

U.S. Department of
Homeland Security

United States
Coast Guard



Commanding Officer
United States Coast Guard
Marine Safety Center

2100 2nd Street, S.W. Stop 7102
Washington, DC 20593-7102
Staff Symbol: MSC-3
Phone: (202) 475-3403
Fax: (202) 475-3920
Email: msc@uscg.mil

16710/P007994/rtw
Serial: E2-1202343
May 11, 2012

Marine Solutions Inc.
Attn: Mr. Chetan Kumaria
7985 Boone Trace
Nashville, TN 37221

Subj: CBC 336, O.N. 1119685, Trinity Marine, Ashland Hull 4402
CBC 337, O.N. 1119686, Trinity Marine, Ashland Hull 4403
Trinity Ashland Shipyard Hull 4404
297.5' x 54' x 12' Unmanned Tank Barge (D)
High Level Overfill Alarm/ Capacitance & Inductance Calculations / Hazardous Area

Ref: (a) Dwg. No. 031202HL-1, SH 1-1, Rev 0, "High Level/Overfill Alarm System"
(b) Dwg. No. 031202HZ-1, SH 1-1, Rev 0, "Hazardous Area Plan"
(c) Capacitance and Inductance Calculations
(d) Navigation and Vessel Inspection Circular (NVIC) 10-92, Change 2, "Coast Guard Recognition of Registered Professional Engineer Certification of Compliance with Coast Guard Requirements."
(e) Telephonic correspondence between CWO Williams and Mr. Kumaria May 8, 2012

Dear Mr. Kumaria:

We reviewed reference s (a) through (c), submitted electronically by your email dated May 1, 2012 under the provisions of reference (d) References (a) through (c) received partial review by Marine Safety Center for compliance with 46 CFR Subchapter D. Accordingly, references (a) and (b) are **"Approved in accordance with NVIC 10-92, Ch-2"** Reference (c) was **"Examined in accordance with NVIC 10-92, Ch-2,"** as these documents are not normally approved but contain information referred to during our review process. The installation, workmanship, and testing shall be accomplished to the satisfaction of the cognizant Officer in Charge, Marine Inspection (OCMI). The following comments apply:

1. We note from your letter that the cargo on this barge will be Grade A and below. The OCMI must be satisfied that the overall electrical installation will conform to the applicable sections of Subpart 111.105 for hazardous locations and 38.15-15 for Subchapter D vessels.
2. The exhaust system location of cargo pump and/or other engines on tank barges must exceed 10 ft from the nearest source of flammable vapor or gas per 4-1-1/15.3 of ABS Rules for Building and Classing Steel Vessels for Service on Rivers and Intracoastal Waterways 2007 or test that provides an equivalent level of safety as determined by the Marine Safety Center per 46 CFR 110.20-1.

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High Level Overfill Alarm/ Capacitance & Inductance Calculations / Hazardous Area

3. A tank vessel designed to carry hazardous material will require an emergency shutdown system per 33CFR 155.780. Please indicate compliance with this regulation to the OCMI.
4. If relevant to this barge, indicate to the marine inspector that the cargo overfill system will comply with the applicable subparagraphs of 33CFR 155.480(b) (2).
5. As discussed in reference (e), the generator set and thermal fluid heater is only to be operated with Grade E Cargos. Any exception to this is at the discretion of the OCMI and shall be endorsed as operational restriction on the vessel's Certificate of Inspection.
6. No electrical or spark producing equipment shall be located inside a Hazardous Area carrying Cargo Grades A through D unless they meet 46 CFR 111.105 and in addition the electrical oil immersion heaters shall meet 46 CFR 111.85

As with all plans and calculations accepted under the provisions of NVIC 10-92, CH-2, the primary responsibility for accuracy and compliance with applicable regulatory requirements rests with the certifying Professional Engineer. The installation, workmanship and testing shall be to the satisfaction of the cognizant Officer in Charge, Marine Inspection (OCMI). Our approval does not in any way limit the authority of the cognizant OCMI to require correction of material, design, construction, installation, etc. that are found not to be in compliance with Coast Guard requirements.

As an agreed upon condition for participating in our Electronic Commerce Program, you must provide a copy of reference (a) through (c) to the OCMI in whose zone the work is to be accomplished.

Our Project Number for this vessel is P008015. Ensure that future correspondence includes the Project Number, and Official Number.

Please contact CWO R. T. Williams at 202-475-3368 with questions concerning our review.

Sincerely,



M. A. HOSSAIN
Chief, Electrical Branch
U. S. Coast Guard
By direction

Copy: Commanding Officer, Coast Guard Marine Safety Unit Port Arthur

U.S. Department of
Homeland Security

United States
Coast Guard



Commanding Officer
United States Coast Guard
Marine Safety Center

2100 2nd Street, S.W. Stop 7102
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16710/ P007994
Serial: C1-1201999
April 19, 2012

Marine Solutions, Inc
Attn: Mr. Chetan Kumaria
7985 Boone Trace
Nashville, TN 37221
Email: MARINESOLINC@aol.com

Subj: CBC 336, O.N. 1119685, Trinity Marine, Ashland Hull 4402
CBC 337, O.N. 1119686, Trinity Marine, Ashland Hull 4403
297'-6" x 54' x 12' Unmanned Tank Barge (D)
Grade B (max. 25 psia Reid) and Lower Flammable or Combustible Liquids Identified in
46 CFR Table 30.25-1 or 46 CFR Part 153 Table 2
Design Density 8.7 lbs/gal;
Rivers; Lakes, Bays, and Sounds; Limited Coastwise on unmanned fair weather voyages
only, not more than 12 miles offshore between St. Marks and Carrabelle, Florida
Vapor Collection System and List of Authorized Cargoes

Ref: (a) Marine Solutions, Inc., Dwg. No. 031202VP-1, Rev 0, "Vapor Piping Addition", dated
March 16, 2012
(b) Marine Solutions, Inc., Dwg. No. 041201VP-1, Rev 0, "Vapor Piping Addition", dated
April 10, 2012
(c) Marine Solutions, Inc., "Vapor Collection System Calculations for Barge Name(s):
CBC 336", dated April 11, 2012
(d) Marine Solutions, Inc., "Vapor Collection System Calculations for Barge Name(s):
CBC 337", dated April 12, 2012
(e) MSC Letter, Serial No. C1-120200x, dated April xx, 2012
(f) Your email dated April 19, 2012
(g) Navigation and Vessel Inspection Circular (NVIC) 10-92, Change 2, "Coast Guard
Recognition of Registered Professional Engineer Certification of Compliance with
Coast Guard Requirements"

Dear Mr. Kumaria:

We received references (a) through (d), submitted with your letter dated April 10, 2012, April 11, 2012, and April 12, 2012, under the provisions of reference (g). References (a) through (d) have received partial technical review by the Marine Safety Center for compliance with 46 CFR Part 39, excluding Subpart 39.40. The vapor collection system piping plan, references (a) and (b), are **"Approved in accordance with NVIC 10-92, CH-2."** The pressure drop calculations, references (c) and (d), are **"Examined in accordance with NVIC 10-92, CH-2."** 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:

Subj: CBC 336 & CBC 337, Trinity Marine, Ashland Hulls 4402 & 4403
Vapor Collection System and List of Authorized Cargoes

1. As with all plans and calculations accepted under the provisions of reference (g), the primary responsibility for accuracy and compliance with applicable regulatory requirements rests with the certifying Professional Engineer. The installation, workmanship and testing shall be to the satisfaction of the cognizant Officer in Charge, Marine Inspection (OCMI). Our approval does not in any way limit the authority of the cognizant OCMI to require correction of material, design, equipment, construction, installation, etc. that are found not to be in compliance with Coast Guard requirements.

2. Based on your calculations, this VCS is capable of recovering vapors of the cargoes listed in enclosure (1) at a maximum vapor-air mixture density of **0.336 lbm/ft³**, at a maximum liquid load rate of **5,000 bbl/hr**, and a maximum liquid discharge rate of **3,000 bbl/hr**.

3. In accordance with references (c) and (d), the set-point of the overfill shutdown system shall be no higher than **9 inches** below the trunk top at centerline of each cargo tank.

4. Please provide documentation showing that the barge's high level alarm and overfill shutdown systems are in compliance with 46 CFR 39.20-9. If plans have not already been approved, they should be submitted to the MSC Electrical Branch. For questions concerning electrical plan review contact Mr. Akhtar Hossain, MSC Electrical Branch Chief at the number above.

5. The oil transfer procedures shall include a table or graph showing the liquid transfer rate versus the pressure drop, as required by 46 CFR 39.30-1(b)(3), to the satisfaction of the cognizant OCMI. This information must be taken from the calculations, tables, and graphs contained within references (c) and (d).

6. 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.

7. Enclosure (1) contains VCS Category 2, 4, and/or 7 cargoes. Polymerization and residue build-up of these cargoes can adversely affect the operation of the vapor collection 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.

8. References (c) and (d) contain calculations to justify dual loading operations. After reviewing your calculations, we confirm that you adequately demonstrated that these vessels are capable of conducting dual loading operations. Tandem loading is limited to simultaneous collection of those cargoes listed in the vessels' CAA at a maximum combined transfer rate of **5,000 bbl/hr**. Please note that this letter does not constitute final approval for dual loading as the Marine Safety Center only reviews technical calculations for such operations. For final approval you must submit your request to Commandant (CG-5215) with the name of the facility where the vessels will be conducting dual loading operations.

16710/ P007994
Serial: C1-1201999
April 19, 2012

Subj: CBC 336 & CBC 337, Trinity Marine, Ashland Hulls 4402 & 4403
Vapor Collection System and List of Authorized Cargoes

9. The Cargo Authority Attachment (CAA) for the vessel is now available in the Coast Guard's Marine Information for Safety and Law Enforcement (MISLE). The CAA will contain the cargoes found in enclosure (1). Please note that only the cognizant OCMI can issue a vessel's CAA, which is valid only when referenced by and attached to a valid Certificate of Inspection (COI). The OCMI will verify the carriage authority and vapor control tank group characteristics we used to create enclosure (1) are consistent with the vessel's actual construction. Enclosure (2) contains the VCS tank group characteristics and our recommended COI endorsement.

As a condition of your participation in MSC's electronic commerce program, you must provide a copy of the approved drawings to the OCMI, along with a copy of the corresponding MSC approval letter.

Our Project Number for this vessel is **P007994**. Please ensure that future correspondence includes the Project Number or the Official Number of the barge.

If you have any questions concerning our review, please contact Lieutenant Tony Cao at the number listed above.

Sincerely,



R. J. LECHNER
Commander, U. S. Coast Guard
Chief, Tank Vessel and Offshore Division
By direction

Encl: (1) Vapor Collection System List of Cargoes; CBC 336 & CBC 337, Trinity Marine, Ashland Hulls 4402 & 4403; dated April 19, 2012
(2) VCS PRIS; CBC 336 & CBC 337, Trinity Marine, Ashland Hulls 4402 & 4403; dated April 19, 2012

Copy: Commander, Coast Guard Marine Safety Unit Port Arthur, w/ enclosures
Commandant, U. S. Coast Guard (CG-5215), via email

Vapor Control System List of Cargoes

for: CBC 336 & CBC 337, O.N. 1119685 & 1119686, Trinlnty Ashland Hull , 4402 & 4403

Chem Code	Chemical Name	VCS Category
ACT	Acetone	1
ACP	Acetophenone	1
APU	Alcohol(C12-C16) poly(1-6)ethoxylates	1
AEB	Alcohol(C6-C17)(secondary) poly(7-12)ethoxylates	1
AEC	Amyl acetate (all isomers)	1
AAI	Amyl alcohol (iso-, n-, sec-, primary)	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
IAL	Butyl alcohol (iso-)	1
BAN	Butyl alcohol (n-)	1
BAS	Butyl alcohol (sec-)	1
BAT	Butyl alcohol (tert-)	1
BUE	Butyl toluene	1
CHX	Cyclohexane	1
CHN	Cyclohexanol	1
CPD	1,3-Cyclopentadiene dimer (molten)	2
CMP	p-Cymene	1
IDA	iso-Decaldehyde	1
DAL	n-Decaldehyde	1
DCE	Decene	1
DAX	Decyl alcohol (all isomers)	1
DBZ	n-Decylbenzene, see Alkyl(C9+)benzenes	1
DAA	Diacetone alcohol	1
DEB	Diethylbenzene	1
DBL	Diisobutylene	1
DIK	Diisobutyl ketone	1
DIX	Diisopropylbenzene (all isomers)	1
DOP	Diocetyl phthalate	1
DPN	Dipentene	1
DIL	Diphenyl	1
DPG	Dipropylene glycol	1
DFF	Distillates: Flashed feed stocks	1
DSR	Distillates: Straight run	1
DOZ	Dodecene (all isomers)	1
ODB	Dodecylbenzene, see Alkyl(C9+)benzenes	1
EEA	2-Ethoxyethyl acetate	1
ETG	Ethoxy triglycol (crude)	1
ETA	Ethyl acetate	1
EAL	Ethyl alcohol	1
ETB	Ethylbenzene	1
EBT	Ethyl butanol	1
EBE	Ethyl tert-butyl ether	1
EBR	Ethyl butyrate	1
ECY	Ethyl cyclohexane	1
EMA	Ethylene glycol butyl ether acetate	1
EPE	Ethylene glycol phenyl ether	1
EEP	Ethyl-3-ethoxypropionate	1
EHX	2-Ethylhexanol	1
EPR	Ethyl propionate	1

Chem Code	Chemical Name	VCS Category
ETE	Ethyl toluene	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
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
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
IPH	Isophorone	1
JPF	Jet fuel: JP-4	1
JPV	Jet fuel: JP-5 (kerosene, heavy)	1
KRS	Kerosene	1
MTT	Methyl acetate	1
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
MEK	Methyl ethyl ketone	1
MHK	Methyl heptyl ketone	1
MIK	Methyl isobutyl ketone	1
MNA	Methyl naphthalene (molten)	1
MNS	Mineral spirits	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
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

Chem Code	Chemical Name	VCS Category
OFV	Oil, fuel: No. 5	1
OSX	Oil, fuel: No. 6	1
OIL	Oil, misc: Crude	1
ODS	Oil, misc: Diesel	1
OGP	Oil, misc: Gas, high pour	1
OLB	Oil, misc: Lubricating	1
ORL	Oil, misc: Residual	1
OTB	Oil, misc: Turbine	1
PPE	n-Pentyl propionate	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
PLB	Polybutene	1
PGC	Polypropylene glycol	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
SFL	Sulfolane	1
THN	Tetrahydronaphthalene	1
TOL	Toluene	1
TCP	Tricresyl phosphate (less than 1% of the ortho isomer)	1
TEB	Triethylbenzene	1
TRE	Trimethylbenzene (all isomers)	1
TRP	Trixylenyl phosphate	1
UDC	Undecene	1
UND	1-Undecyl alcohol	1
XLX	Xylenes (ortho-, meta-, para-)	1

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 components 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.

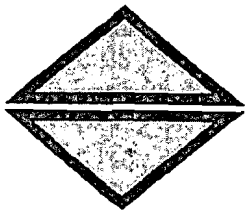
Category 3: (Highly toxic) VCSs for these toxic cargoes cannot use a spill valve or rupture disk as the primary means to meet the overfill protection requirement of 46 CFR 39.20-9. This requirement is in addition to the requirements of Category 1.

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 1 cargoes. 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 SOLUTIONS, INC.

www.marinesolutionsinc.net

April 11, 2012

MSI/031202/S02
Commanding Officer (MSC)
Attn: Chief-Tank Vessel and Offshore Branch
United States Coast Guard,
2100 Second Street, SW, STOP 7102
Washington, D.C. 20593.

Sub: 297'-6" x 54' x 12'-0" DBL SKIN TANK BARGE (D)
Barge Name: CBC 336
OFFICIAL No. D1119685

Ref: 1. NVIC 10-92, Change 2

Encl. 1. Vapor Collection System Calculations (30 Pages)
2. Dwg. No. 031202VP-1, SH1-1, Rev 0, "Vapor Piping Addition"

Dear Commanding Officer:

The Owner has decided to install a Vapor Piping System on subject barge along with intrinsically safe high level over fill alarm system.

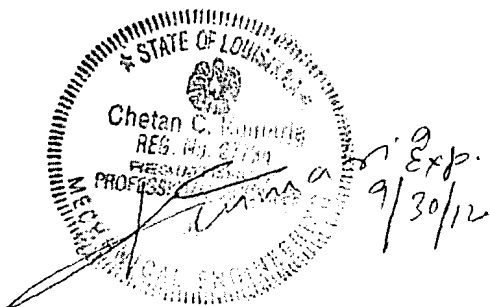
This barge may also be used for "Tandem" loading and unloading with barge CBC 337 or CBC 338. The calculations for Tandem Operation are included from page 8 thru page 25.

We request you to kindly review the enclosures in accordance with the provisions of reference 1.

The information contained in enclosure has been reviewed and is certified as complying with 46 CFR 39 and is stamped.

Please do not hesitate to call if you have questions.

Sincerely,



7985 BOONE TRACE, NASHVILLE, TN 37221
CELL: 615-364-9598 TEL/FAX: 615-662-9608
MARINESOLINC@AOL.COM
www.marinesolutionsinc.net

VAPOR COLLECTION SYSTEM CALCULATIONS

FOR

BARGE NAME(s): "CBC 336"

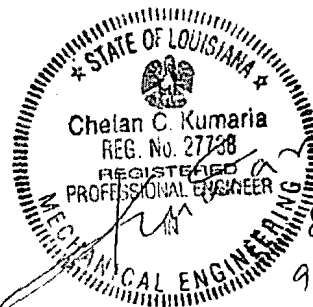
TRINITY ASHLAND SHIPYARD HULL(s): 4402

297'-6" X 54'-0" X 12'-0" DOUBLE SKIN TANK BARGE (D)

CANAL BARGE COMPANY, INC.

April 11, 2012

Prepared by:



**Chetan Kumaria, PE, MBA
MARINE SOLUTIONS, INC.
7985 BOONE TRACE
NASHVILLE, TN. 37221.
615-364-9598**

SUMMARY

The enclosed analysis show that the 297'-0" x 54' x 12'-0" river service tank barge (CBC 336) meets the requirements of 46 CFR 39. The pressure drop through the vapor piping system and pressure vacuum valve setting does not exceed the maximum design pressure of 2.0 psi for this barge.

The Owner may elect to use this barge in "Tandem" loading and unloading with barge CBC 338 or CBC 337. Pages 8 through 17 show the calculations for this scenario. The pressure vacuum valve setting and pressure drop through system do not exceed maximum design pressure of this barge.

MARINE SOLUTIONS, INC.

VCS SYSTEM INFORMATION:

1. GENERAL DESCRIPTION OF VESSEL:

A. NAME (S): CBC 336
B. USCG OFFICIAL NUMBER: D1119685
C. DIMENSIONS: 297'-6" X 54'-0" X 12'-0"
D. SERVICE: TANK BARGE (D)
E. MAX. DESIGN WORKING PRESSURE: 2 PSIG
F. PV VALVE PRESSURE SETTING: 1 PSIG
G. PV VALVE VACUUM SETTING: 0.5 PSIG
H. MAX. DISCHARGE RATE: 3000 BBLs/HR

2. VAPOR CONTROL SYSTEM

A. PIPE DIAMETER: 7.981 INCHES IPS
B. PIPE LENGTHS: A- 13'-6" B-39'-10 3/4" C-28'-7 1/4" D-61'-6" E-20'-1 15/16"
F- 21'-2 9/16" G-27'-4 3/8" H-3'-1 15/16" I-26'-0 1/16"

C. PV VALVE VENTING CAPACITY:

(1) 6" BERGAN KLPH, SET @ 1.0 PSIG
(2) MAXIMUM CAPACITY 21666 BBL/HR OF AIR
(3) 0.5 VAC VACUUM

D. SPILL VALVE RELIEVING CAPACITY: NON INSTALLED

E. MAX. VAPOR-AIR MIXTURE DENSITY: 0.335 LBM/FT³ FOR SUB D

F. MAX. LIQUID LOADING RATE: 5000 BBLs/HR

G. DARCY FRICTION FACTOR: 0.014

H. VCS CARGOES: SEE TABLE 1

I. ADDITIONAL MIS. INFORMATION:

SYSTEM IS DESIGNED TO ACCOMMODATE INTERNAL VISUAL INSPECTION.

VCS CALCULATIONS

1. CARGO AUTHORITY::

The vapor collection system installed on this barge is designed to carry the cargoes listed in Table 1 and Crude Oil and Gasoline Blends. These Cargoes are to be listed on the barge's Certificate of Inspection.

2. DETERMINING VAPOR_AIR MIXTURE DENSITY AND VAPOR GROWTH RATE:

Pentane (iso-) has the heaviest vapor-air mixture density and the highest vapor growth rate (see Table 1)

3. THE MAXIMUM LIQUID TRANSFER RATE AS IMPOSED BY THE CAPACITY OF THE CARGO VENTING SYSTEM:

Tank 1P is the farthest tank from the P/V valve. Using Crane's Technical Paper No. 410, the total equivalent length (L) for the path is shown in Table 2.

TABLE 2

PIPE/FITTINGS	QUANTITY	UNIT EQ. LENGTH (FT)	TOTAL EQ. LENGTH (FT)
Straight Pipe	1	82	82
Entrance	1	37.05	37.05
T Branch	2	39.91	79.82
8"X6"RED	1	39.88	39.88
T Run Thru	3	13.3	39.9
8" 90 ELL	1	7.98	7.98
		Total	286.63

Using Darcy's Equation, with a 0.014 friction factor and the maximum liquid transfer rate, the pressure drop along the VCS piping between the #1P cargo tank and the P/V valve for each cargo is shown in Table 1.

Using a 5000 bbl/h liquid transfer rate, the vapor-air mixture and air-equivalent volumetric flow rate for each cargo are given in Table 1. At a setting of 1.0 psig, Bergan 6" KLPV Valve has an adequate pressure relieving capacity of air for each cargo listed in Table 1. The greatest pressure drop in the venting system (1.261 psig) does not exceed the cargo tank maximum design working pressure of 2.00 psi.

The maximum vacuum that can exist in a tank is 0.713 psig. The barge is constructed as per ABS rules and regulations for a pressure of 2.0 psig and are tested for a pressure of 2.0 psig. Therefore the maximum vacuum of 0.713 psig is within the design capacity of these barges and an unloading rate of 3000 bbl/h is acceptable.

4. THE MAXIMUM LIQUID TRANSFER RATE AS IMPOSED BY THE RELIEVING CAPACITY OF THE CARGO TANK SPILL VALVE. Non-Installed

6. THE MAXIMUM LIQUID TRANSFER RATE AS IMPOSED BY THE SET POINT OF THE OVERFILL ALARM.

The #3P cargo tank has a trunk top dimension of 54'-0" x 24'-0". The set point of the overfill alarm is set at 8" below the trunk top at tank centerline. With a liquid transfer rate of 5000 bbl/h, the person in charge of transfer of transfer operation has more than 2 minutes to stop the transfer operation before tank overflows. Thus VCS meets 46 CFR 39.20-9.

6. THE MAXIMUM LIQUID TRANSFER RATE AS IMPOSED BY 46 CFR 39.30-1(d)(3).

This requires the sum of the pressure drop along the longest path and the pressure at the facility vapor connection not to exceed 80 percent of the P/V valve setting. The total equivalent length from cargo tank 1P to the vapor connection is given in Table 3.

TABLE 3

PIPE/FITTINGS	QUANTITY	UNIT EQ. LENGTH (FT)	TOTAL EQ. LENGTH (FT)
Straight Pipe	1	238.24	238.24
Entrance	1	37.05	37.05
T Branch	7	39.91	279.37
T Run	6	13.33	79.98
8" Gate Valve	1	5.32	5.32
8" 90 ELL	1	7.98	7.98
8" 45 ELL	1	3.72	3.72
		Total	651.66

Pressure drop at the maximum liquid transfer rate of 5000 bbl/h along this path for each cargo is given in Table 1. The largest pressure drop does not exceed 80 percent of the P/V valve pressure setting (0.8 psig).

TABLE 1 (SUB CHAPTER "D" CARGOES)

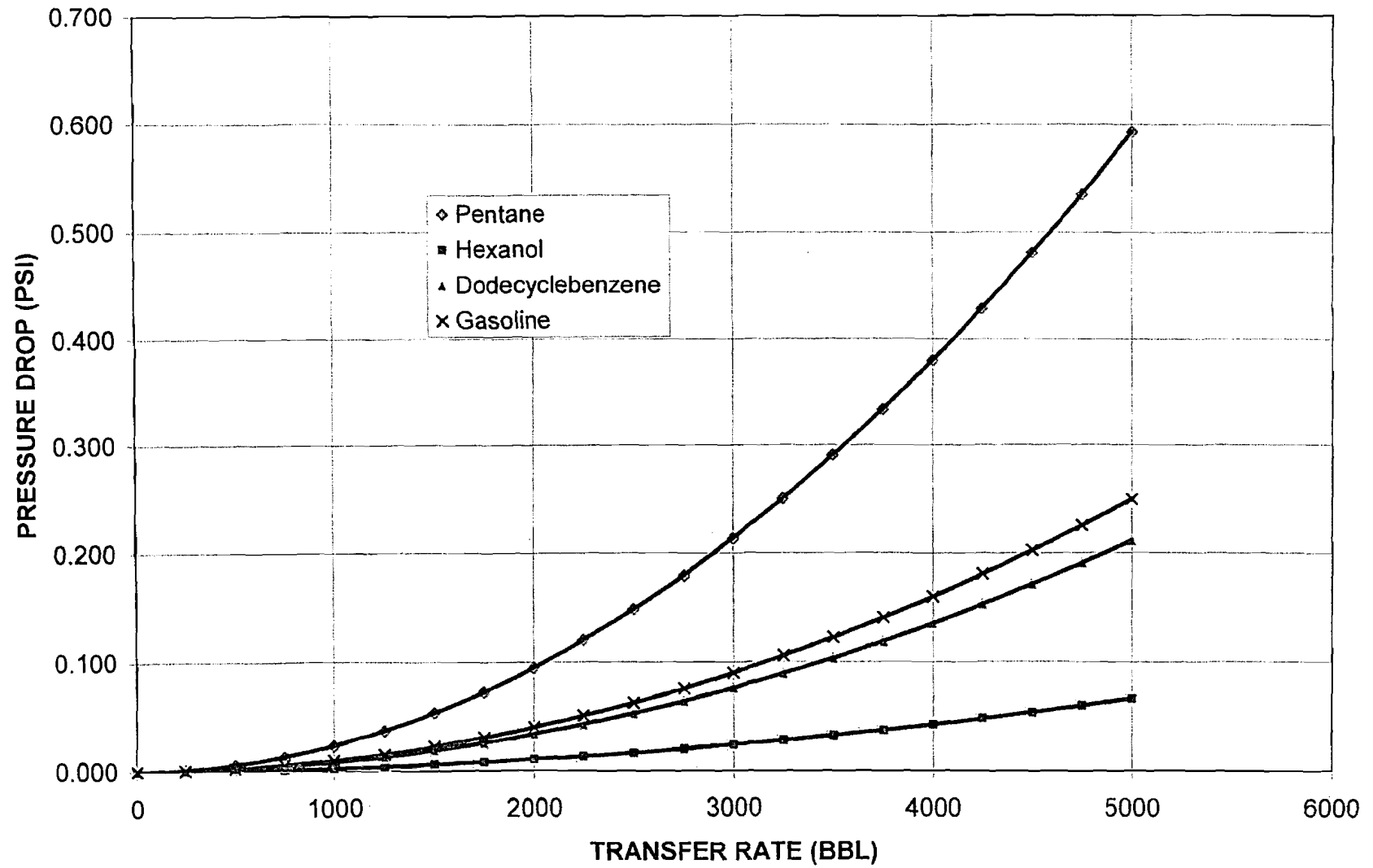
CHRIS CODE	NAME	VCS CAT	LIQ SG	VAPOR PRESS	VAPOR SG	VAPOR AIR WEIGHT DENSITY	VAPOR GROWTH RATE	PRESSURE DROP TO PV VALVE IN VCS(psig) (LOADING)	VAPOR VOLUMETRIC FLOW RATE (bbt/h) (LOADING)	AIR EQUIVALENT VOLUMETRIC FLOW RATE (LOADING)	PRESSURE DROP TO SHORE CONNECTION IN VCS (psig) (LOADING)*	PRESSURE DROP TO PV VALVE IN VCS(psig) (UNLOADING)	PRESSURE DROP TO SHORE CONNECTION IN VCS (psig) (UNLOADING)*	AIR EQUIVALENT VOLUMETRIC FLOW RATE (UNLOADING)
1 ACT	Acetone	1	0.79	10	2	0.121	1.2000	0.057	6000	7874	0.129	0.020	0.047	4805
2 ACP	Acetophenone	1	1.03	0.6	4.14	0.082	1.0120	0.028	5090	6354	0.063	0.010	0.023	3212
19 AAT	Amyl Acetate (iso-)	1	0.88	0.33	4.48	0.079	1.0068	0.029	5033	5212	0.060	0.009	0.021	3127
20 AAJ	Amyl Alcohol (iso-, n-, sec-, primary) (See also IAA)	1	0.82	0.3	3.04	0.077	1.0060	0.025	5030	5126	0.058	0.009	0.021	3078
21 AAN	Amyl Alcohol (n-)	1	0.82	0.3	3.04	0.077	1.0060	0.025	5030	5126	0.058	0.009	0.021	3075
23 APM	Amyl Alcohol, Primary	1	0.82	0.3	3.04	0.077	1.0060	0.025	5030	5126	0.058	0.009	0.021	3075
24 ASE	Amyl Alcohol, (sec-)	1	0.82	0.3	3.04	0.077	1.0060	0.025	5030	5126	0.058	0.009	0.021	3075
26 IAA	Amyl Alcohol, (iso-)	1	0.82	0.3	3.04	0.077	1.0060	0.025	5030	5126	0.058	0.009	0.021	3075
34 BAL	Benzyl Alcohol	1	1.05	0.1	3.73	0.075	1.0020	0.025	5010	5052	0.058	0.009	0.020	3031
40 BAX	Butyl Acetate (iso-, n-)	1	0.87	0.6	4	0.082	1.0120	0.028	5060	5341	0.063	0.010	0.023	3204
42 BTA	Butyl Acetate (sec-)	1	0.89	1.5	4	0.095	1.0300	0.033	5150	5840	0.075	0.012	0.027	3504
44 IAL	Butyl Alcohol (iso-)	1	0.81	0.9	2.8	0.080	1.0180	0.027	5090	5317	0.062	0.010	0.022	3190
46 BAS	Butyl Alcohol (sec-)	1	0.81	1.3	2.8	0.083	1.0260	0.029	5130	5458	0.065	0.010	0.024	3275
47 BAT	Butyl Alcohol (tert-)	1	0.78	2.8	2.8	0.095	1.0580	0.035	5280	5984	0.079	0.012	0.028	3591
48 BPH	Butyl Benzyl Phthalate	1	1.12	0.01	10.8	0.074	1.0002	0.024	5001	5015	0.055	0.009	0.020	3009
58 BUE	Butyl Toluene	1	0.85	0.1	5.11	0.076	1.0020	0.025	5010	5074	0.057	0.009	0.020	3044
64 CLS	Caprolactam Solutions	1	1.02	0.05	3.9	0.074	1.0010	0.024	5005	5027	0.055	0.009	0.020	3016
70 CUM	Cumene	1	0.86	0.60	4.20	0.083	1.0120	0.028	5060	5359	0.063	0.010	0.023	3215
72 CHX	Cyclohexane	1	0.78	4.5	2.9	0.114	1.0900	0.044	5450	6771	0.101	0.016	0.038	4063
73 CHN	Cyclohexanol	1	0.95	0.15	3.45	0.075	1.0030	0.025	5015	5072	0.056	0.009	0.020	3043
74 CPD	1,3-Cyclopentadiene dimer (molten)	1	0.69	0.25	4.55	0.078	1.0060	0.026	5025	5184	0.059	0.009	0.021	3098
76 CMP	Cymene (para-)	1	0.88	0.11	4.82	0.076	1.0022	0.025	5011	5073	0.057	0.009	0.020	3044
77 DHN	Decahydronaphthalene	1	0.89	0.1	4.76	0.075	1.0020	0.025	5010	5068	0.056	0.009	0.020	3041
78 IDA	Decaldehyde (iso-)	1	0.83	0.01	5	0.074	1.0002	0.024	5001	5006	0.055	0.009	0.020	3004
79 DAL	Decaldehyde (n-)	1	0.83	0	5.01	0.074	1.0000	0.024	5000	4999	0.055	0.009	0.020	2999
81 DCE	Decane	1	0.74	0.12	4.8	0.078	1.0024	0.025	5012	5083	0.057	0.009	0.020	3050
82 DAX	Decyl Alcohol (all isomers) (Decanol)	1	0.83	0.01	5.3	0.074	1.0002	0.024	5001	5006	0.055	0.009	0.020	3004
83 ISA	Decyl Alcohol (iso-)	1	0.83	0.01	5.3	0.074	1.0002	0.024	5001	5006	0.055	0.009	0.020	3004
84 DAN	Decyl Alcohol (n-)	1	0.83	0.01	5.3	0.074	1.0002	0.024	5001	5006	0.055	0.009	0.020	3004
85 DBZ	Decylbenzene (n-)	1	0.88	0.01	7.52	0.074	1.0002	0.024	5001	5010	0.055	0.009	0.020	3008
87 DAA	Diacetone Alcohol	1	0.97	0.1	4	0.075	1.0020	0.025	5010	5058	0.056	0.009	0.020	3034
91 DPA	Dibutyl Phthalate (ortho-)	1	1.03	0	9.89	0.074	1.0000	0.024	5000	4999	0.055	0.009	0.020	2999
92 DPT	Dicyclopentadiene, See 1,3-Cyclopentadiene Dime	2	0.88	0.25	4.55	0.078	1.0050	0.026	5025	5184	0.059	0.009	0.021	3098
93 DEB	Diethylbenzene	1	0.87	0.06	4.62	0.075	1.0018	0.025	5008	5053	0.056	0.009	0.020	3032
94 DEG	Diethylene Glycol	1	1.12	0.01	3.68	0.074	1.0002	0.024	5001	5004	0.055	0.009	0.020	3002
95 DME	Diethylene Glycol Butyl Ether	1	0.95	0.01	5.5	0.074	1.0002	0.024	5001	5007	0.055	0.009	0.020	3004
100 DGA	Diethylene Glycol Ethyl Ether Acetate	1	0.99	0.02	4.62	0.074	1.0004	0.024	5002	5012	0.055	0.009	0.020	3007
101 DGM	Diethylene Glycol Methyl Ether	1	1.03	0.03	4.14	0.074	1.0008	0.024	5003	5017	0.055	0.009	0.020	3010
111 DBC	Diisobutylcarbinol	1	0.81	0.09	4.97	0.075	1.0018	0.025	5009	5094	0.058	0.009	0.020	3039
112 DBL	Diisobutylene	1	0.72	2	3.86	0.100	1.0400	0.036	6200	6072	0.081	0.013	0.029	3843
113 DIX	Diisobutyl Ketone	1	0.81	0.16	4.9	0.077	1.0032	0.025	5016	5113	0.057	0.009	0.021	3068
119 DIX	Diisopropylbenzene (all isomer)	1	0.88	0.03	5.6	0.074	1.0008	0.024	5003	5024	0.055	0.009	0.020	3014
124 DTL	Dimethyl Phthalate	1	1.19	0	6.89	0.074	1.0000	0.024	5000	4999	0.055	0.009	0.020	2999
126 DIF	Dinonyl Phthalate	1	0.97	0.01	14.4	0.074	1.0002	0.024	5001	5021	0.055	0.009	0.020	3013
130 DOP	Diocetyl Phthalate	1	0.98	0	13.47	0.074	1.0000	0.024	5000	4999	0.055	0.009	0.020	2999
131 DPN	Dipentene	1	0.84	0.1	4.9	0.075	1.0020	0.025	5010	5070	0.056	0.009	0.020	3042
132 DIL	Diphenyl	1	0.99	0.01	5.31	0.074	1.0002	0.024	5001	5006	0.055	0.009	0.020	3004
133 DDO	Diphenyl, Diphenyl Ether Mixture	1	1.07	0.01	5.86	0.074	1.0002	0.024	5001	5007	0.055	0.009	0.020	3004
134 DPE	Diphenyl Ether	1	1.07	0.01	5.87	0.074	1.0002	0.024	5001	5007	0.055	0.009	0.020	3004
136 DPG	Dipropylene Glycol	1	1.03	0.07	4.63	0.075	1.0014	0.025	5007	5048	0.056	0.009	0.020	3028
139 DFF	Distillates: Flashed Feed Stocks	1	0.75	2.3	3.4	0.100	1.0460	0.036	6230	6079	0.081	0.013	0.029	3847
140 QSR	Distillates: Straight Run	1	0.73	2.3	3.4	0.100	1.0460	0.036	6230	6079	0.081	0.013	0.029	3847
145 DOZ	Dodecene (all isomers)	1	0.78	0.02	5.81	0.074	1.0004	0.024	5002	5016	0.055	0.009	0.020	3010
146 DOD	Dodecane	1	0.78	0.02	5.81	0.074	1.0004	0.024	5002	5016	0.055	0.009	0.020	3010
147 DDB	Dodecylbenzene	1	0.86	4.7	8.4	0.237	1.0940	0.093	5470	6806	0.211	0.033	0.078	5883
155 ETG	Ethoxy Triglycol (crude)	1	1.02	0	6.14	0.074	1.0000	0.024	5000	4999	0.055	0.009	0.020	2999
156 ETA	Ethyl Acetate	1	0.8	4.5	3.04	0.117	1.0900	0.045	5450	6859	0.103	0.016	0.037	4115
157 EAA	Ethyl Acetoacetate	1	1.03	0.2	4.48	0.077	1.0040	0.025	5020	5129	0.058	0.009	0.021	3077
158 EAL	Ethyl Alcohol (Ethanol)	1	0.79	3.5	1.6	0.083	1.0700	0.031	5350	5695	0.071	0.011	0.026	3417
160 ETB	Ethyl Benzene	1	0.87	0.6	3.66	0.081	1.0120	0.027	5060	5300	0.062	0.010	0.022	3180
161 EBT	Ethyl Butanol	1	0.83	0.12	3.52	0.075	1.0024	0.025	5012	5058	0.056	0.009	0.020	3035
162 EBR	Ethyl Butyrate	1	0.88	1	4	0.088	1.0200	0.030	5100	5584	0.068	0.011	0.024	3339
163 EBY	Ethyl Cyclohexane	1	0.79	0.5	3.87	0.080	1.0100	0.027	5050	5274	0.061	0.010	0.022	3165
166 EGL	Ethylene Glycol	1	1.19	0.01	2.21	0.074	1.0002	0.024	5001	5002	0.055	0.009	0.020	3001
169 EMA	Ethylene Glycol Butyl Ether Acetate	1	0.94	0.05	5.52	0.075	1.0010	0.025	5005	5039	0.056	0.009	0.020	3024

172	EGY	Ethylene Glycol Diacetate	1	1.1	0.01	5.03	0.074	1.0002	0.024	5001	5008	0.055	0.009	0.020	3004
178	EME	Ethylene Glycol Methyl Ether	1	1.1	0.01	4.8	0.074	1.0002	0.024	5001	5008	0.055	0.009	0.020	3003
180	EPE	Ethylene Glycol Phenyl Ether	1	1.1	0.01	4.8	0.074	1.0002	0.024	5001	5008	0.055	0.009	0.020	3003
184	EHA	2-Ethylhexaldehyde, See Octyl Aldehydes	1	0.82	0.17	4.41	0.076	1.0034	0.025	5017	5107	0.057	0.009	0.021	3084
188	EHX	2-Ethylhexanol, see Octanol (all isomers)	1	0.84	0.02	4.5	0.074	1.0004	0.024	5002	5012	0.055	0.009	0.020	3007
180	EPR	Ethyl Propionate	1	0.89	3.5	1.6	0.083	1.0700	0.031	5350	5895	0.071	0.011	0.026	3417
191	ETE	Ethyl Toluene	1	0.88	0.28	4.15	0.078	1.0058	0.028	5028	5166	0.059	0.009	0.021	3100
194	FAM	Formamide	1	1.13	0.1	1.55	0.074	1.0020	0.024	5010	5017	0.055	0.009	0.020	3010
185	FAL	Furfuryl Alcohol	1	1.13	0.05	3.4	0.074	1.0010	0.024	5005	5023	0.055	0.009	0.020	3014
197	GAK	Gasoline Blended Stocks: Alkylates	1	0.75	12.5	3.4	0.214	1.2500	0.110	6250	10680	0.250	0.040	0.090	6396
188	GRF	Gasoline Blended Stocks: Reformate	1	0.8	12.5	3.4	0.214	1.2500	0.110	6250	10680	0.250	0.040	0.090	6396
199	GAT	Gasolines: Automotive (containing not over 4.23 gr 1	1	0.74	12.5	3.4	0.214	1.2500	0.110	6250	10680	0.250	0.040	0.090	6396
200	GAV	Gasolines: Aviation (containing not over 4.86 gram 1	1	0.71	12.5	3.4	0.214	1.2500	0.110	6250	10680	0.250	0.040	0.090	6396
201	GCS	Gasolines: Casinghead	1	0.67	12.5	3.4	0.214	1.2500	0.110	6250	10680	0.250	0.040	0.090	6396
202	GPL	Gasolines: Polymer	1	0.75	12.5	3.4	0.214	1.2500	0.110	6250	10680	0.250	0.040	0.090	6396
203	GSR	Gasolines: Straight Run	1	0.75	12.5	3.4	0.214	1.2500	0.110	6250	10680	0.250	0.040	0.090	6396
204	GCR	Glycerine	1	1.26	0	3.17	0.074	1.0000	0.024	5000	4999	0.055	0.009	0.020	2999
217	HMX	Heptane (all isomers) (Methylhexane)	1	0.88	2.5	3.45	0.102	1.0500	0.037	5250	6188	0.084	0.013	0.030	3713
218	HPT	Heptane (n-)	1	0.88	2.5	3.45	0.102	1.0500	0.037	5250	6188	0.084	0.013	0.030	3713
219	HEP	Heptanoic Acid	1	0.92	0.01	4.49	0.074	1.0002	0.024	5001	5005	0.055	0.009	0.020	3003
220	HTX	Heptanol (all isomers)	1	0.82	0.04	4	0.074	1.0008	0.024	5004	5022	0.055	0.009	0.020	3013
221	HTN	Heptanol (all isomers)	1	0.82	0.04	4	0.074	1.0008	0.024	5004	5022	0.055	0.009	0.020	3013
222	HPX	Heptane (all isomers)	2	0.7	2.9	3.4	0.108	1.0580	0.039	5290	6354	0.089	0.014	0.032	3812
223	THE	Heptene (1-)	1	0.7	2.8	3.4	0.105	1.0560	0.038	5280	6308	0.087	0.014	0.031	3785
224	HPE	Heptyl Acetate	1	0.89	0.1	5.5	0.078	1.0020	0.025	5010	5080	0.057	0.009	0.020	3048
229	HXS	Hexane (all isomers)	1	0.66	7	3	0.139	1.1400	0.059	5700	7838	0.135	0.021	0.049	4703
230	HXA	Hexane	1	0.66	7	3	0.139	1.1400	0.059	5700	7838	0.135	0.021	0.049	4703
231	HXO	Hexanoic Acid	1	0.93	0.01	4	0.074	1.0002	0.024	5001	5004	0.055	0.009	0.020	3003
232	HXN	Hexanol	1	0.82	1	3.52	0.085	1.0200	0.029	5100	5493	0.096	0.010	0.024	3298
234	HEX	Hexane (all isomers)	2	0.67	8	2.9	0.145	1.1600	0.064	5800	8135	0.145	0.023	0.052	4881
235	HXE	Hexene (1-)	1	0.67	8.2	2.9	0.147	1.1640	0.065	5820	8213	0.146	0.023	0.053	4828
236	HXT	Hexene (2-)	1	0.67	8.2	2.9	0.147	1.1640	0.065	5820	8213	0.146	0.023	0.053	4828
238	HXG	Hexylene Glycol	4	0.82	0.01	1.1	0.074	1.0002	0.024	5001	5000	0.055	0.009	0.020	3000
243	IPH	Isophorone	1	0.93	0.01	4.75	0.074	1.0002	0.024	5001	5008	0.055	0.009	0.020	3003
244	JPO	Jet Fuel: JP-1 (Kerosene)	1	0.8	0.14	4.5	0.076	1.0028	0.025	5014	5080	0.057	0.009	0.020	3054
245	JPT	Jet Fuel: JP-3	1	0.8	8.51	4.5	0.213	1.1702	0.096	5851	9956	0.216	0.034	0.078	5974
246	JPF	Jet Fuel: JP-4	1	0.81	3.4	4	0.121	1.0680	0.045	5340	6857	0.103	0.018	0.037	4114
247	JPV	Jet Fuel: JP-5 (Kerosene, heavy)	1	0.82	0.1	4	0.075	1.0020	0.025	5010	5056	0.056	0.009	0.020	3034
249	KRS	Kerosene	1	0.81	0.15	4.5	0.078	1.0030	0.025	5015	5097	0.057	0.009	0.021	3058
263	MTT	Methyl Acetate	1	0.82	8.1	2.6	0.118	1.1220	0.049	5810	7142	0.112	0.018	0.040	4285
265	MAL	Methyl Alcohol (See Methanol)	1	0.79	6.63	1.1	0.077	1.1326	0.032	5663	6780	0.073	0.012	0.026	3488
266	MAC	Methyl Amyl Acetate	1	0.88	0.39	4.97	0.080	1.0066	0.028	5033	5237	0.080	0.010	0.022	3142
267	MAA	Methyl Amyl Alcohol	1	0.81	0.43	3.62	0.079	1.0068	0.028	5043	5213	0.080	0.009	0.021	3128
271	MBK	Methyl n-Butyl Ketone	1	0.81	0.97	3.5	0.085	1.0184	0.029	5097	5475	0.086	0.010	0.024	3285
273	MBU	Methyl Butyrate	1	0.8	1.28	3.53	0.089	1.0252	0.031	5126	5621	0.089	0.011	0.025	3372
274	MEK	Methyl Ethyl Ketone	1	0.8	4.5	2.5	0.105	1.0900	0.041	6450	6515	0.093	0.015	0.034	3909
275	MTF	Methyl Formal (Dimethyl Formal)	1	0.88	15.42	2.6	0.189	1.3084	0.106	6542	10488	0.242	0.038	0.087	6293
276	MHK	Methyl Heptyl Ketone	1	0.83	0.08	4.9	0.075	1.0012	0.025	5006	5042	0.058	0.009	0.020	3025
278	MIK	Methyl Isobutyl Ketone	1	0.8	1.15	3.45	0.087	1.0230	0.030	5115	5553	0.068	0.011	0.024	3332
281	MNA	1-Methyl Naphthalene	1	1.02	0.01	4.91	0.074	1.0002	0.024	5001	5008	0.055	0.009	0.020	3003
283	MPN	2-Methyl-1-Pentene	1	0.69	6.3	2.9	0.130	1.1260	0.054	5630	7472	0.123	0.018	0.044	4483
284	MTN	5-Methyl-1-Pentene	1	0.67	8.49	2.9	0.149	1.1698	0.067	5849	8326	0.152	0.024	0.055	4996
286	MBE	Methyl Tert-Butyl Ether (MTBE)	1	0.74	0.04	3.1	0.074	1.0008	0.024	5004	5016	0.055	0.009	0.020	3010
288	MNS	Mineral Spirits	1	0.75	0.2	4.3	0.077	1.0040	0.025	5020	5123	0.058	0.009	0.021	3074
289	MRE	Myrcene	1	0.8	0.17	4.7	0.077	1.0034	0.025	5017	5115	0.057	0.009	0.021	3089
295	NSV	Naphtha: Solvent	1	0.67	0.2	3.5	0.076	1.0040	0.025	5020	5098	0.057	0.009	0.021	3059
296	NSS	Naphtha: Stockard Solvent	1	0.78	0.2	4.3	0.077	1.0040	0.025	5020	5123	0.058	0.009	0.021	3074
297	NVM	Naphtha: Varnish Maker's and Painters (75%)	1	0.77	0.19	4.3	0.077	1.0038	0.025	5019	5117	0.058	0.009	0.021	3070
300	NAX	Nonane (all isomers)	1	0.72	0.27	4.4	0.078	1.0054	0.026	5027	5170	0.059	0.009	0.021	3102
301	NAN	Nonane	1	0.72	0.27	4.4	0.078	1.0054	0.026	5027	5170	0.059	0.009	0.021	3102
304	NON	Nonane	1	0.73	0.35	4.3	0.079	1.0070	0.026	5035	5215	0.060	0.009	0.022	3129
305	NNS	Nonyl Alcohol (all isomers)	1	0.94	0.1	5	0.078	1.0020	0.025	5010	5072	0.056	0.009	0.020	3043
306	NNN	Nonyl Alcohol	1	0.94	0.1	5	0.078	1.0020	0.025	5010	5072	0.056	0.009	0.020	3043
307	NNI	Nonyl Alcohol (iso-)	1	0.94	0.1	5	0.078	1.0020	0.025	5010	5072	0.056	0.009	0.020	3043
309	NNP	Nonyl Phenol	1	0.95	0.01	7.6	0.074	1.0002	0.024	5001	5010	0.055	0.009	0.020	3006
316	OAX	Octane (all isomers)	1	0.7	0.79	3.9	0.084	1.0158	0.029	5079	5435	0.085	0.010	0.023	3281
317	OAN	Octane	1	0.7	0.79	3.9	0.084	1.0158	0.029	5079	5435	0.085	0.010	0.023	3281
318	OAA	Octanoic Acid (all isomers)	1	0.91	0.01	5	0.074	1.0002	0.024	5001	5006	0.055	0.009	0.020	3004
319	OCX	Octanol (all isomers)	1	0.83	0.01	4.48	0.074	1.0002	0.024	5001	5005	0.055	0.009	0.020	3003
320	OTA	Octanol	1	0.83	0.01	4.48	0.074	1.0002	0.024	5001	5005	0.055	0.009	0.020	3003
321	OTX	Octene (all isomers)	2	0.72	0.9	3.9	0.088	1.0180	0.029	5090	5495	0.068	0.011	0.024	3297
322	OTE	Octene (1-)	1	0.72	1	3.88	0.087	1.0200	0.030	5100	5544	0.087	0.011	0.024	3326

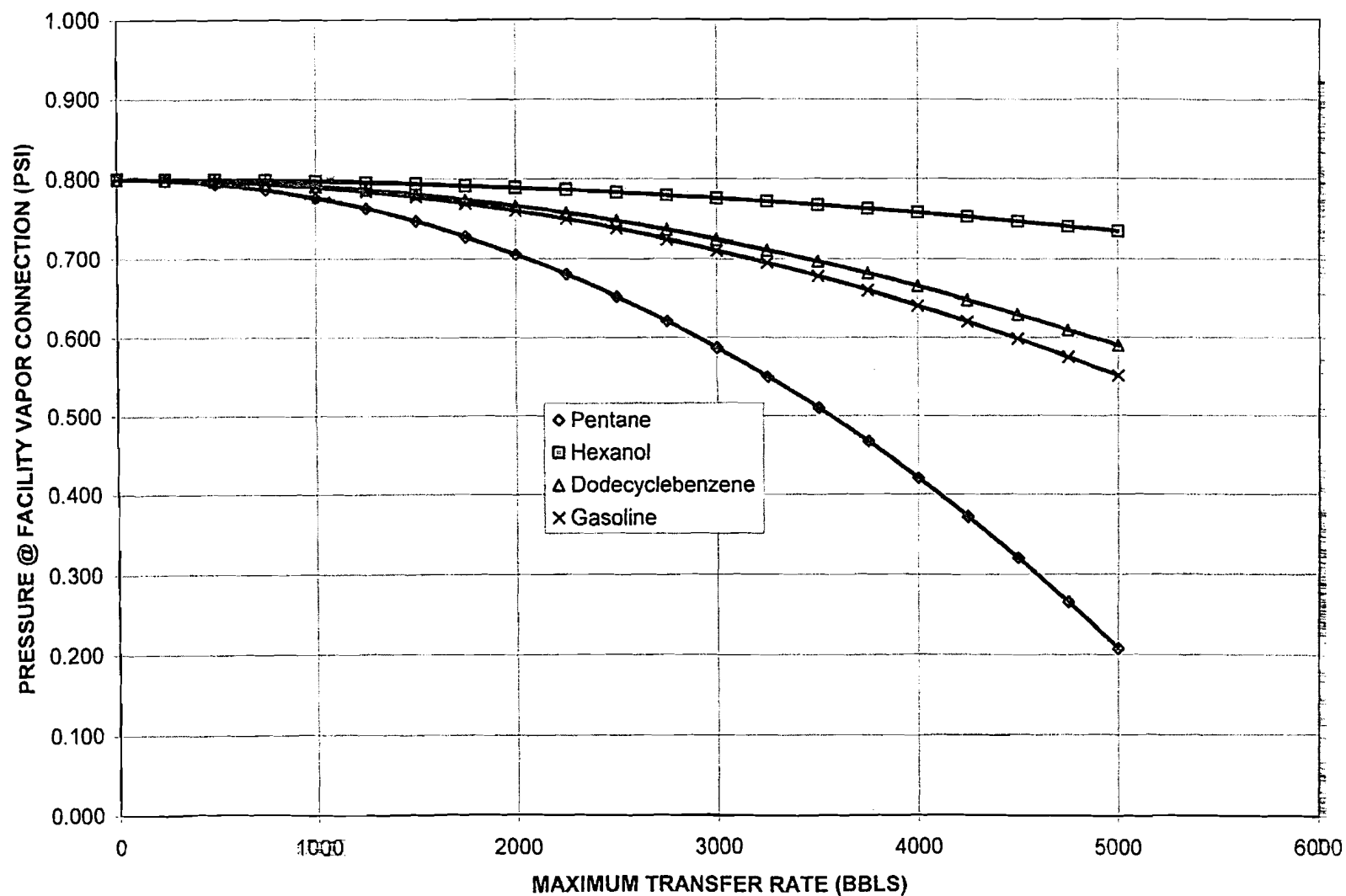
324 OCX	Octyl Alcohol (iso-, n-) (all isomers), See Octanol (1	0.83	0.01	4.48	0.074	1.0002	0.024	5001	5005	0.055	0.009	0.020	3003	
325 OIA	Octyl Alcohol	1	0.83	0.01	4.48	0.074	1.0002	0.024	5001	5005	0.055	0.009	0.020	3003
364 OTW	Fuel: No. 2	1	0.88	0.56	6	0.092	1.0112	0.031	5056	5650	0.070	0.011	0.025	3390
368 OFR	Fuel: No. 4	1	0.9	0.15	3.4	0.075	1.0030	0.025	5015	5071	0.056	0.009	0.020	3042
387 OFV	Fuel: No. 5	1	0.94	0.15	3.4	0.075	1.0030	0.025	5015	5071	0.056	0.009	0.020	3042
368 OSX	Fuel: No. 6	1	0.95	0.15	3.4	0.075	1.0030	0.025	5015	5071	0.056	0.009	0.020	3042
382 OIL	OIL, Misc: Crude	1	0.95	0.15	3.4	0.075	1.0030	0.025	5015	5071	0.056	0.009	0.020	3042
389 OLB	OIL, Misc: Lubricating	1	0.9	0.15	1	0.074	1.0030	0.024	5015	5014	0.055	0.009	0.020	3008
403 ORS	OIL, Misc: Resin	1	1.02	0.15	1	0.074	1.0030	0.024	5015	5014	0.055	0.009	0.020	3008
418 OTB	OIL, Misc: Turbine	1	0.87	0.3	5.4	0.080	1.0060	0.026	5030	5236	0.060	0.010	0.022	3141
429 PDC	Pentadecanol, See Alcohols (C13 and above)	1	0.83	0.01	7.88	0.074	1.0002	0.024	5001	5011	0.055	0.009	0.020	3008
432 PTY	Pentane (all isomers)	5	0.63	21	2.48	0.219	1.4200	0.145	7100	12252	0.330	0.052	0.119	7351
433 IPT	Pentane (iso-)	5	0.82	27	2.48	0.335	1.5400	0.261	7700	16429	0.593	0.094	0.213	9858
434 PTA	Pentane (n-)	5	0.63	20.44	2.5	0.256	1.4088	0.167	7044	13130	0.379	0.060	0.136	7878
436 PTX	Pentane (all isomers)	1	0.64	24.9	2.4	0.299	1.4980	0.220	7490	15098	0.501	0.079	0.180	9059
437 PTE	Pentane (1-)	5	0.64	24.9	2.4	0.299	1.4980	0.220	7490	15098	0.501	0.079	0.180	9059
442 PIN	Pinene	1	0.86	0.35	4.7	0.080	1.0070	0.028	5035	5237	0.060	0.010	0.022	3142
448 PLB	Polybutene	1	0.91	0.01	79.3	0.077	1.0002	0.025	5001	5123	0.058	0.009	0.021	3074
457 PGC	Polypropylene Glycol	1	1.01	0.1	1	0.074	1.0020	0.024	5010	5009	0.055	0.009	0.020	3005
458 PGM	Polypropylene Glycol Methyl Ether	1	0.92	0.8	3.11	0.082	1.0160	0.028	5080	5345	0.063	0.010	0.023	3207
464 IAC	Propyl Acetate (iso-)	1	0.89	1.8	3.52	0.095	1.0360	0.033	5180	5879	0.076	0.012	0.027	3528
465 PAT	Propyl Acetate (n-)	1	0	1.85	3.52	0.095	1.0370	0.034	5185	5903	0.077	0.012	0.028	3542
488 IPA	Propyl Alcohol (iso-)	1	0.79	3	2.07	0.089	1.0600	0.033	5300	5815	0.074	0.012	0.027	3489
487 PAL	Propyl Alcohol (n-)	1	0.8	1.2	2.07	0.080	1.0240	0.027	5120	5324	0.062	0.010	0.022	3194
488 PBZ	Propylbenzene (n-)	1	0.86	0.2	4.14	0.077	1.0040	0.025	5020	5118	0.058	0.009	0.021	3071
489 IPX	Iso-Propylcyclohexane	1	0.8	0.01	4.35	0.074	1.0002	0.024	5001	5005	0.055	0.009	0.020	3003
473 PPG	Propylene Glycol (1,2-Propanediol)	1	1.04	0.01	2.62	0.074	1.0002	0.024	5001	5002	0.055	0.009	0.020	3001
478 PME	Propylene Glycol Methyl Ether	1	0.92	0.7	3.11	0.081	1.0140	0.027	5070	5302	0.062	0.010	0.022	3181
478 PTT	Propylene Tetramer	1	0.29	0.02	1	0.074	1.0004	0.024	5002	5001	0.055	0.009	0.020	3000
488 SFL	Sulfolane	1	1.26	0.01	4.14	0.074	1.0002	0.024	5001	5005	0.055	0.009	0.020	3003
493 TTN	Tetradecanol	1	0.82	0	7.39	0.074	1.0000	0.024	5000	4999	0.055	0.009	0.020	2999
494 TTD	1-Tetradecene, See the olefin or Alpha-Olefin Entry	1	0.77	0.01	6.77	0.074	1.0002	0.024	5001	5009	0.055	0.009	0.020	3005
498 TTG	Tetraethylene Glycol	1	1.12	0.01	6.7	0.074	1.0002	0.024	5001	5009	0.055	0.009	0.020	3005
497 THN	Tetrahydronaphthalene	1	0.97	0.04	4.56	0.074	1.0008	0.024	5004	5025	0.055	0.009	0.020	3015
499 TOL	Toluene	1	0.87	1.5	3.14	0.089	1.0300	0.031	5150	5850	0.070	0.011	0.025	3390
502 TCP	Tricresyl Phosphate (less than 1% of the ortho isom)	1	1.16	0.01	12.69	0.074	1.0002	0.024	5001	5018	0.055	0.009	0.020	3011
503 TRD	Tridecane	1	0.78	0.02	6.4	0.074	1.0004	0.024	5002	5018	0.055	0.009	0.020	3011
505 TDN	Tridecanol, See Alcohols (C13 and above)	1	0.85	0.01	6.91	0.074	1.0002	0.024	5001	5009	0.055	0.009	0.020	3005
506 TDC	1-Tridecene	1	0.77	0.01	6.29	0.074	1.0002	0.024	5001	5006	0.055	0.009	0.020	3005
508 TEB	Triethylbenzene	1	0.86	0.02	5.6	0.074	1.0004	0.024	5002	5015	0.055	0.009	0.020	3009
509 TEG	Triethylene Glycol	1	1.12	0.01	5.17	0.074	1.0002	0.024	5001	5008	0.055	0.009	0.020	3004
519 TRE	Trimethylbenzenes (all isomers)	1	0.89	0.14	4.2	0.076	1.0028	0.025	5014	5084	0.057	0.009	0.020	3050
520 TMB	Trimethyl Benzene (1,2,3-)	1	0.89	0.14	4.14	0.076	1.0028	0.025	5014	5082	0.057	0.009	0.020	3049
521 TMD	Trimethyl Benzene (1,2,3-)	1	0.89	0.14	4.14	0.076	1.0028	0.025	5014	5082	0.057	0.009	0.020	3049
522 TME	Trimethyl Benzene (1,2,4-) (Pseudocumene)	1	0.89	0.14	4.14	0.076	1.0028	0.025	5014	5082	0.057	0.009	0.020	3049
528 TRP	Truxylonyl Phosphate	1	1.16	0	14.2	0.074	1.0000	0.024	5000	4999	0.055	0.009	0.020	2999
533 UDC	Undecene (1-)	1	0.75	0.05	5.32	0.075	1.0010	0.025	5005	5038	0.056	0.009	0.020	3023
534 UND	Undecyl Alcohol	1	0.84	0.01	5.94	0.074	1.0002	0.024	5001	5007	0.055	0.009	0.020	3004
548 XLX	Xylenes (Ortho-, meta-, para-)	1	0.89	0.51	3.66	0.080	1.0102	0.027	5051	5263	0.061	0.010	0.022	3158
547 XLM	Xylene (M-)	1	0.87	0.51	3.66	0.080	1.0102	0.027	5051	5263	0.061	0.010	0.022	3158
548 XLO	Xylene (O-)	1	0.89	0.4	3.66	0.079	1.0080	0.026	5040	5207	0.060	0.009	0.021	3124
549 XLP	Xylene (P-)	1	0.86	0.51	3.66	0.080	1.0102	0.027	5051	5263	0.061	0.010	0.022	3158
550 XYL	Xylenol	1	1.01	0.1	3.66	0.075	1.0020	0.025	5010	5051	0.056	0.009	0.020	3031
551	Zinc Diethylthiophosphate													
	Max.	1.260	27.000	79.300	0.335	1.540	0.261	7700	16429	0.593	0.094	0.213	9858	
	Min.	0.000	0.000	1.000	0.074	1.000	0.024	5000	4999	0.055	0.009	0.020	2999	

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

LIQUID TRANSFER RATE vs PRESSURE DROP



PRESSURE vs MAXIMUM TRANSFER RATE (FOR SUB-CHAPTER "D" CARGOES)



MARINE SOLUTIONS, INC.

VCS SYSTEM INFORMATION:

1. GENERAL DESCRIPTION OF VESSEL:

	WORST CASE:	BARGE "CBC 336" OUTBOARD
		BARGE "CBC 338" INBOARD
A. NAME (S):	CBC 336 & CBC 338	
B. OFFICIAL NUMBER:	D1119685 & D1119687	
C. DIMENSIONS:	297'-0" X 54'-0" X 12'-0"	
D. SERVICE:	TANK BARGE (D)	
E. MAX. DESIGN WORKING PRESSURE:		2 PSIG
F. PV VALVE PRESSURE SETTING:		1 PSIG
G. PV VALVE VACUUM SETTING:		0.5 PSIG

2. VAPOR CONTROL SYSTEM

A. PIPE DIAMETER:	7.981 INCHES IPS
B. MAX. VAPOR-AIR MIXTURE DENSITY:	0.335 LBM/FT ³ FOR SUBCHAPTER "D" CARGOES
C. MAX. LIQUID LOADING RATE:	5000 BBLS/HR
D. DARCY FRICTION FACTOR:	0.014 FOR PIPE 0.001 FOR HOSE
E. VCS CARGOES:	SEE TABLE 1

VCS CALCULATIONS

1. THE EQUIVALENT LENGTH OF PIPE FROM BARGE'S MOST REMOTE CARGO TANK TO THE BARGE'S SHORE SIDE VAPOR CONNECTION:

Tank 1P on "CBC 336" is the farthest tank from the barge's shore connection. Using Crane's Technical Paper No. 410, the total equivalent length (L) for the path is shown in Table 2.

TABLE 2

PIPE/FITTINGS	QUANTITY	UNIT EQ. LENGTH (FT)	TOTAL EQ. LENGTH (FT)
Straight Pipe	1	238.24	238.24
Entrance	1	37.05	37.05
T Branch	7	39.91	279.37
45 Ell	1	3.72	3.72
T Run	6	13.33	79.98
8" Gate Valve	1	5.32	5.32
8" 90 Ell	1	7.98	7.98
		Total	651.66

2. THE EQUIVALENT LENGTH OF PIPE FROM OUTBOARD BARGE'S SHORE SIDE CONNECTION, ACROSS THE INBOARD (BREASTED) BARGE, TO THE SHORE SIDE VAPOR CONNECTION OF THE INBOARD BARGE (30FT OF 8" HOSE + INBOARD BARGE):

TABLE 3

PIPE/FITTINGS	QUANTITY	UNIT EQ. LENGTH (FT)	TOTAL EQ. LENGTH (FT)
Straight Pipe	1	38.083	38.083
T Run	1	13.3	13.3
8" Gate Valve	2	5.32	10.64
		Total	62.023
Hose	1		30

TABLE 1 (SUBCHAPTER "D" CARGOES)

CHRIS CODE	NAME	VCS CAT	LIQ SG	VAPOR PRESS	VAPOR SG	VAPOR WEIGHT DENSITY	VAPOR GROWTH RATE	VAPOR VOLUMETRIC FLOW RATE (bbbl/h)	AIR EQUIVALENT VOLUMETRIC FLOW RATE	PRESSURE DROP TO STERN CONNECTION IN VCS (psig)	PRESSURE DROP THRU HOSE TO FACILITY VCS (psig)	TOTAL PRESSURE DROP TO FACILITY CONNECTION (psig)
1 ACT	Acetone	1	0.78	10	2	0.121	1.2000	6000	7674	0.129	0.013	0.142
2 ACP	Acetophenone	1	1.03	0.6	4.14	0.082	1.0120	5060	5354	0.083	0.006	0.089
19 AAT	Amyl Acetate (iso-)	1	0.88	0.33	4.48	0.078	1.0068	5033	5212	0.060	0.006	0.066
20 AAI	Amyl Alcohol (iso-, n-, sec-, primary) (See also IAA)	1	0.82	0.3	3.04	0.077	1.0060	5030	5128	0.058	0.006	0.063
21 AAN	Amyl Alcohol (n-)	1	0.82	0.3	3.04	0.077	1.0060	5030	5128	0.058	0.006	0.063
23 APM	Amyl Alcohol, Primary	1	0.82	0.3	3.04	0.077	1.0060	5030	5128	0.058	0.006	0.063
24 ASE	Amyl Alcohol, (sec-)	1	0.82	0.3	3.04	0.077	1.0060	5030	5128	0.058	0.006	0.063
28 IAA	Amyl Alcohol, (iso-)	1	0.82	0.3	3.04	0.077	1.0060	5030	5128	0.058	0.006	0.063
34 BAL	Benzyl Alcohol	1	1.05	0.1	3.73	0.075	1.0020	5010	5052	0.058	0.006	0.062
40 BAX	Butyl Acetate (iso-, n-)	1	0.87	0.6	4	0.082	1.0120	5060	5341	0.083	0.006	0.089
42 BTA	Butyl Acetate (sec-)	1	0.89	1.5	4	0.085	1.0300	5150	5840	0.075	0.007	0.082
44 IAL	Butyl Alcohol (iso-)	1	0.81	0.9	2.8	0.080	1.0180	5090	5317	0.082	0.006	0.088
48 BAS	Butyl Alcohol (sec-)	1	0.81	1.3	2.8	0.083	1.0280	5130	5458	0.065	0.006	0.072
47 BAT	Butyl Alcohol (tert-)	1	0.78	2.8	2.8	0.085	1.0560	5280	5884	0.079	0.008	0.086
48 BPH	Butyl Benzyl Phthalate	1	1.12	0.01	10.8	0.074	1.0002	5001	5015	0.055	0.005	0.061
58 BUE	Butyl Toluene	1	0.85	0.1	5.11	0.078	1.0020	5010	5074	0.057	0.006	0.062
64 CLS	Caprolactam Solutions	1	1.02	0.05	3.9	0.074	1.0010	5005	5027	0.055	0.005	0.061
70 CUM	Cumene	1	0.86	0.60	4.20	0.083	1.0120	5060	5359	0.083	0.006	0.089
72 CHX	Cyclohexane	1	0.78	4.5	2.9	0.114	1.0800	5450	6771	0.101	0.010	0.111
73 CHN	Cyclohexanol	1	0.95	0.15	3.45	0.075	1.0030	5015	5072	0.056	0.006	0.062
74 CPD	1,3-Cyclopentadiene dimer (molten)	1	0.69	0.25	4.55	0.078	1.0060	5025	5184	0.059	0.006	0.064
76 CMP	Cymene (para-)	1	0.86	0.11	4.82	0.076	1.0022	5011	5073	0.057	0.006	0.062
77 DHN	Decahydronaphthalene	1	0.89	0.1	4.76	0.075	1.0020	5010	5068	0.056	0.006	0.062
78 IDA	Decaldehyde (iso-)	1	0.83	0.01	5	0.074	1.0002	5001	5006	0.055	0.005	0.060
79 DAL	Decaldehyde (n-)	1	0.83	0	5.01	0.074	1.0000	5000	4999	0.055	0.005	0.060
81 DCE	Decane	1	0.74	0.12	4.8	0.076	1.0024	5012	5083	0.057	0.006	0.062
82 DAX	Decyl Alcohol (all isomers) (Decanol)	1	0.83	0.01	5.3	0.074	1.0002	5001	5006	0.055	0.005	0.060
83 ISA	Decyl Alcohol (iso-)	1	0.83	0.01	5.3	0.074	1.0002	5001	5006	0.055	0.005	0.060
84 DAN	Decyl Alcohol (n-)	1	0.83	0.01	5.3	0.074	1.0002	5001	5006	0.055	0.005	0.060
85 DBZ	Decylbenzene (n-)	1	0.86	0.01	7.52	0.074	1.0002	5001	5010	0.055	0.005	0.061
87 DAA	Diacetone Alcohol	1	0.97	0.1	4	0.075	1.0020	5010	5056	0.056	0.006	0.062
91 DPA	Dibutyl Phthalate (ortho-)	1	1.05	0	8.59	0.074	1.0000	5000	4999	0.055	0.005	0.060
92 DPT	Dicyclopentadiene, See 1,3-Cyclopentadiene Dimer (molten)	2	0.98	0.25	4.55	0.078	1.0060	5025	5184	0.059	0.006	0.064
93 DEB	Diethylbenzene	1	0.87	0.08	4.62	0.075	1.0018	5008	5053	0.056	0.006	0.062
94 DEG	Diethylene Glycol	1	1.12	0.01	3.66	0.074	1.0002	5001	5004	0.055	0.005	0.060
95 DME	Diethylene Glycol Butyl Ether	1	0.95	0.01	5.5	0.074	1.0002	5001	5007	0.055	0.005	0.060
100 DGA	Diethylene Glycol Ethyl Ether Acetate	1	0.99	0.02	4.82	0.074	1.0004	5002	5012	0.055	0.005	0.061
101 DGM	Diethylene Glycol Methyl Ether	1	1.03	0.03	4.14	0.074	1.0008	5003	5017	0.055	0.005	0.061
111 DBC	Diisobutylcarbinol	1	0.81	0.08	4.97	0.075	1.0018	5009	5064	0.056	0.006	0.062
112 DBL	Dilaobutylene	1	0.72	2	3.66	0.100	1.0400	5200	6072	0.081	0.008	0.089
113 DIX	Dilaobutyl Ketone	1	0.81	0.18	4.9	0.077	1.0032	5016	5113	0.057	0.006	0.063
118 DIX	Diisopropylbenzene (all isomer)	1	0.86	0.03	5.6	0.074	1.0008	5003	5024	0.055	0.005	0.061
124 DTL	Dimethyl Phthalate	1	1.19	0	6.69	0.074	1.0000	5000	4999	0.055	0.005	0.060
126 DIF	Dinonyl Phthalate	1	0.97	0.01	14.4	0.074	1.0002	5001	5021	0.055	0.005	0.061
130 DOP	Diocetyl Phthalate	1	0.98	0	13.47	0.074	1.0000	5000	4999	0.055	0.005	0.060
131 DPN	Dipentene	1	0.84	0.1	4.9	0.075	1.0020	5010	5070	0.056	0.006	0.062
132 DIL	Diphenyl	1	0.99	0.01	5.31	0.074	1.0002	5001	5006	0.055	0.005	0.060
133 DDO	Diphenyl, Diphenyl Ether Mixture	1	1.07	0.01	5.86	0.074	1.0002	5001	5007	0.055	0.005	0.060
134 DPE	Diphenyl Ether	1	1.07	0.01	5.87	0.074	1.0002	5001	5007	0.055	0.005	0.060
138 OPG	Dipropylene Glycol	1	1.03	0.07	4.63	0.075	1.0014	5007	5046	0.056	0.006	0.061
139 OFF	Distillates: Flashed Feed Stocks	1	0.75	2.3	3.4	0.100	1.0460	5230	6079	0.081	0.008	0.089
140 DSR	Distillates: Straight Run	1	0.73	2.3	3.4	0.100	1.0460	5230	6079	0.081	0.008	0.089
145 DOZ	Dodecene (all isomers)	1	0.76	0.02	5.81	0.074	1.0004	5002	5016	0.055	0.005	0.061
146 DOD	Dodecene	1	0.76	0.02	5.81	0.074	1.0004	5002	5016	0.055	0.005	0.061
147 ODB	Dodecylbenzene	1	0.88	4.7	8.4	0.237	1.0940	5470	9806	0.211	0.021	0.232
155 ETG	Ethoxy Triglycol (crude)	1	1.02	0	8.14	0.074	1.0000	5000	4999	0.055	0.005	0.060
156 ETA	Ethyl Acetate	1	0.8	4.5	3.04	0.117	1.0900	5450	6859	0.103	0.010	0.113
157 EAA	Ethyl Acetoacetate	1	1.03	0.2	4.48	0.077	1.0040	5020	5129	0.058	0.006	0.063
158 EAL	Ethyl Alcohol (Ethanol)	1	0.79	3.5	1.6	0.083	1.0700	5350	5695	0.071	0.007	0.078
160 ETB	Ethyl Benzene	1	0.87	0.6	3.56	0.081	1.0120	5060	5300	0.082	0.006	0.088
161 EBT	Ethyl Butanol	1	0.83	0.12	3.52	0.075	1.0024	5012	5059	0.056	0.006	0.062
162 EBR	Ethyl Butyrate	1	0.88	1	4	0.088	1.0200	5100	5584	0.068	0.007	0.075
163 ECY	Ethyl Cyclohexane	1	0.79	0.5	3.87	0.080	1.0100	5050	5274	0.061	0.006	0.067
166 EGL	Ethylene Glycol	1	1.19	0.01	2.21	0.074	1.0002	5001	5002	0.055	0.005	0.060
169 EMA	Ethylene Glycol Butyl Ether Acetate	1	0.94	0.05	5.52	0.075	1.0010	5005	5039	0.056	0.005	0.061

TABLE 1 (SUBCHAPTER "D" CARGOES)

CHRIS CODE	NAME	VCS CAT	LIQ SG	VAPOR PRESS	VAPOR SG	AIR WEIGHT DENSITY	VAPOR GROWTH RATE	VAPOR VOLUMETRIC FLOW RATE (bb/h)	AIR EQUIVALENT VOLUMETRIC FLOW RATE	PRESSURE DROP TO STERN CONNECTION IN VCS (psig)	PRESSURE DROP THRU HOSE TO FACILITY VCS (psig)	PRESSURE DROP TO FACILITY CONNECTION (psig)
172 EGY	Ethylene Glycol Diacetate	1	1.1	0.01	5.03	0.074	1.0002	5001	5008	0.055	0.005	0.060
178 EME	Ethylene Glycol Methyl Ether	1	1.1	0.01	4.8	0.074	1.0002	5001	5008	0.055	0.005	0.060
180 EPE	Ethylene Glycol Phenyl Ether	1	1.1	0.01	4.8	0.074	1.0002	5001	5008	0.055	0.005	0.060
184 EHA	2-Ethylhexaldehyde, See Octyl Aldehydes	1	0.82	0.17	4.41	0.076	1.0034	5017	5107	0.057	0.008	0.063
188 EHX	2-Ethylhexanol, see Octanol (all isomers)	1	0.84	0.02	4.5	0.074	1.0004	5002	5012	0.055	0.005	0.061
190 EPR	Ethyl Propionate	1	0.89	3.5	1.8	0.083	1.0700	5950	6895	0.071	0.007	0.078
191 ETE	Ethyl Toluene	1	0.88	0.28	4.15	0.078	1.0058	5028	5168	0.059	0.008	0.064
194 FAM	Formamide	1	1.13	0.1	1.55	0.074	1.0020	5010	5017	0.055	0.005	0.061
195 FAL	Furfuryl Alcohol	1	1.13	0.05	3.4	0.074	1.0010	5005	5023	0.055	0.005	0.061
197 GAK	Gasoline Blended Stocks: Alkylates	1	0.75	12.5	3.4	0.214	1.2500	6250	10660	0.250	0.025	0.274
198 GRF	Gasoline Blended Stocks: Reformate	1	0.8	12.5	3.4	0.214	1.2500	6250	10660	0.250	0.025	0.274
199 GAT	Gasolines: Automotive (containing not over 4.23 grams lead/l	1	0.74	12.5	3.4	0.214	1.2500	6250	10660	0.250	0.025	0.274
200 GAV	Gasolines: Aviation (containing not over 4.86 grams lead pr	1	0.71	12.5	3.4	0.214	1.2500	6250	10660	0.250	0.025	0.274
201 GCS	Gasolines: Casinghead	1	0.67	12.5	3.4	0.214	1.2500	6250	10660	0.250	0.025	0.274
202 GPL	Gasolines: Polymer	1	0.75	12.5	3.4	0.214	1.2500	6250	10660	0.250	0.025	0.274
203 GSR	Gasolines: Straight Run	1	0.75	12.5	3.4	0.214	1.2500	6250	10660	0.250	0.025	0.274
204 GCR	Glycerine	1	1.26	0	3.17	0.074	1.0000	5000	4999	0.055	0.005	0.060
217 HMX	Heptane (all isomers) (Methylhexane)	1	0.68	2.5	3.45	0.102	1.0500	5250	6188	0.084	0.008	0.092
218 HPT	Heptane (n-)	1	0.68	2.5	3.45	0.102	1.0500	5250	6188	0.084	0.008	0.092
219 HEP	Heptanoic Acid	1	0.92	0.01	4.49	0.074	1.0002	5001	5005	0.055	0.005	0.060
220 HTX	Heptanol (all isomers)	1	0.82	0.04	4	0.074	1.0008	5004	5022	0.055	0.005	0.061
221 HTN	Heptanol (all isomers)	1	0.82	0.04	4	0.074	1.0008	5004	5022	0.055	0.005	0.061
222 HPX	Heptene (all isomers)	2	0.7	2.9	3.4	0.108	1.0580	5290	6354	0.089	0.009	0.097
223 THE	Heptene (1-)	1	0.7	2.8	3.4	0.105	1.0580	5280	6308	0.087	0.009	0.096
224 HPE	Heptyl Acetate	1	0.88	0.1	5.5	0.078	1.0020	5010	5080	0.057	0.008	0.062
228 HXS	Hexane (all isomers)	1	0.66	7	3	0.139	1.1400	5700	7838	0.135	0.013	0.148
230 HXA	Hexane	1	0.66	7	3	0.139	1.1400	5700	7838	0.135	0.013	0.148
231 HXO	Hexanoic Acid	1	0.93	0.01	4	0.074	1.0002	5001	5004	0.055	0.005	0.060
232 HXN	Hexanol	1	0.82	1	3.52	0.085	1.0200	5100	5493	0.066	0.007	0.073
234 HEX	Hexene (all isomers)	2	0.67	8	2.9	0.145	1.1600	5800	8135	0.145	0.014	0.160
235 HXE	Hexene (1-)	1	0.67	8.2	2.9	0.147	1.1640	5820	8213	0.148	0.015	0.163
236 HXT	Hexene (2-)	1	0.67	8.2	2.9	0.147	1.1640	5820	8213	0.148	0.015	0.163
238 HXG	Hexylene Glycol	4	0.92	0.01	1.1	0.074	1.0002	5001	5000	0.055	0.005	0.060
243 IPH	Isophorone	1	0.93	0.01	4.75	0.074	1.0002	5001	5008	0.055	0.005	0.060
244 JPO	Jet Fuels: JP-1 (Kerosene)	1	0.8	0.14	4.5	0.076	1.0028	5014	5090	0.057	0.008	0.063
245 JPT	Jet Fuels: JP-3	1	0.8	8.51	4.5	0.213	1.1702	5851	9956	0.218	0.021	0.239
248 JPF	Jet Fuels: JP-4	1	0.81	3.4	4	0.121	1.0680	5340	6857	0.103	0.010	0.113
247 JPV	Jet Fuels: JP-5 (Kerosene, heavy)	1	0.82	0.1	4	0.075	1.0020	5010	5058	0.056	0.008	0.062
249 KRS	Kerosene	1	0.81	0.15	4.5	0.076	1.0030	5015	5097	0.057	0.008	0.063
263 MTT	Methyl Acetate	1	0.82	6.1	2.8	0.119	1.1220	5810	7142	0.112	0.011	0.123
265 MAL	Methyl Alcohol (See Methanol)	1	0.79	6.63	1.1	0.077	1.1328	5863	5780	0.073	0.007	0.081
266 MAC	Methyl Amyl Acetate	1	0.88	0.33	4.97	0.080	1.0068	5033	5237	0.060	0.008	0.066
267 MAA	Methyl Amyl Alcohol	1	0.81	0.43	3.52	0.079	1.0088	5043	5213	0.060	0.008	0.066
271 MBK	Methyl n-Butyl Ketone	1	0.81	0.97	3.5	0.085	1.0194	5097	5475	0.066	0.006	0.072
273 MBU	Methyl Butyrate	1	0.9	1.26	3.53	0.089	1.0252	5128	5621	0.069	0.007	0.076
274 MEK	Methyl Ethyl Ketone	1	0.8	4.5	2.5	0.105	1.0900	5450	6515	0.093	0.009	0.102
275 MTF	Methyl Formal (Dimethyl Formal)	1	0.88	15.42	2.6	0.189	1.3084	6542	10488	0.242	0.024	0.265
276 MHK	Methyl Heptyl Ketone	1	0.83	0.06	4.9	0.075	1.0012	5006	5042	0.058	0.005	0.061
278 MIX	Methyl Isobutyl Ketone	1	0.8	1.15	3.45	0.087	1.0230	5115	5553	0.068	0.007	0.074
281 MNA	1-Methyl Naphthalene	1	1.02	0.01	4.91	0.074	1.0002	5001	5006	0.055	0.005	0.060
283 MPN	2-Methyl-1-Pentene	1	0.69	6.3	2.9	0.130	1.1260	5830	7472	0.123	0.012	0.135
284 MTN	5-Methyl-1-Pentene	1	0.67	6.49	2.9	0.149	1.1698	5848	8326	0.152	0.015	0.167
288 MBE	Methyl Tert-Butyl Ether (MTBE)	1	0.74	0.04	3.1	0.074	1.0008	5004	5016	0.055	0.005	0.061
288 MNS	Mineral Spirits	1	0.75	0.2	4.3	0.077	1.0040	5020	5123	0.058	0.008	0.063
289 MRE	Myrcene	1	0.8	0.17	4.7	0.077	1.0034	5017	5115	0.057	0.008	0.063
295 NSV	Naphtha: Solvent	1	0.87	0.2	3.5	0.076	1.0040	5020	5098	0.057	0.008	0.063
296 NSS	Naphtha: Stoddard Solvent	1	0.78	0.2	4.3	0.077	1.0040	5020	5123	0.058	0.008	0.063
297 NVM	Naphtha: Varnish Maker's and Painters (75%)	1	0.77	0.19	4.3	0.077	1.0038	5019	5117	0.058	0.008	0.063
300 NAX	Nonane (all isomers)	1	0.72	0.27	4.4	0.078	1.0054	5027	5170	0.059	0.008	0.064
301 NAN	Nonane	1	0.72	0.27	4.4	0.078	1.0054	5027	5170	0.059	0.008	0.064
304 NON	Nonane	1	0.73	0.35	4.3	0.079	1.0070	5035	5215	0.060	0.008	0.066
305 NNS	Nonyl Alcohol (all isomers)	1	0.94	0.1	5	0.078	1.0020	5010	5072	0.058	0.008	0.062
306 NNN	Nonyl Alcohol	1	0.94	0.1	5	0.078	1.0020	5010	5072	0.058	0.008	0.062
307 NNI	Nonyl Alcohol (Iso-)	1	0.94	0.1	5	0.078	1.0020	5010	5072	0.058	0.008	0.062
309 NNP	Nonyl Phenol	1	0.95	0.01	7.8	0.074	1.0002	5001	5010	0.055	0.005	0.061
316 OAX	Octane (all isomers)	1	0.7	0.79	3.9	0.084	1.0158	5079	5435	0.065	0.008	0.071
317 OAN	Octane	1	0.7	0.79	3.9	0.084	1.0158	5079	5435	0.065	0.008	0.071

TABLE 1 (SUBCHAPTER "D" CARGOES)

CHRIS CODE	NAME	VCS CAT	LIQ SG	VAPOR PRESS	VAPOR SG	VAPOR AIR WEIGHT DENSITY	VAPOR GROWTH RATE	VAPOR VOLUMETRIC FLOW RATE (bbt/h)	AIR EQUIVALENT VOLUMETRIC FLOW RATE	PRESSURE DROP TO STERN CONNECTION IN VCS (psig)	PRESSURE DROP THRU HOSE TO FACILITY VCS (psig)	PRESSURE DROP TO FACILITY CONNECTION (psig)
318 OAA	Octanoic Acid (all isomers)	1	0.91	0.01	5	0.074	1.0002	5001	5008	0.055	0.006	0.080
319 OCX	Octanol (all isomers)	1	0.83	0.01	4.48	0.074	1.0002	5001	5005	0.055	0.005	0.080
320 OTA	Octanol	1	0.83	0.01	4.48	0.074	1.0002	5001	5005	0.055	0.005	0.080
321 OTX	Octane (all isomers)	2	0.72	0.9	3.9	0.086	1.0180	5090	5495	0.066	0.007	0.073
322 OTE	Octane (1-)	1	0.72	1	3.86	0.087	1.0200	5100	5544	0.067	0.007	0.074
324 OCX	Octyl Alcohol (iso-, n-) (all isomers), See Octanol (all isomers)	1	0.83	0.01	4.48	0.074	1.0002	5001	5005	0.055	0.005	0.080
325 IOA	Octyl Alcohol	1	0.83	0.01	4.48	0.074	1.0002	5001	5005	0.055	0.005	0.080
364 OTW	Fuel: No. 2	1	0.88	0.56	8	0.092	1.0112	5056	5650	0.070	0.007	0.077
366 OFR	Fuel: No. 4	1	0.9	0.15	3.4	0.075	1.0030	5015	5071	0.056	0.006	0.062
367 OFV	Fuel: No. 5	1	0.94	0.15	3.4	0.075	1.0030	5015	5071	0.056	0.006	0.062
368 OSX	Fuel: No. 8	1	0.95	0.15	3.4	0.075	1.0030	5015	5071	0.056	0.006	0.062
382 OIL	OIL, Misc: Crude	1	0.95	0.15	3.4	0.075	1.0030	5015	5071	0.056	0.006	0.062
383 ODS	OIL, Misc: Diesel	1	0.9	0.69	3.4	0.081	1.0138	5069	5328	0.062	0.006	0.068
389 OLB	OIL, Misc: Lubricating	1	0.9	0.15	1	0.074	1.0030	5015	5014	0.055	0.005	0.061
403 ORS	OIL, Misc: Resin	1	1.02	0.15	1	0.074	1.0030	5015	5014	0.055	0.005	0.061
418 OTB	OIL, Misc: Turbine	1	0.87	0.3	5.4	0.080	1.0080	5030	5236	0.060	0.006	0.066
429 PDC	Pentadecanol, See Alcohols (C13 and above)	1	0.83	0.01	7.88	0.074	1.0002	5001	5011	0.055	0.005	0.081
432 PTY	Pentane (all isomers)	5	0.63	21	2.48	0.261	1.4200	7100	13360	0.392	0.039	0.431
433 IPT	Pentane (iso-)	5	0.62	27	2.48	0.335	1.5400	7700	18429	0.593	0.058	0.651
434 PTA	Pentane (n-)	5	0.63	20.44	2.5	0.256	1.4088	7044	13130	0.379	0.037	0.416
436 PTX	Pentene (all isomers)	5	0.64	24.9	2.4	0.299	1.4980	7490	15098	0.501	0.049	0.550
437 PTE	Pentene (1-)	5	0.64	24.9	2.4	0.299	1.4980	7490	15098	0.501	0.049	0.550
442 PIN	Pinene	1	0.86	0.35	4.7	0.080	1.0070	5035	5237	0.060	0.006	0.066
448 PLB	Polybutene	1	0.91	0.01	79.3	0.077	1.0002	5001	5123	0.058	0.008	0.063
457 PGC	Polypropylene Glycol	1	1.01	0.1	1	0.074	1.0020	5010	5009	0.055	0.005	0.061
458 PGM	Polypropylene Glycol Methyl Ether	1	0.92	0.8	3.11	0.082	1.0160	5080	5345	0.063	0.006	0.068
464 IAC	Propyl Acetate (iso-)	1	0.89	1.8	3.52	0.095	1.0360	5180	5879	0.076	0.007	0.083
465 PAT	Propyl Acetate (n-)	1	0	1.85	3.52	0.095	1.0370	5185	5903	0.077	0.008	0.084
466 IPA	Propyl Alcohol (iso-)	1	0.79	3	2.07	0.089	1.0800	5300	5815	0.074	0.007	0.082
467 PAL	Propyl Alcohol (n-)	1	0.8	1.2	2.07	0.080	1.0240	5120	5324	0.062	0.006	0.068
468 PBZ	Propylbenzene (n-)	1	0.88	0.2	4.14	0.077	1.0040	5020	5118	0.058	0.006	0.063
469 IPX	Iso-Propylcyclohexane	1	0.8	0.01	4.35	0.074	1.0002	5001	5005	0.055	0.005	0.060
473 PPG	Propylene Glycol (1,2-Propanediol)	1	1.04	0.01	2.62	0.074	1.0002	5001	5002	0.055	0.005	0.060
476 PME	Propylene Glycol Methyl Ether	1	0.92	0.7	3.11	0.081	1.0140	5070	5302	0.062	0.008	0.068
478 PTT	Propylene Tetramer	1	0.29	0.02	1	0.074	1.0004	5002	5001	0.055	0.005	0.060
488 SFL	Sulfolane	1	1.26	0.01	4.14	0.074	1.0002	5001	5005	0.055	0.005	0.060
493 TTN	Tetradecanol	1	0.82	0	7.39	0.074	1.0000	5000	4999	0.055	0.005	0.060
494 TTD	1-Tetradecene, See the olefin or Alpha-Olefin Entries	1	0.77	0.01	8.77	0.074	1.0002	5001	5009	0.055	0.005	0.061
498 TTG	Tetraethylene Glycol	1	1.12	0.01	6.7	0.074	1.0002	5001	5008	0.055	0.005	0.061
497 THN	Tetrahydronaphthalene	1	0.87	0.04	4.68	0.074	1.0008	5004	5025	0.055	0.005	0.061
499 TOL	Toluene	1	0.87	1.5	3.14	0.089	1.0300	5150	5650	0.070	0.007	0.077
502 TCP	Triacetyl Phosphate (less than 1% of the ortho isomer)	1	1.16	0.01	12.69	0.074	1.0002	5001	5018	0.055	0.005	0.061
503 TRD	Tridecene	1	0.78	0.02	6.4	0.074	1.0004	5002	5018	0.055	0.005	0.061
505 TDN	Tridecanol, See Alcohols (C13 and above)	1	0.85	0.01	6.91	0.074	1.0002	5001	5009	0.055	0.005	0.061
508 TDC	1-Tridecene	1	0.77	0.01	8.29	0.074	1.0002	5001	5008	0.055	0.005	0.061
508 TEB	Triethylbenzene	1	0.86	0.02	5.6	0.074	1.0004	5002	5015	0.055	0.005	0.061
509 TEG	Triethylene Glycol	1	1.12	0.01	5.17	0.074	1.0002	5001	5008	0.055	0.005	0.060
519 TRE	Trimethylbenzenes (all isomers)	1	0.89	0.14	4.2	0.076	1.0028	5014	5084	0.057	0.006	0.062
520 TMB	Trimethyl Benzene (1,2,5-)	1	0.89	0.14	4.14	0.076	1.0028	5014	5082	0.057	0.006	0.062
521 TMD	Trimethyl Benzene (1,2,3-)	1	0.89	0.14	4.14	0.076	1.0028	5014	5082	0.057	0.006	0.062
522 TME	Trimethyl Benzene (1,2,4-) (Pseudocumene)	1	0.89	0.14	4.14	0.076	1.0028	5014	5082	0.057	0.006	0.062
529 TRP	Trixylenyl Phosphate	1	1.16	0	14.2	0.074	1.0000	5000	4999	0.055	0.005	0.060
533 UDC	Undecene (1-)	1	0.75	0.05	5.32	0.075	1.0010	5005	5038	0.058	0.005	0.061
534 UND	Undecyl Alcohol	1	0.84	0.01	5.94	0.074	1.0002	5001	5007	0.055	0.005	0.060
548 XLX	Xylenes (Ortho-, meta-, para-)	1	0.89	0.51	3.66	0.080	1.0102	5051	5263	0.061	0.006	0.067
547 XLM	Xylene (M-)	1	0.87	0.51	3.66	0.080	1.0102	5051	5263	0.061	0.006	0.067
548 XLO	Xylene (O-)	1	0.89	0.4	3.66	0.079	1.0080	5040	5207	0.060	0.006	0.065
549 XLP	Xylene (P-)	1	0.86	0.51	3.66	0.080	1.0102	5051	5263	0.061	0.006	0.067
550 XYL	Xylenol	1	1.01	0.1	3.66	0.075	1.0020	5010	5051	0.058	0.006	0.062
551	Zinc Dialkylthiophosphate											
		Max.	1.280	27.000	79.300	0.335	1.540	7700	18429	0.593	0.058	0.651

MARINE SOLUTIONS, INC.

VCS SYSTEM INFORMATION:

1. GENERAL DESCRIPTION OF VESSEL:

	WORST CASE:	BARGE "CBC 336" OUTBOARD BARGE "CBC 338" INBOARD
A. NAME (S):	CBC 336 & CBC 338	
B. OFFICIAL NUMBER:	D1119684 & D1119687	
C. DIMENSIONS:	297'-0" X 54'-0" X 12'-0"	
D. SERVICE:	TANK BARGE (D)	
E. MAX. DESIGN WORKING PRESSURE:		2 PSIG
F. PV VALVE PRESSURE SETTING:		1 PSIG
G. PV VALVE VACUUM SETTING:		0.5 PSIG

2. VAPOR CONTROL SYSTEM

A. PIPE DIAMETER:	7.981 INCHES IPS
B. MAX. VAPOR-AIR MIXTURE DENSITY:	0.335 LBM/FT ³ FOR SUBCHAPTER "D" CARGOES
C. MAX. LIQUID UNLOADING RATE:	3000 BBLS/HR
D. DARCY FRICTION FACTOR:	0.014 FOR PIPE 0.001 FOR HOSE
E. VCS CARGOES:	SEE TABLE 1

VCS CALCULATIONS

1. THE EQUIVALENT LENGTH OF PIPE FROM BARGE'S MOST REMOTE CARGO TANK TO THE BARGE'S SHORE SIDE VAPOR CONNECTION:

Tank 1P on "CBC 336" is the farthest tank from the barge's shore connection. Using Crane's Technical Paper No. 410, the total equivalent length (L) for the path is shown in Table 2.

TABLE 2

PIPE/FITTINGS	QUANTITY	UNIT EQ. LENGTH (FT)	TOTAL EQ. LENGTH (FT)
Straight Pipe	1	238.24	238.24
Entrance	1	37.05	37.05
T Branch	7	39.91	279.37
45 Ell	1	3.72	3.72
T Run	6	13.33	79.98
8" Gate Valve	1	5.32	5.32
8" 90 Ell	1	7.98	7.98
		Total	651.66

2. THE EQUIVALENT LENGTH OF PIPE FROM OUTBOARD BARGE'S SHORE SIDE CONNECTION, ACROSS THE INBOARD (BREASTED) BARGE, TO THE SHORE SIDE VAPOR CONNECTION OF THE INBOARD BARGE (30FT OF 8" HOSE + INBOARD BARGE):

TABLE 3

PIPE/FITTINGS	QUANTITY	UNIT EQ. LENGTH (FT)	TOTAL EQ. LENGTH (FT)
Straight Pipe	1	38.083	38.083
T Run	1	13.3	13.3
8" Gate Valve	2	5.32	10.64
		Total	62.023
Hose	1		30

TABLE 1 (SUBCHAPTER "D" CARGOES)

CHRIS CODE	NAME	VCS CAT	LIQ SG	VAPOR PRESS	VAPOR SG	VAPOR AIR WEIGHT DENSITY	VAPOR GROWTH RATE	VAPOR VOLUMETRIC FLOW RATE (bb/h)	AIR EQUIVALENT VOLUMETRIC FLOW RATE	PRESSURE DROP TO STERN CONNECTION IN VCS (psig)	PRESSURE DROP THRU HOSE TO FACILITY VCS (psig)	TOTAL PRESSURE DROP TO FACILITY CONNECTION (psig)
1 ACT	Acetone	1	0.79	10	2	0.121	1.2000	3600	4805	0.047	0.005	0.051
2 ACP	Acetophenone	1	1.03	0.8	4.14	0.082	1.0120	3036	3212	0.023	0.002	0.025
19 AAT	Amyl Acetate (iso-)	1	0.88	0.33	4.48	0.079	1.0068	3020	3127	0.021	0.002	0.024
20 AAI	Amyl Alcohol (iso-, n-, sec-, primary) (See also IAA)	1	0.82	0.3	3.04	0.077	1.0060	3018	3075	0.021	0.002	0.023
21 AAN	Amyl Alcohol (n-)	1	0.82	0.3	3.04	0.077	1.0060	3018	3075	0.021	0.002	0.023
23 APM	Amyl Alcohol, Primary	1	0.82	0.3	3.04	0.077	1.0060	3018	3075	0.021	0.002	0.023
24 ASE	Amyl Alcohol, (sec-)	1	0.82	0.3	3.04	0.077	1.0060	3018	3075	0.021	0.002	0.023
28 IAA	Amyl Alcohol, (iso-)	1	0.82	0.3	3.04	0.077	1.0060	3018	3075	0.021	0.002	0.023
34 BAL	Benzyl Alcohol	1	1.05	0.1	3.73	0.075	1.0020	3006	3031	0.020	0.002	0.022
40 BAX	Butyl Acetate (iso-, n-)	1	0.87	0.8	4	0.082	1.0120	3038	3204	0.023	0.002	0.025
42 BTA	Butyl Acetate (sec-)	1	0.89	1.5	4	0.085	1.0300	3080	3504	0.027	0.003	0.030
44 IAL	Butyl Alcohol (iso-)	1	0.81	0.8	2.8	0.080	1.0180	3054	3180	0.022	0.002	0.025
48 BAS	Butyl Alcohol (sec-)	1	0.81	1.3	2.8	0.083	1.0260	3078	3275	0.024	0.002	0.026
47 BAT	Butyl Alcohol (tert-)	1	0.78	2.8	2.6	0.085	1.0560	3168	3591	0.028	0.003	0.031
48 BPH	Butyl Benzyl Phthalate	1	1.12	0.01	10.8	0.074	1.0002	3001	3009	0.020	0.002	0.022
58 BUE	Butyl Toluene	1	0.85	0.1	5.11	0.076	1.0020	3006	3044	0.020	0.002	0.022
84 CLS	Caprolactam Solutions	1	1.02	0.05	3.9	0.074	1.0010	3003	3016	0.020	0.002	0.022
70 CUM	Cumene	1	0.86	0.60	4.20	0.083	1.0120	3038	3215	0.023	0.002	0.025
72 CHX	Cyclohexane	1	0.78	4.5	2.9	0.114	1.0800	3270	4063	0.036	0.004	0.040
73 CHN	Cyclohexanol	1	0.95	0.15	3.45	0.075	1.0030	3009	3043	0.020	0.002	0.022
74 CPD	1,3-Cyclopentadiene dimer (molten)	1	0.89	0.25	4.55	0.078	1.0050	3015	3098	0.021	0.002	0.023
78 CMP	Cymene (para-)	1	0.88	0.11	4.82	0.076	1.0022	3007	3044	0.020	0.002	0.022
77 DHN	Decaldehydronaphthalene	1	0.89	0.1	4.76	0.075	1.0020	3006	3041	0.020	0.002	0.022
78 IDA	Decaldehyde (iso-)	1	0.83	0.01	5	0.074	1.0002	3001	3004	0.020	0.002	0.022
79 DAL	Decaldehyde (n-)	1	0.83	0	5.01	0.074	1.0000	3000	2999	0.020	0.002	0.022
81 DCE	Decane	1	0.74	0.12	4.8	0.076	1.0024	3007	3050	0.020	0.002	0.022
82 DAX	Decyl Alcohol (all isomers) (Decanol)	1	0.83	0.01	5.3	0.074	1.0002	3001	3004	0.020	0.002	0.022
83 ISA	Decyl Alcohol (iso-)	1	0.83	0.01	5.3	0.074	1.0002	3001	3004	0.020	0.002	0.022
84 DAN	Decyl Alcohol (n-)	1	0.83	0.01	5.3	0.074	1.0002	3001	3004	0.020	0.002	0.022
85 DBZ	Decylbenzene (n-)	1	0.88	0.01	7.52	0.074	1.0002	3001	3006	0.020	0.002	0.022
87 DAA	Diacetone Alcohol	1	0.97	0.1	4	0.075	1.0020	3006	3034	0.020	0.002	0.022
91 DPA	Diethyl Phthalate (ortho-)	1	1.05	0	9.59	0.074	1.0000	3000	2999	0.020	0.002	0.022
92 DPT	Dicyclopentadiene, See 1,3-Cyclopentadiene Dimer (molten)	2	0.88	0.25	4.55	0.078	1.0050	3015	3098	0.021	0.002	0.023
93 DEB	Diethylbenzene	1	0.87	0.08	4.82	0.075	1.0016	3005	3032	0.020	0.002	0.022
94 DEG	Diethylene Glycol	1	1.12	0.01	3.88	0.074	1.0002	3001	3002	0.020	0.002	0.022
95 DME	Diethylene Glycol Butyl Ether	1	0.85	0.01	5.5	0.074	1.0002	3001	3004	0.020	0.002	0.022
100 DGA	Diethylene Glycol Ethyl Ether Acetate	1	0.99	0.02	4.62	0.074	1.0004	3001	3007	0.020	0.002	0.022
101 DGM	Diethylene Glycol Methyl Ether	1	1.03	0.03	4.14	0.074	1.0006	3002	3010	0.020	0.002	0.022
111 DBC	Diisobutylcarbinol	1	0.81	0.09	4.97	0.075	1.0018	3005	3039	0.020	0.002	0.022
112 DBL	Diisobutylene	1	0.72	2	3.88	0.100	1.0400	3120	3843	0.029	0.003	0.032
113 DIX	Diisobutyl Ketone	1	0.81	0.16	4.9	0.077	1.0032	3010	3068	0.021	0.002	0.023
119 DIX	Diisopropylbenzene (all isomer)	1	0.86	0.03	5.6	0.074	1.0008	3002	3014	0.020	0.002	0.022
124 DTL	Dimethyl Phthalate	1	1.19	0	8.69	0.074	1.0000	3000	2999	0.020	0.002	0.022
128 DIF	Dimethyl Phthalate	1	0.97	0.01	14.4	0.074	1.0002	3001	3013	0.020	0.002	0.022
130 DOP	Diethyl Phthalate	1	0.88	0	13.47	0.074	1.0000	3000	2999	0.020	0.002	0.022
131 DPN	Dipentene	1	0.84	0.1	4.9	0.075	1.0020	3006	3042	0.020	0.002	0.022
132 DIL	Diphenyl	1	0.99	0.01	5.31	0.074	1.0002	3001	3004	0.020	0.002	0.022
133 DDO	Diphenyl, Diphenyl Ether Mixture	1	1.07	0.01	5.88	0.074	1.0032	3001	3004	0.020	0.002	0.022
134 DPE	Diphenyl Ether	1	1.07	0.01	5.87	0.074	1.0002	3001	3004	0.020	0.002	0.022
136 DPG	Dipropylene Glycol	1	1.03	0.07	4.83	0.075	1.0014	3004	3028	0.020	0.002	0.022
139 DFF	Distillates: Flashed Feed Stocks	1	0.75	2.3	3.4	0.100	1.0480	3138	3847	0.029	0.003	0.032
140 DSR	Distillates: Straight Run	1	0.73	2.3	3.4	0.100	1.0480	3138	3847	0.029	0.003	0.032
145 DOZ	Dodecene (all isomers)	1	0.76	0.02	5.81	0.074	1.0004	3001	3010	0.020	0.002	0.022
146 DOD	Dodecene	1	0.76	0.02	5.81	0.074	1.0004	3001	3010	0.020	0.002	0.022
147 DDB	Dodecylbenzene	1	0.86	4.7	8.4	0.237	1.0840	3282	5883	0.076	0.007	0.084
155 ETG	Ethoxy Triglycol (crude)	1	1.02	0	6.14	0.074	1.0000	3000	2999	0.020	0.002	0.022
158 ETA	Ethyl Acetate	1	0.9	4.5	3.04	0.117	1.0800	3270	4115	0.037	0.004	0.041
157 EAA	Ethyl Acetoacetate	1	1.03	0.2	4.48	0.077	1.0040	3012	3077	0.021	0.002	0.023
158 EAL	Ethyl Alcohol (Ethanol)	1	0.79	3.5	1.6	0.083	1.0700	3210	3417	0.026	0.003	0.028
160 ETB	Ethyl Benzene	1	0.87	0.8	3.56	0.081	1.0120	3036	3180	0.022	0.002	0.024
161 EBT	Ethyl Butanol	1	0.83	0.12	3.52	0.075	1.0024	3007	3035	0.020	0.002	0.022
162 EBR	Ethyl Butyrate	1	0.88	1	4	0.088	1.0200	3060	3339	0.024	0.002	0.027
163 ECY	Ethyl Cyclohexane	1	0.79	0.5	3.87	0.080	1.0100	3030	3165	0.022	0.002	0.024

TABLE 1 (SUBCHAPTER "D" CARGOES)

CHRIS CODE	NAME	VCS CAT	LIQ SG	VAPOR PRESS	VAPOR SG	VAPOR AIR WEIGHT DENSITY	VAPOR GROWTH RATE	VAPOR VOLUMETRIC FLOW RATE (bbt/h)	AIR EQUIVALENT VOLUMETRIC FLOW RATE	PRESSURE DROP TO STERN CONNECTION IN VCS (psig)	PRESSURE DROP THRU HOSE TO FACILITY VCS (psig)	PRESSURE DROP TO FACILITY CONNECTION (psig)
166 EGL	Ethylene Glycol	1	1.18	0.01	2.21	0.074	1.0002	3001	3001	0.020	0.002	0.022
169 EMA	Ethylene Glycol Butyl Ether Acetate	1	0.94	0.05	5.52	0.075	1.0010	3003	3024	0.020	0.002	0.022
172 EGY	Ethylene Glycol Diacetate	1	1.1	0.01	5.03	0.074	1.0002	3001	3004	0.020	0.002	0.022
178 EME	Ethylene Glycol Methyl Ether	1	1.1	0.01	4.8	0.074	1.0002	3001	3003	0.020	0.002	0.022
180 EPE	Ethylene Glycol Phenyl Ether	1	1.1	0.01	4.8	0.074	1.0002	3001	3003	0.020	0.002	0.022
184 SHA	2-Ethylhexaldehyde, See Octyl Aldehydes	1	0.82	0.17	4.41	0.078	1.0034	3010	3084	0.021	0.002	0.023
188 EMX	2-Ethylhexanol, see Octanol (all isomers)	1	0.84	0.02	4.5	0.074	1.0004	3001	3007	0.020	0.002	0.022
190 EPR	Ethyl Propionate	1	0.89	3.5	1.8	0.083	1.0700	3210	3417	0.028	0.003	0.028
191 ETE	Ethyl Toluene	1	0.88	0.28	4.15	0.078	1.0058	3017	3100	0.021	0.002	0.023
194 FAM	Formamide	1	1.13	0.1	1.55	0.074	1.0020	3008	3010	0.020	0.002	0.022
195 FAL	Formyl Alcohol	1	1.13	0.05	3.4	0.074	1.0010	3003	3014	0.020	0.002	0.022
197 GAK	Gasoline Blended Stocks: Alkylates	1	0.75	12.5	3.4	0.214	1.2500	3750	6398	0.090	0.009	0.099
198 GRF	Gasoline Blended Stocks: Reformate	1	0.8	12.5	3.4	0.214	1.2500	3750	6398	0.090	0.009	0.099
199 GAT	Gasolines: Automotive (containing not over 4.23 grams lead per gallon)	1	0.74	12.5	3.4	0.214	1.2500	3750	6398	0.090	0.009	0.099
200 GAV	Gasolines: Aviation (containing not over 4.88 grams lead per gallon)	1	0.71	12.5	3.4	0.214	1.2500	3750	6398	0.090	0.009	0.099
201 GCS	Gasolines: Casinghead	1	0.87	12.5	3.4	0.214	1.2500	3750	6398	0.090	0.009	0.099
202 GPL	Gasolines: Polymer	1	0.75	12.5	3.4	0.214	1.2500	3750	6398	0.090	0.009	0.099
203 GSR	Gasolines: Straight Run	1	0.75	12.5	3.4	0.214	1.2500	3750	6398	0.090	0.009	0.099
204 GCR	Glycerine	1	1.28	0	3.17	0.074	1.0000	3000	2999	0.020	0.002	0.022
217 HMX	Heptane (all isomers) (Methylhexane)	1	0.68	2.5	3.45	0.102	1.0500	3150	3713	0.030	0.003	0.033
218 HPT	Heptane (n-)	1	0.68	2.5	3.45	0.102	1.0500	3150	3713	0.030	0.003	0.033
219 HEP	Heptonic Acid	1	0.92	0.01	4.49	0.074	1.0002	3001	3003	0.020	0.002	0.022
220 HTX	Heptanol (all isomers)	1	0.82	0.04	4	0.074	1.0008	3002	3013	0.020	0.002	0.022
221 HTN	Heptanol (all isomers)	1	0.82	0.04	4	0.074	1.0008	3002	3013	0.020	0.002	0.022
222 HPX	Heptene (all isomers)	2	0.7	2.9	3.4	0.108	1.0580	3174	3812	0.032	0.003	0.035
223 THE	Heptene (1-)	1	0.7	2.8	3.4	0.105	1.0580	3168	3785	0.031	0.003	0.035
224 HPE	Heptyl Acetate	1	0.88	0.1	5.5	0.078	1.0020	3008	3048	0.020	0.002	0.022
229 HXS	Hexane (all isomers)	1	0.68	7	3	0.139	1.1400	3420	4703	0.049	0.005	0.053
230 HXA	Hexane	1	0.68	7	3	0.139	1.1400	3420	4703	0.049	0.005	0.053
231 HXO	Hexanoic Acid	1	0.93	0.01	4	0.074	1.0002	3001	3003	0.020	0.002	0.022
232 HXN	Hexanol	1	0.82	1	3.52	0.085	1.0200	3060	3298	0.024	0.002	0.026
234 HEX	Hexene (all isomers)	2	0.67	8	2.9	0.145	1.1800	3480	4881	0.052	0.005	0.057
235 HXE	Hexene (1-)	1	0.67	8.2	2.9	0.147	1.1840	3492	4928	0.053	0.005	0.059
236 HXT	Hexene (2-)	1	0.67	8.2	2.9	0.147	1.1840	3492	4928	0.053	0.005	0.059
238 HXG	Hexylene Glycol	4	0.92	0.01	1.1	0.074	1.0002	3001	3000	0.020	0.002	0.022
243 IPH	Isophorone	1	0.93	0.01	4.75	0.074	1.0002	3001	3003	0.020	0.002	0.022
244 JPO	Jet Fuels: JP-1 (Kerosene)	1	0.8	0.14	4.5	0.078	1.0028	3008	3054	0.020	0.002	0.023
245 JPT	Jet Fuels: JP-3	1	0.8	9.51	4.5	0.213	1.1702	3511	5874	0.078	0.008	0.080
246 JPF	Jet Fuels: JP-4	1	0.81	3.4	4	0.121	1.0660	3204	4114	0.037	0.004	0.041
247 JPV	Jet Fuels: JP-5 (Kerosene, heavy)	1	0.82	0.1	4	0.075	1.0020	3008	3034	0.020	0.002	0.022
248 KRS	Kerosene	1	0.81	0.15	4.5	0.078	1.0030	3009	3058	0.021	0.002	0.023
263 MTT	Methyl Acetate	1	0.92	8.1	2.8	0.119	1.1220	3368	4285	0.040	0.004	0.044
265 MAL	Methyl Alcohol (See Methanol)	1	0.79	8.83	1.1	0.077	1.1328	3398	3488	0.028	0.003	0.029
266 MAC	Methyl Amyl Acetate	1	0.88	0.33	4.87	0.080	1.0068	3020	3142	0.022	0.002	0.024
267 MAA	Methyl Amyl Alcohol	1	0.81	0.43	3.52	0.079	1.0088	3028	3128	0.021	0.002	0.024
271 MBK	Methyl n-Butyl Ketone	1	0.81	0.87	3.5	0.085	1.0194	3058	3285	0.024	0.002	0.026
273 MBU	Methyl Butyrate	1	0.9	1.28	3.53	0.089	1.0252	3078	3372	0.025	0.002	0.027
274 MEK	Methyl Ethyl Ketone	1	0.8	4.5	2.5	0.105	1.0900	3270	3909	0.034	0.003	0.037
275 MTF	Methyl Formal (Dimethyl Formal)	1	0.88	15.42	2.8	0.189	1.3084	3925	6283	0.087	0.009	0.096
276 MHK	Methyl Heptyl Ketone	1	0.83	0.06	4.9	0.075	1.0012	3004	3025	0.020	0.002	0.022
278 MUK	Methyl Isobutyl Ketone	1	0.8	1.15	3.45	0.087	1.0230	3089	3332	0.024	0.002	0.027
281 MNA	1-Methyl Naphthalene	1	1.02	0.01	4.91	0.074	1.0002	3001	3003	0.020	0.002	0.022
283 MPN	2-Methyl-1-Pentene	1	0.69	8.3	2.8	0.130	1.1280	3378	4483	0.044	0.004	0.048
284 MTN	5-Methyl-1-Pentene	1	0.67	8.49	2.8	0.149	1.1688	3509	4998	0.055	0.005	0.060
298 MBE	Methyl Tert-Butyl Ether (MTBE)	1	0.74	0.04	3.1	0.074	1.0008	3002	3010	0.020	0.002	0.022
298 MNS	Mineral Spirits	1	0.75	0.2	4.3	0.077	1.0040	3012	3074	0.021	0.002	0.023
289 MRE	Myrcene	1	0.8	0.17	4.7	0.077	1.0034	3010	3069	0.021	0.002	0.023
295 NSV	Naphtha: Solvent	1	0.87	0.2	3.5	0.078	1.0040	3012	3059	0.021	0.002	0.023
296 NSS	Naphtha: Stoddard Solvent	1	0.78	0.2	4.3	0.077	1.0040	3012	3074	0.021	0.002	0.023
297 NVM	Naphtha: Varnish Maker's and Painters (75%)	1	0.77	0.19	4.3	0.077	1.0038	3011	3070	0.021	0.002	0.023
300 NAX	Nonane (all isomers)	1	0.72	0.27	4.4	0.078	1.0054	3018	3102	0.021	0.002	0.023
301 NAN	Nonane	1	0.72	0.27	4.4	0.078	1.0054	3018	3102	0.021	0.002	0.023
304 NON	Nonene	1	0.73	0.35	4.3	0.079	1.0070	3021	3129	0.022	0.002	0.024
305 NNS	Nonyl Alcohol (all isomers)	1	0.94	0.1	5	0.078	1.0020	3008	3043	0.020	0.002	0.022
306 NNN	Nonyl Alcohol	1	0.94	0.1	5	0.078	1.0020	3008	3043	0.020	0.002	0.022

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307 NNI	Nonyl Alcohol (iso-)	1	0.84	0.1	5	0.076	1.0020	3006	3043	0.020	0.002	0.022
308 NNP	Nonyl Phenol	1	0.95	0.01	7.6	0.074	1.0002	3001	3006	0.020	0.002	0.022
316 OAX	Octane (all isomers)	1	0.7	0.79	3.9	0.084	1.0158	3047	3261	0.023	0.002	0.026
317 OAN	Octane	1	0.7	0.79	3.9	0.084	1.0158	3047	3261	0.023	0.002	0.026
318 OAA	Octanoic Acid (all isomers)	1	0.81	0.01	5	0.074	1.0002	3001	3004	0.020	0.002	0.022
319 OCX	Octanol (all isomers)	1	0.83	0.01	4.48	0.074	1.0002	3001	3003	0.020	0.002	0.022
320 OTA	Octanol	1	0.83	0.01	4.48	0.074	1.0002	3001	3003	0.020	0.002	0.022
321 OTX	Octene (all isomers)	2	0.72	0.9	3.9	0.086	1.0180	3054	3287	0.024	0.002	0.026
322 OTE	Octene (1-)	1	0.72	1	3.86	0.087	1.0200	3060	3326	0.024	0.002	0.027
324 OCX	Octyl Alcohol (iso-, n-) (all isomers), See Octanol (all isome	1	0.83	0.01	4.48	0.074	1.0002	3001	3003	0.020	0.002	0.022
325 IOA	Octyl Alcohol	1	0.83	0.01	4.48	0.074	1.0002	3001	3003	0.020	0.002	0.022
384 OTW	Fuel: No. 2	1	0.88	0.58	6	0.092	1.0112	3034	3390	0.025	0.002	0.028
386 OFR	Fuel: No. 4	1	0.9	0.15	3.4	0.075	1.0030	3009	3042	0.020	0.002	0.022
387 OFV	Fuel: No. 5	1	0.94	0.15	3.4	0.075	1.0030	3009	3042	0.020	0.002	0.022
388 OSX	Fuel: No. 6	1	0.95	0.15	3.4	0.075	1.0030	3009	3042	0.020	0.002	0.022
382 OIL	Oil, Misc: Crude	1	0.85	0.15	3.4	0.075	1.0030	3009	3042	0.020	0.002	0.022
383 ODS	Oil, Misc: Diesel	1	0.9	0.09	3.4	0.081	1.0138	3041	3197	0.022	0.002	0.025
389 OLB	Oil, Misc: Lubricating	1	0.9	0.15	1	0.074	1.0030	3009	3008	0.020	0.002	0.022
403 ORS	Oil, Misc: Resin	1	1.02	0.16	1	0.074	1.0030	3009	3008	0.020	0.002	0.022
418 OTB	Oil, Misc: Turbine	1	0.87	0.3	6.4	0.080	1.0060	3018	3141	0.022	0.002	0.024
429 PDC	Pentadecanol, See Alcohols (C13 and above)	1	0.83	0.01	7.88	0.074	1.0002	3001	3006	0.020	0.002	0.022
432 PTY	Pentane (all isomers)	5	0.63	21	2.48	0.261	1.4200	4280	8016	0.141	0.014	0.155
433 IPT	Pentane (iso-)	5	0.62	27	2.48	0.335	1.5400	4620	9858	0.213	0.021	0.234
434 PTA	Pentane (n-)	5	0.63	20.44	2.5	0.256	1.4088	4226	7878	0.136	0.013	0.150
436 PTX	Pentane (all isomers)	5	0.64	24.9	2.4	0.299	1.4980	4484	9059	0.180	0.018	0.198
437 PTE	Pentane (1-)	5	0.64	24.9	2.4	0.299	1.4980	4484	9059	0.180	0.018	0.198
442 PIN	Pinene	1	0.86	0.35	4.7	0.080	1.0070	3021	3142	0.022	0.002	0.024
446 PLB	Polybutene	1	0.91	0.01	79.3	0.077	1.0002	3001	3074	0.021	0.002	0.023
457 PGC	Polypropylene Glycol	1	1.01	0.1	1	0.074	1.0020	3006	3005	0.020	0.002	0.022
458 PGM	Polypropylene Glycol Methyl Ether	1	0.92	0.8	3.11	0.082	1.0160	3048	3207	0.023	0.002	0.025
484 IAC	Propyl Acetate (iso-)	1	0.89	1.8	3.52	0.095	1.0360	3108	3528	0.027	0.003	0.030
485 PAT	Propyl Acetate (n-)	1	0	1.85	3.52	0.095	1.0370	3111	3542	0.028	0.003	0.030
486 IPA	Propyl Alcohol (iso-)	1	0.79	3	2.07	0.089	1.0600	3180	3489	0.027	0.003	0.029
487 PAL	Propyl Alcohol (n-)	1	0.8	1.2	2.07	0.080	1.0240	3072	3184	0.022	0.002	0.025
488 PBZ	Propylbenzene (n-)	1	0.86	0.2	4.14	0.077	1.0040	3012	3071	0.021	0.002	0.023
489 IPX	Iso-Propylcyclohexane	1	0.8	0.01	4.35	0.074	1.0002	3001	3003	0.020	0.002	0.022
473 PPG	Propylene Glycol (1,2-Propandiol)	1	1.04	0.01	2.62	0.074	1.0002	3001	3001	0.020	0.002	0.022
478 PME	Propylene Glycol Methyl Ether	1	0.92	0.7	3.11	0.081	1.0140	3042	3181	0.022	0.002	0.024
478 PTT	Propylene Tetramer	1	0.29	0.02	1	0.074	1.0004	3001	3000	0.020	0.002	0.022
488 SFL	Sulfolane	1	1.26	0.01	4.14	0.074	1.0002	3001	3003	0.020	0.002	0.022
493 TTN	Tetradecanol	1	0.82	0	7.39	0.074	1.0000	3000	2999	0.020	0.002	0.022
494 TTD	1-Tetradecene, See the olefin or Alpha-Olefin Entries	1	0.77	0.01	6.77	0.074	1.0002	3001	3005	0.020	0.002	0.022
496 TTG	Tetraethylene Glycol	1	1.12	0.01	8.7	0.074	1.0002	3001	3005	0.020	0.002	0.022
497 THN	Tetrahydronaphthalene	1	0.97	0.04	4.56	0.074	1.0008	3002	3015	0.020	0.002	0.022
499 TOL	Toluene	1	0.87	1.5	3.14	0.089	1.0300	3090	3380	0.025	0.002	0.028
502 TCP	Tricresyl Phosphate (less than 1% of the ortho isomer)	1	1.16	0.01	12.69	0.074	1.0002	3001	3011	0.020	0.002	0.022
503 TRD	Tridecane	1	0.76	0.02	6.4	0.074	1.0004	3001	3011	0.020	0.002	0.022
505 TDN	Tridecanol, See Alcohols (C13 and above)	1	0.85	0.01	6.91	0.074	1.0002	3001	3005	0.020	0.002	0.022
506 TDC	1-Tridecene	1	0.77	0.01	6.29	0.074	1.0002	3001	3005	0.020	0.002	0.022
508 TEB	Triethylbenzene	1	0.86	0.02	5.6	0.074	1.0004	3001	3009	0.020	0.002	0.022
509 TEG	Triethylene Glycol	1	1.12	0.01	5.17	0.074	1.0002	3001	3004	0.020	0.002	0.022
519 TRE	Trimethylbenzenes (all isomers)	1	0.89	0.14	4.2	0.078	1.0028	3008	3050	0.020	0.002	0.022
520 TMB	Trimethyl Benzene (1,2,5-)	1	0.89	0.14	4.14	0.078	1.0028	3008	3049	0.020	0.002	0.022
521 TMD	Trimethyl Benzene (1,2,3-)	1	0.89	0.14	4.14	0.076	1.0028	3008	3049	0.020	0.002	0.022
522 TME	Trimethyl Benzene (1,2,4-) (Pseudocumene)	1	0.89	0.14	4.14	0.076	1.0028	3008	3049	0.020	0.002	0.022
529 TRP	Triphenyl Phosphate	1	1.16	0	14.2	0.074	1.0000	3000	2999	0.020	0.002	0.022
533 UDC	Undecene (1-)	1	0.75	0.05	5.32	0.075	1.0010	3003	3023	0.020	0.002	0.022
534 UND	Undecyl Alcohol	1	0.84	0.01	5.94	0.074	1.0002	3001	3004	0.020	0.002	0.022
548 XLX	Xylenes (Ortho-, meta-, para-)	1	0.89	0.51	3.66	0.080	1.0102	3031	3158	0.022	0.002	0.024
547 XLM	Xylene (M-)	1	0.87	0.51	3.66	0.080	1.0102	3031	3158	0.022	0.002	0.024
548 XLO	Xylene (O-)	1	0.89	0.4	3.66	0.079	1.0080	3024	3124	0.021	0.002	0.024
549 XLP	Xylene (P-)	1	0.86	0.51	3.66	0.080	1.0102	3031	3158	0.022	0.002	0.024
550 XYL	Xylenol	1	1.01	0.1	3.66	0.075	1.0020	3006	3031	0.020	0.002	0.022
551	Zinc Diethyldithiophosphate											
	Max.		1.260	27.000	79.300	0.335	1.540	4620	9858	0.213	0.021	0.234

RESULTS OF (BREASTED) DUAL CARGO LOADING OPERATIONS

Worst Case	1	2.00	0.65	-1.00	-1.65	OK
Max.	Design Pressure (psig)	Maximum Pressure drop (psig)	Facility Set @ psig vacuum	Total Vacuum, psig	Status	

RESULTS OF (BREASTED) DUAL CARGO UNLOADING OPERATIONS

Worst Case	1	2.00	0.23	1.00	1.23	OK
Max.	Design Pressure (psig)	Maximum Pressure drop (psig)	Facility Set @ psig pressure	Total pressure, psig	Status	

MARINE SOLUTIONS, INC.

VCS SYSTEM INFORMATION:

1. GENERAL DESCRIPTION OF VESSEL:

	WORST CASE:	BARGE "CBC 336" OUTBOARD BARGE "CBC 337" INBOARD
A. NAME (S):		CBC 336 & CBC 337
B. OFFICIAL NUMBER:		D1119685 & D1119686
C. DIMENSIONS:		297'-0" X 54'-0" X 12'-0"
D. SERVICE:		TANK BARGE (D)
E. MAX. DESIGN WORKING PRESSURE:		2 PSIG
F. PV VALVE PRESSURE SETTING:		1 PSIG
G. PV VALVE VACUUM SETTING:		0.5 PSIG

2. VAPOR CONTROL SYSTEM

A. PIPE DIAMETER:	7.981 INCHES IPS
B. MAX. VAPOR-AIR MIXTURE DENSITY:	0.335 LBM/FT ³ FOR SUBCHAPTER "D" CARGOES
C. MAX. LIQUID LOADING RATE:	5000 BBLs/HR
D. DARCY FRICTION FACTOR:	0.014 FOR PIPE 0.001 FOR HOSE
E. VCS CARGOES:	SEE TABLE 1

VCS CALCULATIONS

1. THE EQUIVALENT LENGTH OF PIPE FROM BARGE'S MOST REMOTE CARGO TANK TO THE BARGE'S SHORE SIDE VAPOR CONNECTION:

Tank 1P on "CBC 336" is the farthest tank from the barge's shore connection. Using Crane's Technical Paper No. 410, the total equivalent length (L) for the path is shown in Table 2.

TABLE 2

PIPE/FITTINGS	QUANTITY	UNIT EQ. LENGTH (FT)	TOTAL EQ. LENGTH (FT)
Straight Pipe	1	238.24	238.24
Entrance	1	37.05	37.05
T Branch	7	38.91	272.37
45 Ell	1	3.72	3.72
T Run	6	13.33	79.98
8" Gate Valve	1	5.32	5.32
8" 90 Ell	1	7.98	7.98
		Total	651.66

2. THE EQUIVALENT LENGTH OF PIPE FROM OUTBOARD BARGE'S SHORE SIDE CONNECTION, ACROSS THE INBOARD (BREASTED) BARGE, TO THE SHORE SIDE VAPOR CONNECTION OF THE INBOARD BARGE (30FT OF 8" HOSE + INBOARD BARGE):

TABLE 3

PIPE/FITTINGS	QUANTITY	UNIT EQ. LENGTH (FT)	TOTAL EQ. LENGTH (FT)
Straight Pipe	1	38.083	38.083
T Run	1	13.3	13.3
8" Gate Valve	2	5.32	10.64
		Total	62.023
Hose	1		30

TABLE 1 (SUBCHAPTER "D" CARGOES)

CHRIS CODE	NAME	VCS CAT	LIQ SG	VAPOR PRESS	VAPOR SG	VAPOR AIR WEIGHT DENSITY	VAPOR GROWTH RATE	VAPOR VOLUMETRIC FLOW RATE (bb/h)	AIR EQUIVALENT VOLUMETRIC FLOW RATE	PRESSURE DROP TO STERN CONNECTION IN VCS (psig)	PRESSURE DROP THRU HOSE TO FACILITY VCS (psig)	TOTAL PRESSURE DROP TO FACILITY CONNECTION (psig)
1 ACT	Acetone	1	0.79	10	2	0.121	1.2000	6000	7674	0.129	0.013	0.142
2 ACP	Acetophenone	1	1.03	0.8	4.14	0.082	1.0120	5080	5354	0.063	0.008	0.069
19 AAT	Amyl Acetate (iso-)	1	0.86	0.33	4.48	0.079	1.0066	5033	5212	0.060	0.008	0.066
20 AAI	Amyl Alcohol (iso-, n-, sec-, primary) (See also IAA)	1	0.82	0.3	3.04	0.077	1.0060	5030	5126	0.058	0.008	0.063
21 AAN	Amyl Alcohol (n-)	1	0.82	0.3	3.04	0.077	1.0060	5030	5126	0.058	0.008	0.063
23 APM	Amyl Alcohol, Primary	1	0.82	0.3	3.04	0.077	1.0060	5030	5126	0.058	0.008	0.063
24 ASE	Amyl Alcohol, (sec-)	1	0.82	0.3	3.04	0.077	1.0060	5030	5126	0.058	0.008	0.063
26 IAA	Amyl Alcohol, (iso-)	1	0.82	0.3	3.04	0.077	1.0060	5030	5126	0.058	0.008	0.063
34 BAL	Benzyl Alcohol	1	1.05	0.1	3.73	0.075	1.0020	5010	5052	0.058	0.008	0.062
40 BAX	Butyl Acetate (iso-, n-)	1	0.87	0.8	4	0.082	1.0120	5060	5341	0.063	0.008	0.069
42 BTA	Butyl Acetate (sec-)	1	0.89	1.5	4	0.095	1.0300	5150	5840	0.075	0.007	0.082
44 IAL	Butyl Alcohol (iso-)	1	0.81	0.9	2.8	0.080	1.0180	5090	5317	0.062	0.008	0.068
46 BAS	Butyl Alcohol (sec-)	1	0.81	1.3	2.8	0.083	1.0260	5130	5458	0.065	0.008	0.072
47 BAT	Butyl Alcohol (tert-)	1	0.78	2.8	2.8	0.095	1.0560	5280	5984	0.079	0.008	0.086
48 BPH	Butyl Benzyl Phthalate	1	1.12	0.01	10.8	0.074	1.0002	5001	5015	0.055	0.005	0.061
58 BLUE	Butyl Toluene	1	0.85	0.1	5.11	0.078	1.0020	5010	5074	0.057	0.008	0.062
64 CLS	Ceprolactam Solutions	1	1.02	0.05	3.9	0.074	1.0010	5005	5027	0.055	0.005	0.061
70 CUM	Cumene	1	0.86	0.60	4.20	0.083	1.0120	5060	5359	0.063	0.008	0.069
72 CHX	Cyclohexane	1	0.78	4.5	2.9	0.114	1.0900	5450	6771	0.101	0.010	0.111
73 CHN	Cyclohexanol	1	0.95	0.15	3.45	0.075	1.0030	5015	5072	0.058	0.008	0.062
74 CPD	1,3-Cyclopentadiene dimer (molten)	1	0.89	0.25	4.55	0.078	1.0050	5025	5184	0.059	0.008	0.064
76 CMP	Cymene (para-)	1	0.86	0.11	4.62	0.078	1.0022	5011	5073	0.057	0.008	0.062
77 DHN	Decahydronaphthalene	1	0.89	0.1	4.76	0.078	1.0020	5010	5068	0.058	0.008	0.062
78 IDA	Decaldehyde (iso-)	1	0.83	0.01	5	0.074	1.0002	5001	5006	0.055	0.005	0.060
79 DAL	Decaldehyde (n-)	1	0.83	0	5.01	0.074	1.0000	5000	4999	0.055	0.005	0.060
81 DCE	Decane	1	0.74	0.12	4.6	0.078	1.0024	5012	5083	0.057	0.008	0.062
82 DAX	Decyl Alcohol (all isomers) (Decanol)	1	0.83	0.01	5.3	0.074	1.0002	5001	5006	0.055	0.005	0.060
83 ISA	Decyl Alcohol (iso-)	1	0.83	0.01	5.3	0.074	1.0002	5001	5006	0.055	0.005	0.060
84 DAN	Decyl Alcohol (n-)	1	0.83	0.01	5.3	0.074	1.0002	5001	5006	0.055	0.005	0.060
85 DRZ	Decylbenzene (n-)	1	0.86	0.01	7.52	0.074	1.0002	5001	5010	0.055	0.005	0.061
87 DAA	Diacetone Alcohol	1	0.97	0.1	4	0.075	1.0020	5010	5056	0.058	0.008	0.062
91 DPA	Dibutyl Phthalate (ortho-)	1	1.05	0	9.59	0.074	1.0000	5000	4999	0.055	0.005	0.060
92 DPT	Dicyclopentadiene, See 1,3-Cyclopentadiene Dimer (molten)	2	0.88	0.25	4.55	0.078	1.0050	5025	5184	0.059	0.008	0.064
93 DEB	Diethylbenzene	1	0.87	0.08	4.82	0.075	1.0018	5008	5053	0.058	0.008	0.062
94 DEG	Diethylene Glycol	1	1.12	0.01	3.66	0.074	1.0002	5001	5004	0.055	0.005	0.060
95 DME	Diethylene Glycol Butyl Ether	1	0.95	0.01	5.5	0.074	1.0002	5001	5007	0.055	0.005	0.060
100 DGA	Diethylene Glycol Ethyl Ether Acetate	1	0.89	0.02	4.82	0.074	1.0004	5002	5012	0.055	0.005	0.061
101 DGM	Diethylene Glycol Methyl Ether	1	1.03	0.03	4.14	0.074	1.0006	5003	5017	0.055	0.005	0.061
111 DBC	Diisobutylcarbinol	1	0.81	0.09	4.97	0.075	1.0018	5009	5084	0.058	0.008	0.062
112 DBL	Diisobutylene	1	0.72	2	3.88	0.100	1.0400	5200	6072	0.081	0.008	0.089
113 DIX	Diisobutyl Ketone	1	0.81	0.16	4.9	0.077	1.0032	5016	5113	0.057	0.008	0.063
119 DIX	Diisopropylbenzene (all isomer)	1	0.86	0.03	5.6	0.074	1.0006	5003	5024	0.055	0.005	0.061
124 DTL	Dimethyl Phthalate	1	1.19	0	8.89	0.074	1.0000	5000	4999	0.055	0.005	0.060
128 DIF	Dimethyl Phthalate	1	0.97	0.01	14.4	0.074	1.0002	5001	5021	0.055	0.005	0.061
130 DOP	Diethyl Phthalate	1	0.88	0	13.47	0.074	1.0000	5000	4999	0.055	0.005	0.060
131 DPN	Dipentene	1	0.84	0.1	4.9	0.075	1.0020	5010	5070	0.058	0.008	0.062
132 DIL	Diphenyl	1	0.99	0.01	5.31	0.074	1.0002	5001	5006	0.055	0.005	0.060
133 DDO	Diphenyl, Diphenyl Ether Mixture	1	1.07	0.01	5.88	0.074	1.0002	5001	5007	0.055	0.005	0.060
134 DPE	Diphenyl Ether	1	1.07	0.01	5.87	0.074	1.0002	5001	5007	0.055	0.005	0.060
138 DPG	Dipropylene Glycol	1	1.03	0.07	4.83	0.075	1.0014	5007	5046	0.058	0.008	0.061
139 DFF	Distillates: Flashed Feed Stocks	1	0.75	2.3	3.4	0.100	1.0460	5230	6079	0.081	0.008	0.089
140 DSR	Distillates: Straight Run	1	0.73	2.3	3.4	0.100	1.0460	5230	6079	0.081	0.008	0.089
145 DOZ	Dodecene (all isomers)	1	0.76	0.02	5.61	0.074	1.0004	5002	5016	0.055	0.005	0.061
146 DOD	Dodecene	1	0.76	0.02	5.81	0.074	1.0004	5002	5016	0.055	0.005	0.061
147 DDB	Dodecylbenzene	1	0.88	4.7	6.4	0.237	1.0940	5470	9806	0.211	0.021	0.232
155 ETG	Ethoxy Triglycol (crude)	1	1.02	0	8.14	0.074	1.0000	5000	4999	0.055	0.005	0.060
156 ETA	Ethyl Acetate	1	0.9	4.5	3.04	0.117	1.0900	5450	6859	0.103	0.010	0.113
157 EAA	Ethyl Acetoacetate	1	1.03	0.2	4.48	0.077	1.0040	5020	5129	0.056	0.008	0.063
158 EAL	Ethyl Alcohol (Ethanol)	1	0.79	3.5	1.8	0.083	1.0700	5350	5695	0.071	0.007	0.078
160 ETB	Ethyl Benzene	1	0.87	0.6	3.58	0.081	1.0120	5060	5300	0.062	0.008	0.068
161 EBT	Ethyl Butanol	1	0.83	0.12	3.52	0.075	1.0024	5012	5059	0.056	0.008	0.062
162 EBR	Ethyl Butyrate	1	0.88	1	4	0.088	1.0200	5100	5584	0.068	0.007	0.075
163 ECV	Ethyl Cyclohexane	1	0.79	0.5	3.87	0.080	1.0100	5050	5274	0.061	0.008	0.067

TABLE 1 (SUBCHAPTER "D" CARGOES)

CHRIS CODE	NAME	VCS CAT	LIQ SG	VAPOR PRESS	VAPOR SG	VAPOR AIR WEIGHT DENSITY	VAPOR GROWTH RATE	VAPOR VOLUMETRIC FLOW RATE (bb/h)	AIR EQUIVALENT VOLUMETRIC FLOW RATE	PRESSURE DROP TO STERN CONNECTION IN VCS (psig)	PRESSURE DROP THRU HOSE TO FACILITY VCS (psig)	PRESSURE DROP TO FACILITY CONNECTION (psig)
166 EGL	Ethylene Glycol	1	1.19	0.01	2.21	0.074	1.0002	5001	5002	0.055	0.005	0.080
169 EMA	Ethylene Glycol Butyl Ether Acetate	1	0.94	0.05	5.52	0.075	1.0010	5005	5039	0.058	0.005	0.081
172 EGY	Ethylene Glycol Diacetate	1	1.1	0.01	5.03	0.074	1.0002	5001	5006	0.055	0.005	0.080
178 EME	Ethylene Glycol Methyl Ether	1	1.1	0.01	4.8	0.074	1.0002	5001	5006	0.055	0.005	0.080
180 EPE	Ethylene Glycol Phenyl Ether	1	1.1	0.01	4.8	0.074	1.0002	5001	5006	0.055	0.005	0.080
184 EHA	2-Ethylhexaldehyde, See Octyl Aldehydes	1	0.82	0.17	4.41	0.076	1.0034	5017	5107	0.057	0.006	0.083
188 EHX	2-Ethylhexanol, see Octanol (all isomers)	1	0.84	0.02	4.5	0.074	1.0004	5002	5012	0.055	0.005	0.081
190 EPR	Ethyl Propionate	1	0.89	3.5	1.8	0.083	1.0700	5350	5885	0.071	0.007	0.078
191 ETE	Ethyl Toluene	1	0.88	0.28	4.15	0.076	1.0058	5028	5186	0.059	0.006	0.084
194 FAM	Formamide	1	1.13	0.1	1.55	0.074	1.0020	5010	5017	0.055	0.005	0.081
195 FAL	Furfuryl Alcohol	1	1.13	0.05	3.4	0.074	1.0010	5005	5023	0.055	0.005	0.081
197 GAK	Gasoline Blended Stocks: Alkylates	1	0.75	12.5	3.4	0.214	1.2500	6250	10680	0.250	0.025	0.274
198 GRF	Gasoline Blended Stocks: Reformate	1	0.8	12.5	3.4	0.214	1.2500	6250	10680	0.250	0.025	0.274
199 GAT	Gasolines: Automotive (containing not over 4.23 grams lead per gallon)	1	0.74	12.5	3.4	0.214	1.2500	6250	10680	0.250	0.025	0.274
200 GAV	Gasolines: Aviation (containing not over 4.88 grams lead per gallon)	1	0.71	12.5	3.4	0.214	1.2500	6250	10680	0.250	0.025	0.274
201 GCS	Gasolines: Casinghead	1	0.87	12.5	3.4	0.214	1.2500	6250	10680	0.250	0.025	0.274
202 GPL	Gasolines: Polymer	1	0.75	12.5	3.4	0.214	1.2500	6250	10680	0.250	0.025	0.274
203 GSR	Gasolines: Straight Run	1	0.75	12.5	3.4	0.214	1.2500	6250	10680	0.250	0.025	0.274
204 GCR	Glycerine	1	1.26	0	3.17	0.074	1.0000	5000	4999	0.055	0.005	0.080
217 HMX	Heptane (all isomers) (Methylhexane)	1	0.68	2.5	3.45	0.102	1.0500	5250	6188	0.084	0.008	0.092
218 HPT	Heptane (n-)	1	0.68	2.5	3.45	0.102	1.0500	5250	6188	0.084	0.008	0.092
219 HEP	Heptonic Acid	1	0.92	0.01	4.49	0.074	1.0002	5001	5005	0.055	0.005	0.080
220 HTX	Heptanol (all isomers)	1	0.82	0.04	4	0.074	1.0008	5004	5022	0.055	0.005	0.081
221 HTN	Heptanol (all isomers)	1	0.82	0.04	4	0.074	1.0008	5004	5022	0.055	0.005	0.081
222 HPX	Heptane (all isomers)	2	0.7	2.9	3.4	0.106	1.0580	5280	6354	0.089	0.009	0.097
223 THE	Heptene (1-)	1	0.7	2.8	3.4	0.106	1.0580	5280	6308	0.087	0.009	0.096
224 HPE	Heptyl Acetate	1	0.88	0.1	5.5	0.078	1.0020	5010	5080	0.057	0.006	0.082
229 HXS	Hexane (all isomers)	1	0.66	7	3	0.139	1.1400	5700	7838	0.135	0.013	0.148
230 HXA	Hexane	1	0.66	7	3	0.139	1.1400	5700	7838	0.135	0.013	0.148
231 HXO	Hexanoic Acid	1	0.93	0.01	4	0.074	1.0002	5001	5004	0.055	0.005	0.080
232 HXN	Hexanol	1	0.82	1	3.52	0.085	1.0200	5100	5483	0.088	0.007	0.073
234 HEX	Hexane (all isomers)	2	0.67	8	2.9	0.145	1.1600	5800	8135	0.145	0.014	0.180
235 HXE	Hexene (1-)	1	0.67	8.2	2.9	0.147	1.1640	5820	8213	0.148	0.015	0.183
236 HXT	Hexene (2-)	1	0.67	8.2	2.9	0.147	1.1640	5820	8213	0.148	0.015	0.183
238 HXG	Hexylene Glycol	4	0.92	0.01	1.1	0.074	1.0002	5001	5000	0.055	0.005	0.080
243 IPH	Isophorone	1	0.83	0.01	4.75	0.074	1.0002	5001	5008	0.055	0.005	0.080
244 JPO	Jet Fuels: JP-1 (Kerosene)	1	0.8	0.14	4.5	0.078	1.0028	5014	5090	0.057	0.006	0.083
245 JPT	Jet Fuels: JP-3	1	0.8	8.51	4.5	0.213	1.1702	5851	9958	0.218	0.021	0.239
246 JPF	Jet Fuels: JP-4	1	0.81	3.4	4	0.121	1.0680	5340	6857	0.103	0.010	0.113
247 JPV	Jet Fuels: JP-5 (Kerosene, heavy)	1	0.82	0.1	4	0.075	1.0020	5010	5058	0.058	0.006	0.082
249 KRS	Kerosene	1	0.81	0.15	4.5	0.078	1.0030	5015	5097	0.057	0.006	0.083
263 MTT	Methyl Acetate	1	0.82	8.1	2.8	0.119	1.1220	5810	7142	0.112	0.011	0.123
265 MAL	Methyl Alcohol (See Methanol)	1	0.79	8.63	1.1	0.077	1.1328	5863	5780	0.073	0.007	0.081
266 MAC	Methyl Amyl Acetate	1	0.86	0.33	4.97	0.080	1.0068	5033	5237	0.060	0.006	0.086
267 MAA	Methyl Amyl Alcohol	1	0.81	0.43	3.52	0.079	1.0088	5043	5213	0.060	0.006	0.086
271 MBK	Methyl n-Butyl Ketone	1	0.81	0.87	3.5	0.085	1.0184	5087	5475	0.088	0.008	0.072
273 MBU	Methyl Butyrate	1	0.9	1.28	3.53	0.089	1.0252	5128	5821	0.089	0.007	0.078
274 MEK	Methyl Ethyl Ketone	1	0.8	4.5	2.5	0.105	1.0800	5450	6815	0.093	0.009	0.102
275 MTF	Methyl Formate (Dimethyl Formal)	1	0.88	15.42	2.8	0.189	1.3084	6542	10488	0.242	0.024	0.265
276 MHK	Methyl Heptyl Ketone	1	0.83	0.06	4.9	0.075	1.0012	5006	5042	0.056	0.005	0.081
278 MIK	Methyl Isobutyl Ketone	1	0.8	1.15	3.45	0.087	1.0230	5115	5553	0.088	0.007	0.074
281 MNA	1-Methyl Naphthalene	1	1.02	0.01	4.91	0.074	1.0002	5001	5008	0.055	0.005	0.080
283 MPN	2-Methyl-1-Pentene	1	0.89	8.3	2.9	0.130	1.1260	5830	7472	0.123	0.012	0.135
284 MTN	5-Methyl-1-Pentene	1	0.87	8.49	2.9	0.149	1.1898	5849	8328	0.182	0.015	0.187
286 MBE	Methyl Tert-Butyl Ether (MTBE)	1	0.74	0.04	3.1	0.074	1.0008	5004	5016	0.055	0.005	0.081
288 MNS	Mineral Spirits	1	0.75	0.2	4.3	0.077	1.0040	5020	5123	0.058	0.006	0.083
289 MRE	Myrcene	1	0.8	0.17	4.7	0.077	1.0034	5017	5115	0.057	0.006	0.083
295 NSV	Naphtha: Solvent	1	0.87	0.2	3.5	0.078	1.0040	5020	5098	0.057	0.006	0.083
296 NSS	Naphtha: Stoddard Solvent	1	0.78	0.2	4.3	0.077	1.0040	5020	5123	0.058	0.006	0.083
297 NVM	Naphtha: Varnish Maker's and Painters (75%)	1	0.77	0.19	4.3	0.077	1.0038	5019	5117	0.058	0.006	0.083
300 NAX	Nonane (all isomers)	1	0.72	0.27	4.4	0.078	1.0054	5027	5170	0.059	0.006	0.084
301 NAN	Nonane	1	0.72	0.27	4.4	0.078	1.0054	5027	5170	0.059	0.006	0.084
304 NON	Nonene	1	0.73	0.36	4.3	0.079	1.0070	5035	5215	0.060	0.006	0.086
305 NNS	Nonyl Alcohol (all isomers)	1	0.94	0.1	5	0.078	1.0020	5010	5072	0.058	0.006	0.082
306 NNN	Nonyl Alcohol	1	0.94	0.1	5	0.078	1.0020	5010	5072	0.058	0.006	0.082

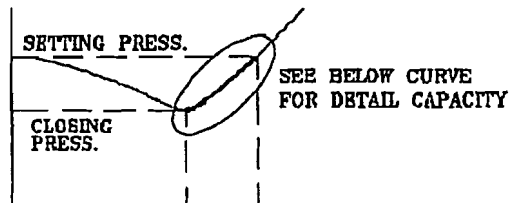
RESULTS OF (BREASTED) DUAL CARGO LOADING OPERATIONS

	Max. Design Pressure (psig)	Maximum Pressure drop (psig)	Facility Set @ psig vacuum	Total Vaccum, psig	Status
Worst Case					
1	2.00	0.65	-1.00	-1.65	OK

RESULTS OF (BREASTED) DUAL CARGO UNLOADING OPERATIONS

	Max. Design Pressure (psig)	Maximum Pressure drop (psig)	Facility Set @ psig pressure	Total pressure, psig	Status
Worst Case					
1	2.00	0.23	1.00	1.23	OK

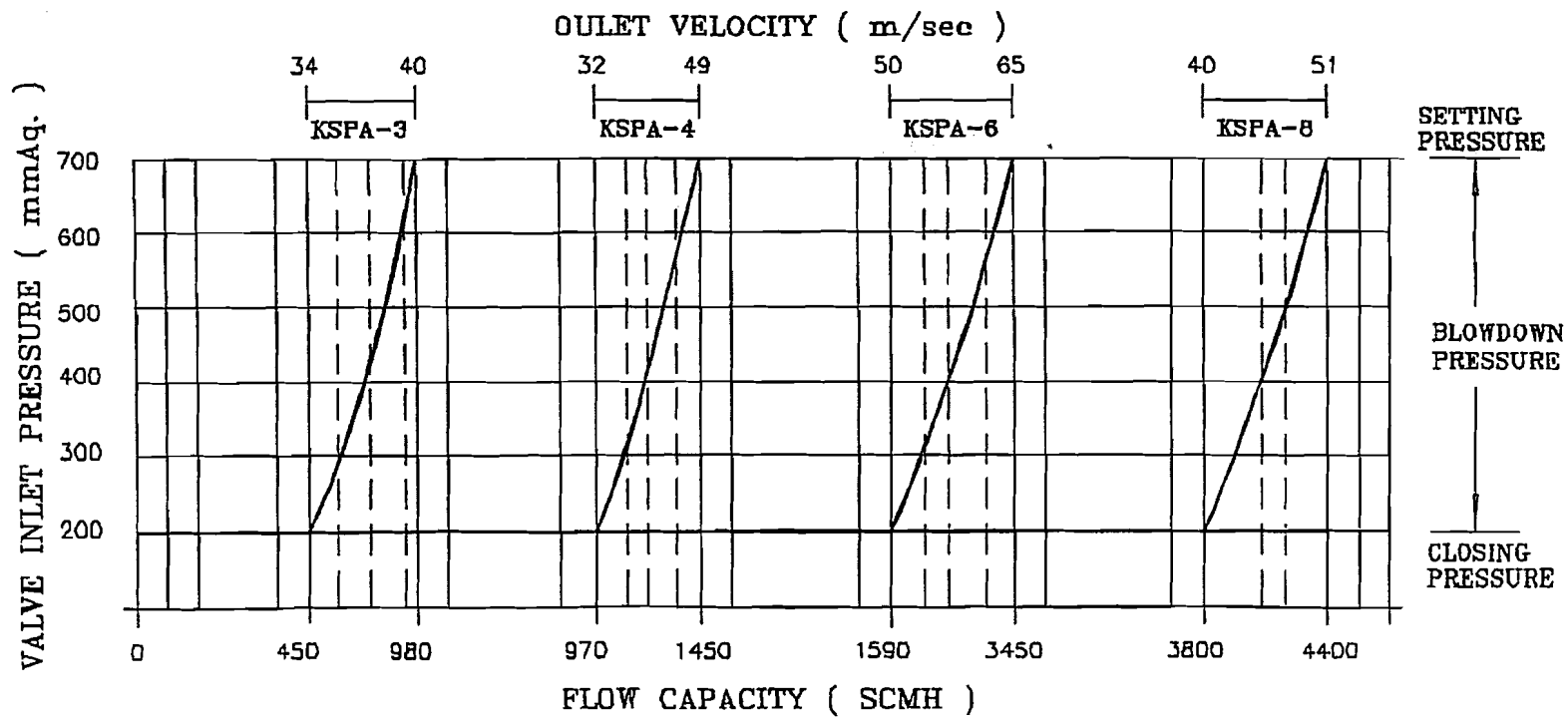
PROGRESS OF VALVE PRESSURE



TANKTECH HIGH VELOCITY VENT VALVES

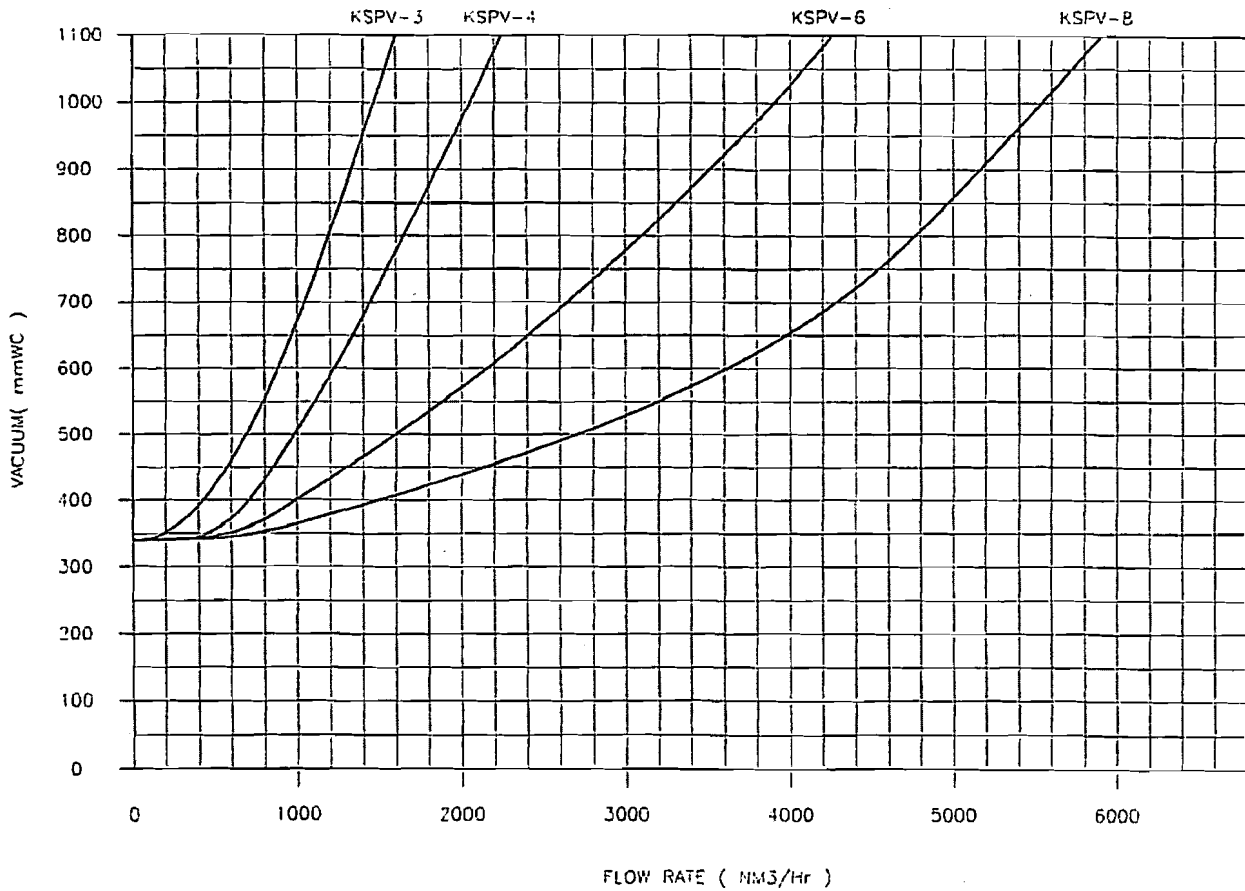
KSPA TYPE FLOW CAPACITY CURVE

700 mmAq. SETTING PRESSURE



FLOW CAPACITY CURVE GRAPH

FLOW TEST PERFORMED ON EQUIPMENT
USING AIR, AT TEMP. $T=15.6^{\circ}\text{C}$ AND
AMBIENT PRESSURE $P=1.0332 \text{ KG/CM}^2$

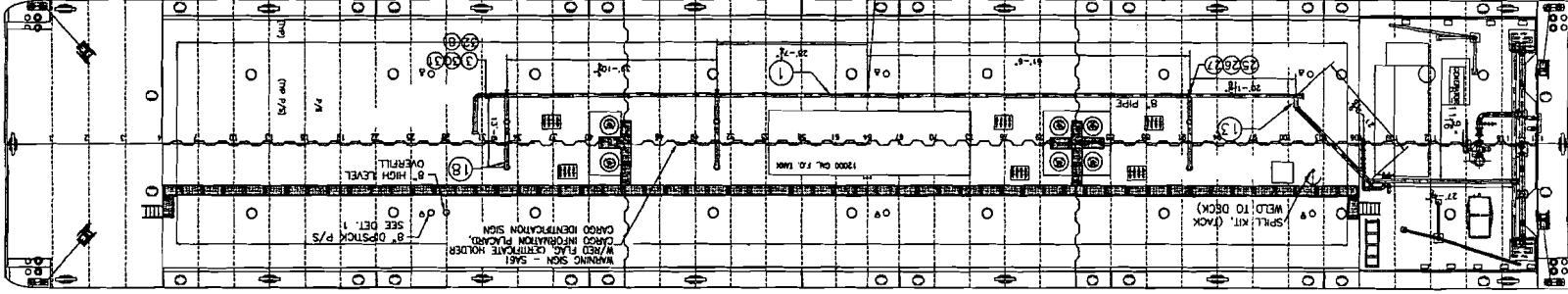


TANKTECH

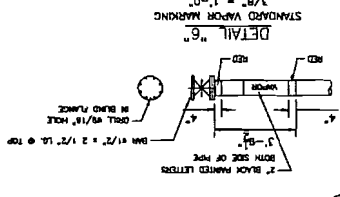
TITLE

HIGH VELOCITY VACUUM RELIEF VALVE

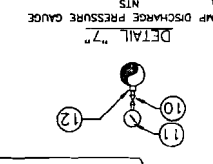
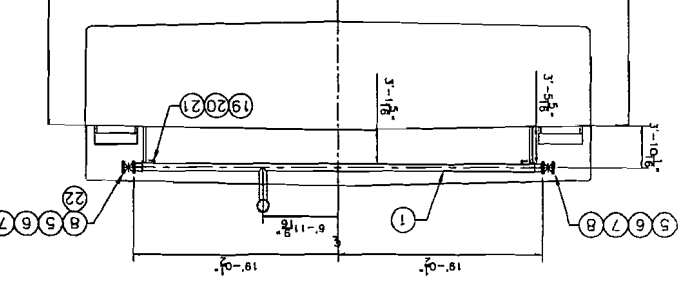
KSPV TYPE



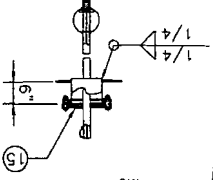
DECK PLAN



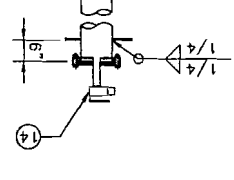
SECTION "A-A"



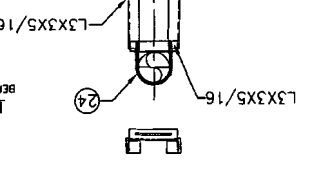
DETAIL "1"



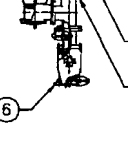
DETAIL "2"



DETAIL "8"



DETAIL "3"



MARK	QTY	DESCRIPTION	ASTM NO.	ANSI NO.
1	283	8" PIPE, SCH. 40, ERW, BLK. STEEL	A-53	B36.10
2	4	8" PIPE, SCH. 20, ERW, BLK. STL.	A-53	B36.10
3	10	8" PIPE, SCH. 10, 304 SS.	A-312	B36.10
4	5	8" BLIND FLANGE, 150#, R.F., F.S.	A-105	B16.5
5	5	8" PIPE, SCH. 10, 304 SS.	A-312	B36.10
6	19	RING GASKET, 1/8" THK, NON-ASBESTOS, 150# 8" FLG. KAMIGERSEAL OR EQ.	A-105	B16.5
7	152	BOLTS, 3/4" x 3 1/2" LG. FOR 8" FLG.	A-307	B18.2.1
8	3	WELD GATE, 8", 150# C.S. BODY/ENDS 150# SPACER/ENDS 150# OR EQ.	A-216	B16.5
9	1	WELD GATE, 8", 150# C.S. BODY/ENDS 150# SPACER/ENDS 150# OR EQ.	A-216	B16.5
10	1	WELD GATE, 1/2", 3000#, FORGED STEEL BODY/ENDS 150# OR EQ.	A-105	B16.11
11	1	PRESSURE VACUUM GAUGE, 4" PS VAC. TO 4" PS PRESS. ASHPORT OR EQ.	A-105	B16.11
12	1	COUPLING, 1/2", 3000#, SCRD.	A-105	B16.11
13	1	ELBOW, 45°, 8", SCH. 40, L.R., B.W., STEEL	A-234	B16.9
14	6	HIGH LEVEL ALARM/SHUT DOWN SYSTEM, BERGAN GUARD LEVEL 073247M-2A		
15	6	HIGH LEVEL INDICATING DENSE, BERGAN GUARD LEVEL 073247M-2A		
16	1	RING GASKET, 1/8" THK, NON-ASBESTOS, 150# 6" FLG. KAMIGERSEAL OR EQ.	A-307	B18.2.1
17	8	BOLTS, 3/4" x 3 1/2" LG. FOR 6" FLG.	A-307	B18.2.1
18	1	ELBOW, 90°, 8", SCH. 40, B.W.	A-234	B16.9
19	2	WELD GATE, 3/4", 3000#, FORGED STEEL BODY/ENDS 150# OR EQ.	A-105	B16.11
20	2	ELBOW, 90°, 3/4", 3000#, SCRD.	A-105	B16.11
21	2	HALF COUPLING, 3/4", 3000#, SCRD.	A-105	B16.11
22	2	8" FLANGE, 150#, SUP. ON, R.F., F.S.	A-105	B16.5
23	1	8" FLANGE, SUP. ON, 150#, R.F., F.S.	A-105	B16.5
24	1	8" PIPE, SCH. 40, ERW, BLK. STEEL	A-53	B36.10
25	1	U-BOLT FOR 8" PIPE	A-307	B18.2.1
26	6	8" BLIND FLANGE, 150#, R.F., F.S.	A-105	B16.5
27	6	8" FLANGE, 150#, SUP. ON, R.F., F.S.	A-105	B16.5
28	6	RING GASKET, 1/8" THK, NON-ASBESTOS, 150# 4" FLG. KAMIGERSEAL OR EQ.	A-307	B18.2.1
29	48	BOLTS, 5/8" x 3" LG. FOR 4" FLG.	A-312	B36.10
30	1	LAP JOINT, 8" SCH. 10, WELDED, 304SS	A-312	B36.10
31	1	STUB FOR 8" LAP JOINT, SCH. 10, WELDED, 304SS	A-312	B36.10
32	1	ELBOW, 90°, 8", SCH. 10, B.W., 304SS	A-182	B16.9



DESIGNED BY: 04/12/2012
 EXPIRY DATE: 04/12/2012

GENERAL NOTES

1. BERGE IS CBC 336, O.M. 01119685.
2. ALL PIPING TO MEET USC II REGULATIONS.
3. BACKING RINGS SHALL BE USED AT BUTT WELD JOINTS 2" AND LARGER.
4. PIPES PASSING THROUGH WATER/OIL TIGHT BOUNDARIES TO BE WELDED BOTH SIDES.
5. VAPOR SYSTEM:
 - 1.0 PSI
 - DESIGN
 - TEST
 - 2.0 PSI
 - RELIEF VALVE
 - 1.0 PSI
6. LABELS TO BE INSTALLED ON ALL VALVES WHERE REQUIRED TO IDENTIFY SERVICE.
7. ENDS OF VAPOR MANIFOLD SHOULD BE PAINTED AS SHOWN IN DETAIL "6" IN ACCORDANCE WITH CFR 46 PART 39.20-(d)-(4).
8. THE VAPOR PIPING MUST BE ELECTRICALLY CONTINUOUS AND BONDED TO HULL.

REV	BY	DATE	DESCRIPTION

REVISIONS

MAINTENANCE SOLUTIONS, INC.
 1000 CH. F.D. LANE
 CHICAGO, ILL. 60606
 TEL: (773) 344-1111
 FAX: (773) 344-1112
 E-MAIL: INFO@MAINTSOL.COM

CANAL BARGE COMPANY, INC.
 287'-6" x 54'-0" x 12'-0" DOUBLE SKIN TANK BRIDGE
 VAPOR PIPING ADDITION

DATE: 03/18/13
 DRAWN BY: [Signature]
 CHECKED BY: [Signature]
 CONTRACT NO. [Blank]



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



Vessel Name	CBC 336 & CBC 337
Official Number	1119685 & 1119686

Shipyard	Trinity Ashland City
Hull Number	4402 & 4403

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 MSC's Cargo Authority branch.

2. Tank Maximum Design Working Pressure	2.00 psig	Raised Trunk	☒
		Flush Deck	☐

3. Authorized Maximum Cargo Transfer Rate(s)	5000 bbl/hr loading
	3000 bbl/hr discharging

4. Authorized Maximum Vapor-Air Mixture Density	0.336 lbm/ft ³
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5. Authorized VCS Categories	1 thru 7
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6. Cargoes with the highest vapor density and/or pressure drop:

a. Cargo Name	PENTANE
b. Cargo Name	PENTANE

7. Pressure Vacuum Valve:

Manufacturer	BERGAN
Size	KLPH-6
CG Approval	162.017/144/3

Settings in psig:	
Pressure-side	1
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	18461 bbl/hr (air)
Required Venting Capacity of Vacuum-Side of P/V valve	5000 bbl/hr (air)

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

a. High Level/Tank Overfill Alarm	☒	Type	BERGAN	Meets ASTM F1271	Setting in psig N/A
b. Overfill Control Shutdown	☒	Type	BERGAN		
c. Spill Valve	☐	Type	N/A		
d. Rupture Disk	☐	Type	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:

In accordance with 46 CFR Part 39, excluding part 39.40, this vessel's vapor collection system has been inspected to the plans approved by Marine Safety Center letter Serial # C1-1201999 dated April 19, 2012 and has been found acceptable for the collection of bulk liquid cargo vapors annotated with "Yes" in the CAA's VCS column of the vessel's Cargo Authority Attachment, Serial # C1-1201999 dated April 19, 2012.

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.

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:

VCS Approval Letter	MSC letter C1-1201999 dated April 19, 2012	MSC Plan Reviewer	LT T. J. Cao
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