudocumene)	1	0.89	0.14	4.14	0.085	1.0028	0.007	2306	2334	0.011	0.021	0.032
529 TRP	Trixylenyl Phosphate	1	1.16	0	14.2	0.083	1.0000	0.007	2300	2299	0.010	0.021	0.032
533 UDC	Undecene (1-)	1	0.75	0.05	5.32	0.084	1.0010	0.007	2302	2316	0.011	0.021	0.032
534 UND	Undecyl Alcohol	1	0.84	0.01	6.94	0.083	1.0002	0.007	2300	2303	0.010	0.021	0.032
540 XLX	Xylenes (Ortho-, meta-, para-)	1	0.89	0.51	3.66	0.089	1.0102	0.008	2323	2410	0.011	0.023	0.035
547 XLM	Xylene (M-)	1	0.87	0.51	3.66	0.089	1.0102	0.008	2323	2410	0.011	0.023	0.035
548 XLO	Xylene (O-)	1	0.89	0.4	3.66	0.088	1.0080	0.007	2316	2386	0.011	0.022	0.034
549 XLP	Xylene (P-)	1	0.86	0.51	3.66	0.089	1.0102	0.008	2323	2410	0.011	0.023	0.035
550 XYL	Xylenol	1	1.01	0.1	3.66	0.084	1.0020	0.007	2305	2321	0.011	0.021	0.032

551	Zinc Dialkyldithiophosphate	Max.	1.260	15.420	79.300	0.189	1.306	0.028		3008	4855	0.043	0.065
		Min.	0.000	0.000	1.000	0.083	1.000	0.007		2300	2299	0.010	0.000

*when barge vapor piping is connected to facility vapor recovery system.

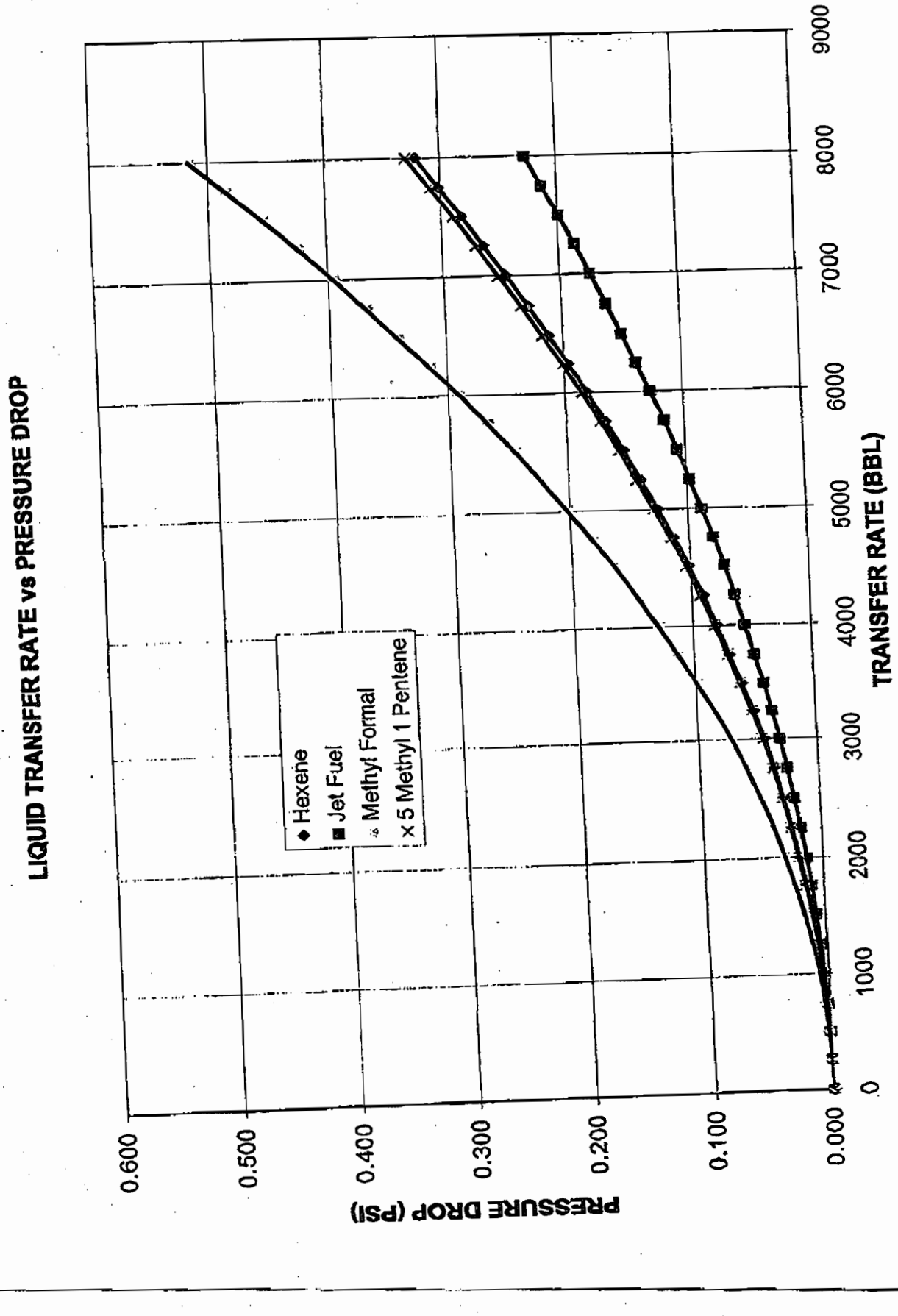
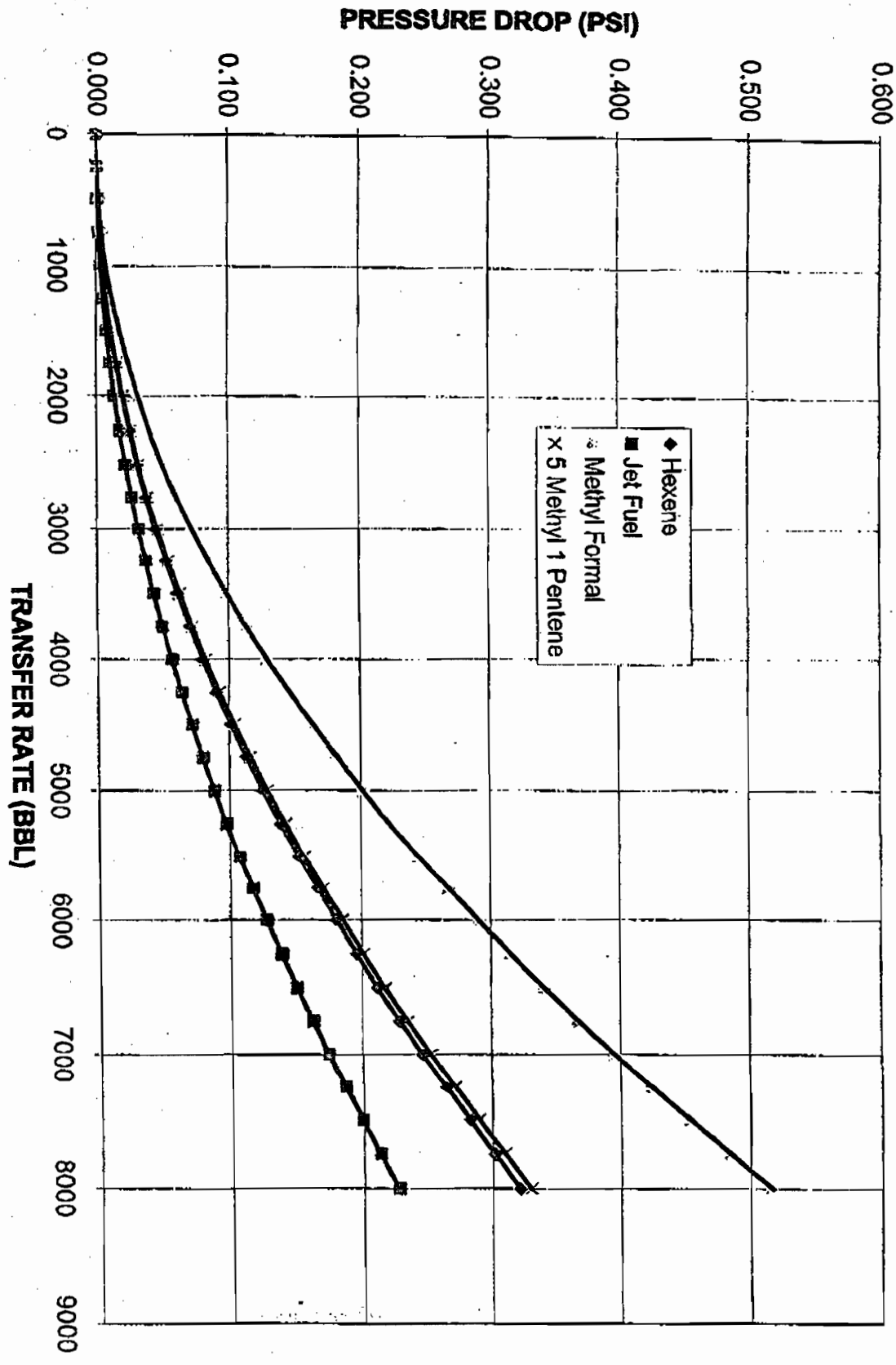

LIQUID TRANSFER RATE vs PRESSURE DROP
PRESSURE DROP (PSI)
0.600
0.500
0.400
0.300
0.200
0.100
0.000
TRANSFER RATE (BBL)
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
◆ Hexene
■ Jet Fuel
▲ Methyl Formal
× 5 Methyl 1 Pentene

TABLE 3 (SUB CHAPTER "O' CARGOES)

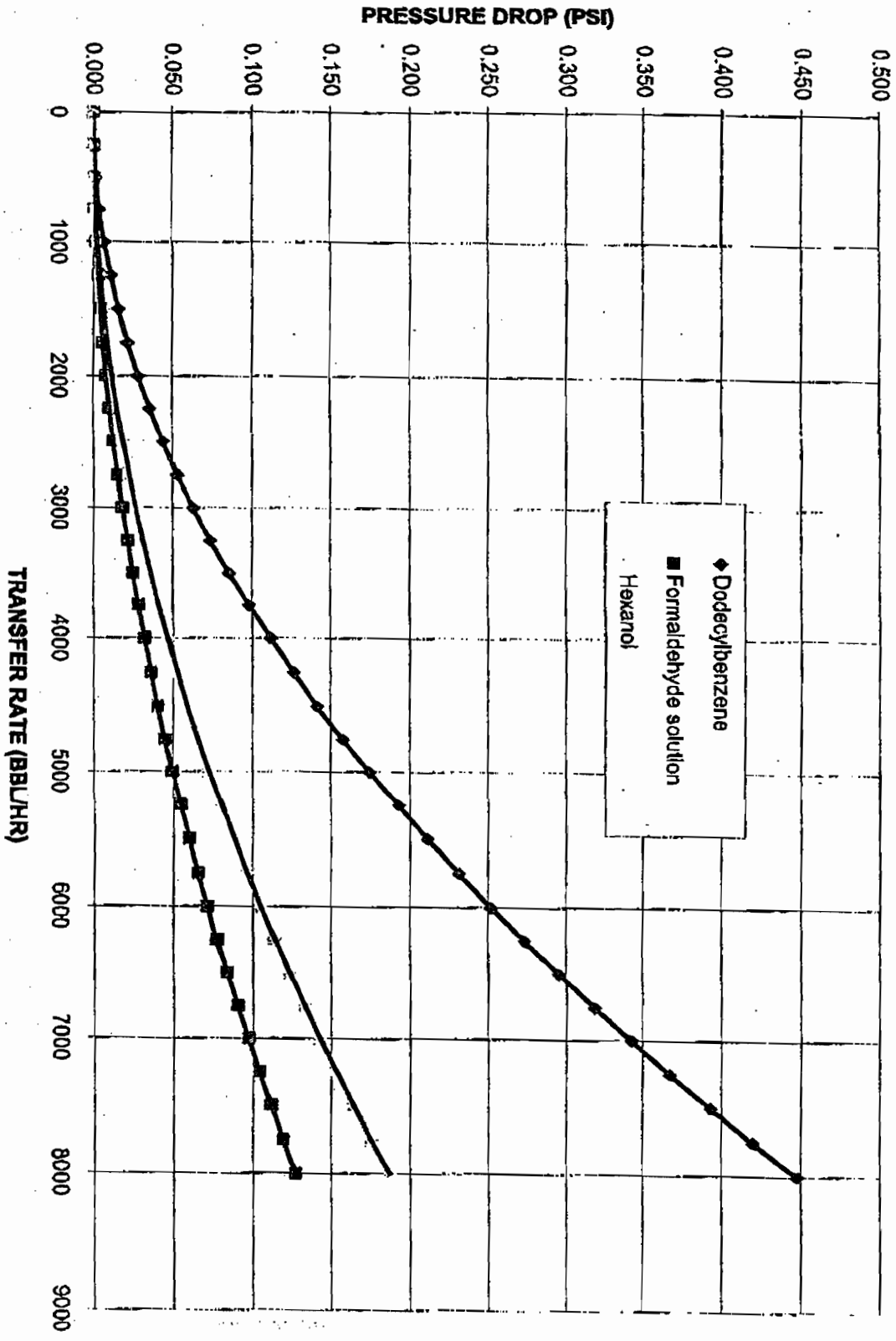
	CHRIS CODE	NAME	VCS CAT	LIQ SG	VAPOR PRESS	VAPOR SG	VAPOR AIR WEIGHT DENSITY	VAPOR GROWTH RATE	PRESSURE DROP TO PV VALVE IN VCS(psig) (LOADING)	VAPOR VOLUMETRIC FLOW RATE (bbl/h)	AIR EQUIVALENT VOLUMETRIC FLOW RATE	PRESSURE DROP TO SHORE CONNECTION IN VCS (psig) (LOADING)*	PRESSURE DROP TO PV VALVE IN VCS(psig) (UNLOADING)	PRESSURE DROP TO SHORE CONNECTION IN VCS (psig) (UNLOADING)*
1	ACN	Acrylonitrile	4	0.81	5.00	1.90	0.102	1.1000	0.011	2640	2922	0.017	0.006	0.009
2		NOT USED												
3	ADN	Adipontrile	1	0.95	0.01	3.73	0.083	1.0002	0.007	2400	2402	0.011	0.004	0.006
4	ATN	Acetonitrile	3	0.78	0.03	1.41	0.083	1.0006	0.007	2401	2402	0.011	0.004	0.006
5	BAD	Iso-Butyraldehyde	1	0.80	7.80	2.50	0.138	1.1560	0.017	2774	3575	0.025	0.008	0.013
6	BAN	Butyl alcohol (n-)	1	0.81	0.50	2.60	0.087	1.0100	0.008	2424	2477	0.012	0.004	0.006
7	BAR	Butyl acrylate (iso-, n-)	2	0.90	0.60	4.42	0.093	1.0120	0.009	2429	2565	0.013	0.004	0.007
8	BCN	Butyl acetate (n-)	1	0.88	0.80	4.00	0.094	1.0160	0.009	2438	2598	0.013	0.004	0.007
9	BNZ	Benzene	1	0.88	4.50	2.80	0.121	1.0900	0.013	2616	3157	0.020	0.007	0.010
10	BTR	n-Butyraldehyde	1	0.80	7.80	2.50	0.138	1.1560	0.017	2774	3575	0.025	0.008	0.013
11	BTX	Benzene, Toluene, Xylene mixtures (10% Benzene or more)	1	0.84	7.30	2.80	0.145	1.1460	0.017	2750	3629	0.026	0.009	0.013
12	CCH	Cyclohexanone	1	0.95	0.20	3.40	0.085	1.0040	0.008	2410	2441	0.012	0.004	0.006
13	CHA	Cyclohexylamine	1	0.87	0.62	3.42	0.090	1.0124	0.008	2430	2530	0.013	0.004	0.006
14	CHX	Cyclohexane	1	0.78	4.50	2.90	0.123	1.0900	0.013	2616	3185	0.020	0.007	0.010
15	CPD	1,3-Cyclopentadiene dimer (molten)	2	0.89	0.25	4.55	0.087	1.0050	0.008	2412	2471	0.012	0.004	0.006
16	CRB	Chlorobenzene	1	1.11	0.80	3.88								
17	CRS	Cresols	1	1.05	0.06	3.72								
18	DAN	Decyl alcohol (n-)	1	0.83	0.01	5.30	0.083	1.0002	0.007	2400	2403	0.011	0.004	0.006
19	DCH	1,1-Dichloroethane	1	1.18	9.90	3.41	0.195	1.1980	0.025	2875	4404	0.038	0.013	0.020
20	DDB	Dodecylbenzene	1	0.86	4.70	8.40	0.248	1.0940	0.027	2626	4520	0.040	0.014	0.021
21	DEG	Diethylene glycol	1	1.12	0.01	3.66	0.083	1.0002	0.007	2400	2402	0.011	0.004	0.006
22	DEN	Diethylamine	3	0.71	1.00	2.50	0.090	1.0200	0.008	2448	2549	0.013	0.004	0.007
23	DIP	Diisopropanolamine	1	0.98	0.01	4.59	0.083	1.0002	0.007	2400	2402	0.011	0.004	0.006
24	DMF	Dimethylformamide	1	0.95	0.30	2.51	0.085	1.0060	0.008	2414	2444	0.012	0.004	0.006
25	DOD	Dodecene	1	0.76	0.02	5.81	0.083	1.0004	0.008	2401	2407	0.011	0.004	0.006
26	DPG	Dipropylene glycol	1	1.03	0.07	4.63	0.084	1.0014	0.008	2403	2420	0.012	0.004	0.006
27	DPX	1,1-, 1,2-, or 1,3-Dichloropropane	3	1.16	6.30	3.90	0.169	1.1260	0.019	2702	3861	0.029	0.010	0.015
28	EAC	Ethyl acrylate	2	0.93	2.00	3.50	0.106	1.0400	0.010	2496	2928	0.016	0.005	0.008
29	EAI	2-Ethylhexyl acrylate	2	0.89	0.02	6.35	0.084	1.0004	0.008	2401	2408	0.011	0.004	0.006
30	EDC	Ethylene dichloride	1	1.25	4.00	3.42	0.126	1.0800	0.013	2592	3223	0.020	0.007	0.010
31	EGL	Ethylene glycol	1	1.13	0.01	2.21	0.083	1.0002	0.007	2400	2401	0.011	0.004	0.006
32	EHX	2-Ethyl hexanol	1	0.84	0.02	4.50	0.083	1.0004	0.008	2401	2405	0.011	0.004	0.006
33	ETA	Ethyl acetate	1	0.90	4.50	3.04	0.126	1.0900	0.013	2616	3223	0.020	0.007	0.010
34	FFA	Furfural	1	1.20	0.15	3.31	0.085	1.0030	0.008	2407	2430	0.012	0.004	0.006
35	FMS	Formaldehyde solution (37% to 50%)	1	1.13	0.15	1.03	0.083	1.0030	0.008	2407	2407	0.011	0.004	0.006
36		NOT USED												
37		NOT USED												
38		NOT USED												
39		NOT USED												
40		NOT USED												
41		NOT USED												
42		NOT USED												
43		NOT USED												
44	HMX	Heptane (all isomers)	1	0.68	2.50	3.45	0.112	1.0500	0.011	2520	2923	0.017	0.006	0.009
45	HPX	Heptene (all isomers)	2	0.70	2.90	3.40	0.116	1.0560	0.012	2539	2996	0.018	0.006	0.009
46		NOT USED												
47	HXN	Hexanol	1	0.82	1.00	3.62	0.095	1.0200	0.009	2448	2616	0.013	0.005	0.007
48	IPA	Propyl alcohol (iso)	1	0.79	3.00	2.07	0.099	1.0600	0.010	2544	2764	0.015	0.005	0.008
49	KRS	Kerosene	1	0.81	0.15	4.50	0.085	1.0030	0.008	2407	2442	0.012	0.004	0.006
50	MAL	Methyl alcohol	1	0.79	6.63	1.10	0.088	1.1326	0.010	2718	2768	0.015	0.005	0.008
51	MAM	Methyl acrylate	2	0.95	4.10	3.00	0.121	1.0820	0.013	2597	3140	0.019	0.007	0.010
52	MBE	Methyl tert-butyl ether	1	0.74	0.04	3.10	0.083	1.0008	0.008	2402	2407	0.011	0.004	0.006

	Methyl vinyl ketone	1	0.80	4.80	2.80	0.116	1.0900	0.012	2616	3074	0.019	0.006	0.0
54 MMM	Methyl methacrylate	2	0.94	2.02	3.46	0.108	1.0404	0.010	2497	2624	0.016	0.005	0.006
55 MNS	Mineral spirits	1	0.75	0.20	4.30	0.086	1.0040	0.008	2410	2453	0.012	0.004	0.006
56 MPL	Morpholine	1	1.00	0.90	3.00	0.091	1.0160	0.008	2438	2546	0.013	0.004	0.007
57 MTT	Methyl acetate	1	0.92	6.10	2.60	0.129	1.1220	0.015	2693	3353	0.022	0.007	0.011
58 NNN	Nonyl alcohol	1	0.94	0.10	6.00	0.085	1.0020	0.008	2406	2431	0.012	0.004	0.006
59 NON	Nonene	2	0.73	0.35	4.30	0.086	1.0070	0.008	2417	2494	0.012	0.004	0.006
60 NPM	1- or 2-Nitropropane	1	0.99	1.05	3.06	0.093	1.0210	0.009	2450	2595	0.013	0.004	0.007
61 NSV	Naphtha: Solvent	1	0.87	0.20	3.50	0.085	1.0040	0.008	2410	2443	0.012	0.004	0.006
62 NVM	Naphtha: VM & P (75% Naphtha)	1	0.77	0.19	4.30	0.086	1.0036	0.008	2409	2451	0.012	0.004	0.006
63 OIL	Oil, misc: Crude	1	0.95	0.15	3.40	0.085	1.0030	0.008	2407	2431	0.012	0.004	0.006
64 OTW	Oil, Fuel: No. 2	1	0.88	0.56	8.00	0.101	1.0112	0.009	2427	2661	0.014	0.005	0.007
65 PRD	Pyridine	1	0.98	1.30	2.72	0.093	1.0260	0.009	2462	2613	0.013	0.005	0.007
66 PBY	Propylbenzene	1	0.86	0.60	4.20	0.092	1.0120	0.009	2429	2556	0.013	0.004	0.007
67 STY	Styrene	2	0.92	0.40	3.60	0.088	1.0080	0.008	2419	2469	0.012	0.004	0.006
68 TCN	1,2,3-Trichloropropane	3	1.39	0.15	5.69	0.086	1.0030	0.008	2407	2453	0.012	0.004	0.006
69 TEN	Triethylamine	3	0.73	2.50	3.49	0.112	1.0500	0.011	2520	2929	0.017	0.006	0.009
70 THF	Tetrahydrofuran	1	0.89	8.50	1.35	0.097	1.1700	0.012	2808	3004	0.016	0.006	0.009
71 TOL	Toluene	1	0.87	1.50	3.14	0.096	1.0300	0.009	2472	2686	0.014	0.005	0.007
72 VAM	Vinyl acetate	2	0.94	5.80	2.97	0.137	1.1160	0.015	2678	3435	0.023	0.008	0.012
		Max.	1.39	12.5	8.40	0.246	1.198	0.027	2875	4520	0.040	0.014	0.021
		Min.	0.69	0.01	1.03	0.083	1.000	0.007	2400	2401	0.011	0.004	0.006

*when barge vapor piping is connected to facility vapor recovery system.



LIQUID TRANSFER RATE vs PRESSURE DROP


LIQUID TRANSFER RATE vs PRESSURE DROP
(SUBCHAPTER "O" CARGOES)
PRESSURE DROP (PSI)
0.000
0.050
0.100
0.150
0.200
0.250
0.300
0.350
0.400
0.450
0.500
TRANSFER RATE (BBL/HR)
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
◆Dodecylbenzene
■Formaldehyde solution
Hexanol

070101-1.....GENERAL ARRANGEMENT
070101-2.....CARGO PIPING ARRANGEMENT
070101-4.....HEATING SYSTEM ARRANGEMENT

GENERAL NOTES

1. P/V VALVES SHALL BE SET @ 2.0 PSIG PRES. & -.5 PSIG VAC.
2. ENDS OF THE VAPOR MANIFOLD SHOULD BE PAINTED AS SHOWN IN DETAIL "1" IN ACCORDANCE WITH CRF 46 PART 39.20-D-(d).
3. THE VAPOR COLLECTION PIPING MUST BE ELECTRICALLY CONTINUOUS AND BONDED TO THE HULL.
4. NO VAPOR COLLECTION HOSES ARE TO BE CARRIED ABOARD THE BARGE.
5. PIPING SYSTEM TO BE U.S.C.G. CLASS II SYSTEM.
6. PIPING SYSTEM TO BE AIR TESTED TO 1.5 PSI IN ASSOCIATION WITH SOAPY WATER SOLUTION.

Subject to comments in Marine Safety Center letter of

APR 16 2008

APPROVED

NO.	REVISION	BY	DATE
2	INCORPORATED USCG COMMENTS PER LETTER 16710/P013823 DATED 3/24/08	RF	4/1/08
1	INCORPORATED USCG COMMENTS.	RF	8/22/07

PREPARED FOR:

C&C MARINE AND REPAIR

SHEARER & ASSOC., INC.
NAVAL ARCHITECTS
NEW ORLEANS •HOUSTON •NASHVILLE

200'-0" x 35'-0" x 12'-6"
DOUBLE SKIN TANK BARGE

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SCALE: 1/8"=1'-0" U.N.	APPROVED BY:	DRAWN BY: KTS
DATE: 11/08/07		REV. No. 2

VAPOR CONTROL SYSTEM ARRANGEMENT

JOB A-1182	HULL 95-104 HULL 111-126	DRAWING NUMBER 070101-3

53 MEK	Methyl ethyl ketone	1	0.80	4.50	2.50	0.115	1.0900	0.012	2615	3074	0.019	0.006	0.0
54 MMM	Methyl methacrylate	2	0.94	2.02	3.45	0.106	1.0404	0.010	2497	2824	0.016	0.005	0.008
55 MNS	Mineral spirits	1	0.76	0.20	4.30	0.086	1.0040	0.008	2410	2453	0.012	0.004	0.006
56 MPL	Morpholine	1	1.00	0.80	3.00	0.091	1.0160	0.008	2438	2645	0.013	0.004	0.007
57 MTT	Methyl acetate	1	0.92	5.10	2.60	0.129	1.1220	0.015	2693	3353	0.022	0.007	0.011
58 NNN	Nonyl alcohol	1	0.94	0.10	5.00	0.086	1.0020	0.008	2405	2431	0.012	0.004	0.006
59 NON	Nonene	2	0.73	0.35	4.30	0.088	1.0070	0.009	2417	2494	0.012	0.004	0.006
60 NPM	1- or 2-Nitropropane	1	0.99	1.05	3.06	0.093	1.0210	0.009	2450	2595	0.013	0.004	0.007
61 NSV	Naphtha:Solvent	1	0.87	0.20	3.50	0.085	1.0040	0.008	2410	2443	0.012	0.004	0.006
62 NVM	Naphtha:VM & P (76% Naphtha)	1	0.77	0.19	4.30	0.086	1.0038	0.008	2409	2451	0.012	0.004	0.006
63 OIL	Oil,misc:Crude	1	0.95	0.15	3.40	0.086	1.0030	0.008	2407	2431	0.012	0.004	0.006
64 OTW	Oil,Fuel:No.2	1	0.88	0.56	6.00	0.101	1.0112	0.009	2427	2661	0.014	0.005	0.007
65 PRD	Pyridine	1	0.96	1.30	2.72	0.093	1.0260	0.009	2462	2613	0.013	0.005	0.007
66 PBY	Propylbenzene	1	0.86	0.60	4.20	0.092	1.0120	0.008	2429	2556	0.013	0.004	0.007
67 STY	Styrene	2	0.92	0.40	3.60	0.088	1.0080	0.008	2419	2489	0.012	0.004	0.006
68 TCN	1,2,3-Trichloropropane	3	1.39	0.15	5.60	0.086	1.0030	0.008	2407	2453	0.012	0.004	0.006
69 TEN	Triethylamine	3	0.73	2.50	3.49	0.112	1.0500	0.011	2520	2929	0.017	0.006	0.009
70 THF	Tetrahydrfuran	1	0.89	5.50	1.35	0.097	1.1700	0.012	2808	3034	0.016	0.006	0.009
71 TOL	Toluene	1	0.87	1.50	3.14	0.096	1.0300	0.009	2472	2666	0.014	0.005	0.007
72 VAM	Vinyl acetate	2	0.94	5.80	2.97	0.137	1.1160	0.015	2678	3435	0.023	0.008	0.012
		Max.	1.39	12.5	8.40	0.246	1.195	0.027	2876	4520	0.040	0.014	0.021
		Min.	0.63	0.01	1.03	0.083	1.000	0.007	2400	2401	0.011	0.004	0.006

*when barge vapor piping is connected to facility vapor recovery system.

TABLE 3 (SUB CHAPTER "O" CARGOES)

CHRIS CODE	NAME	VCS CAT	LIQ SG	VAPOR PRESS	VAPOR SG	VAPOR AIR WEIGHT DENSITY	VAPOR GROWTH RATE	PRESSURE DROP TO PV VALVE IN VCS(psig) (LOADING)	VAPOR VOLUMETRIC FLOW RATE (bbl/h)	AIR EQUIVALENT VOLUMETRIC FLOW RATE	PRESSURE DROP TO SHORE CONNECTION IN VCS (psig) (LOADING)*	PRESSURE DROP TO PV VALVE IN VCS(psig) (UNLOADING)	PRESSURE DROP TO SHORE CONNECTION IN VCS (psig) (UNLOADING)*
1 ACN	Acrylonitrile	4	0.81	5.00	1.80	0.102	1.1000	0.011	2640	2922	0.017	0.006	0.009
2	NOT USED												
3 ADN	Adiponitrile	1	0.95	0.01	3.73	0.083	1.0002	0.007	2400	2402	0.011	0.004	0.006
4 ATN	Acetonitrile	3	0.78	0.03	1.41	0.083	1.0006	0.007	2401	2402	0.011	0.004	0.006
5 BAD	Iso-Butyraldehyde	1	0.80	7.80	2.50	0.138	1.1560	0.017	2774	3575	0.025	0.008	0.013
6 BAN	Butyl alcohol (n-)	1	0.81	0.50	2.60	0.087	1.0100	0.008	2424	2477	0.012	0.004	0.006
7 BAR	Butyl acrylate (iso-, n-)	2	0.90	0.60	4.42	0.093	1.0120	0.009	2429	2586	0.013	0.004	0.007
8 BCN	Butyl acetate (n-)	1	0.88	0.80	4.00	0.094	1.0160	0.009	2438	2598	0.013	0.004	0.007
9 BNZ	*Benzene*	1	0.88	4.50	2.80	0.121	1.0900	0.013	2616	3157	0.020	0.007	0.010
10 BTR	n-Butyraldehyde	1	0.80	7.80	2.50	0.138	1.1560	0.017	2774	3575	0.025	0.008	0.013
11 BTX	Benzene, Toluene, Xylene mixtures (10% Benzene or more)	1	0.84	7.30	2.80	0.145	1.1460	0.017	2750	3629	0.026	0.009	0.013
12 CCH	Cyclohexanone	1	0.95	0.20	3.40	0.085	1.0040	0.008	2410	2441	0.012	0.004	0.006
13 CHA	Cyclohexylamine	1	0.87	0.62	3.42	0.090	1.0124	0.008	2430	2530	0.013	0.004	0.006
14 CHX	Cyclohexane	1	0.78	4.50	2.90	0.123	1.0900	0.013	2616	3186	0.020	0.007	0.010
15 CPD	1,3-Cyclopentadiene dimer (molten)	2	0.89	0.25	4.55	0.087	1.0050	0.008	2412	2471	0.012	0.004	0.006
16 CRB	Chlorobenzene	1	1.11	0.80	3.88								
17 CRS	Cresols	1	1.05	0.06	3.72								
18 DAN	Decyl alcohol (n-)	1	0.83	0.01	5.30	0.083	1.0002	0.007	2400	2403	0.011	0.004	0.006
19 DCH	1,1-Dichloroethane	1	1.18	9.90	3.41	0.195	1.1980	0.025	2875	4404	0.038	0.013	0.020
20 DDB	Dodecylbenzene	1	0.86	4.70	8.40	0.248	1.0940	0.027	2626	4520	0.040	0.014	0.021
21 DEG	Diethylene glycol	1	1.12	0.01	3.66	0.083	1.0002	0.007	2400	2402	0.011	0.004	0.006
22 DEN	Diethylamine	3	0.71	1.00	2.50	0.090	1.0200	0.008	2448	2549	0.013	0.004	0.007
23 DIP	Diisopropanolamine	1	0.98	0.01	4.59	0.083	1.0002	0.007	2400	2402	0.011	0.004	0.006
24 DMF	Dimethylformamide	1	0.95	0.30	2.51	0.085	1.0060	0.008	2414	2444	0.012	0.004	0.006
25 DOD	Dodecene	1	0.76	0.02	5.81	0.083	1.0004	0.008	2401	2407	0.011	0.004	0.006
26 DPG	Dipropylene glycol	1	1.03	0.07	4.63	0.084	1.0014	0.008	2403	2420	0.012	0.004	0.006
27 DPX	1,1-,1,2-, or 1,3-Dichloropropane	3	1.16	6.30	3.90	0.169	1.1260	0.019	2702	3851	0.029	0.010	0.015
28 EAC	Ethyl acrylate	2	0.93	2.00	3.50	0.105	1.0400	0.010	2496	2826	0.016	0.005	0.008
29 EAI	2-Ethylhexyl acrylate	2	0.89	0.02	6.35	0.084	1.0004	0.008	2401	2408	0.011	0.004	0.006
30 EDC	Ethylene dichloride	1	1.26	4.00	3.42	0.128	1.0800	0.013	2592	3223	0.020	0.007	0.010
31 EGL	Ethylene glycol	1	1.13	0.01	2.21	0.083	1.0002	0.007	2400	2401	0.011	0.004	0.006
32 EHX	2-Ethyl hexanol	1	0.84	0.02	4.50	0.083	1.0004	0.008	2401	2405	0.011	0.004	0.006
33 ETA	Ethyl acetate	1	0.90	4.50	3.04	0.126	1.0900	0.013	2616	3223	0.020	0.007	0.010
34 FFA	Furfural	1	1.20	0.15	3.31	0.085	1.0030	0.008	2407	2430	0.012	0.004	0.006
35 FMS	Formaldehyde solution (37% to 50%)	1	1.13	0.15	1.03	0.083	1.0030	0.008	2407	2407	0.011	0.004	0.006
36	NOT USED												
37	NOT USED												
38	NOT USED												
39	NOT USED												
40	NOT USED												
41	NOT USED												
42	NOT USED												
43	NOT USED												
44 HMX	Heptane (all isomers)	1	0.68	2.50	3.45	0.112	1.0500	0.011	2520	2923	0.017	0.006	0.009
45 HPX	Heptene (all isomers)	2	0.70	2.90	3.40	0.116	1.0580	0.012	2539	2996	0.018	0.006	0.009
46	NOT USED												
47 HXN	Hexanol	1	0.82	1.00	3.52	0.095	1.0200	0.009	2448	2616	0.013	0.005	0.007
48 IPA	Propyl alcohol (iso)	1	0.79	3.00	2.07	0.098	1.0600	0.010	2544	2764	0.015	0.005	0.008
49 KRS	Kerosene	1	0.81	0.15	4.50	0.085	1.0030	0.008	2407	2442	0.012	0.004	0.006
50 MAL	Methyl alcohol	1	0.79	6.63	1.10	0.086	1.1326	0.010	2718	2768	0.015	0.005	0.008
51 MAM	Methyl acrylate	2	0.95	4.10	3.00	0.121	1.0820	0.013	2597	3140	0.019	0.007	0.010
52 MBE	Methyl tert-butyl ether	1	0.74	0.04	3.10	0.083	1.0008	0.008	2402	2407	0.011	0.004	0.006