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

Commanding Officer
United States Coast Guard
Marine Safety Center

US Coast Guard Stop 7430
2703 Martin Luther King Jr Ave SE
Washington, DC 20593-7430
Staff Symbol: MSC-3
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16710/P022811/jdm1
Serial: C1-2001653
May 6, 2020

Marine Solutions, Inc.
Attn: Mr. Chetan Kumaria
P.O. Box 218197
Nashville, TN 37221
marinesolinc@aol.com

Subj: CBC 1010, O.N. 1302990, Southwest Shipyard Hull No. 9830
CBC 1011, O.N. 1302991, Southwest Shipyard Hull No. 9831
CBC 1012, O.N. 1302992, Southwest Shipyard Hull No. 9832
CBC 1013, O.N. 1302993, Southwest Shipyard Hull No. 9834
CBC 1014, O.N. 1302994, Southwest Shipyard Hull No. 9836
200′ x 35′ x 12.5′ Unmanned Double Hull Type I/II/III Tank Barges (D/O)
Grade A (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, and Specified Hazardous Cargoes
Design Density 8.74 lbs/gal
Rivers, Lakes, Bays, and Sounds
Vapor Control System

Ref: (a) MSI Dwg. No. 101907VP-1, Rev. 1, "Vapor Piping," 2 sheets, dated April 19, 2020
(b) MSI Doc., "Vapor Collection System Calculations," 13 pages, dated April 19, 2020

Dear Mr. Kumaria:

We reviewed references (a) and (b), submitted by your email dated April 19, 2020 (MSC Document No. 2013081), for compliance with 46 CFR Part 39, excluding Subparts 39.4000 and 39.5000. Reference (a) is **Approved.** The installation, workmanship and testing shall be accomplished to the satisfaction of the cognizant Officer in Charge, Marine Inspection (OCMI). Reference (b) is **Examined**. Calculations such as these are not normally approved but are examined to verify compliance with appropriate regulations. The following comments apply:

1. 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 **0.348 lbm/ft^3** at a maximum liquid load rate of **3,500 bbl/hr** and a maximum liquid discharge rate of **800 bbl/hr**.

2. The vapor collection piping must be electrically continuous and bonded to the hull as required by 46 CFR 39.2001(c).

3. Vapor collection hoses carried aboard the vessel, if any, must be designed and marked in accordance with the requirements of 46 CFR 39.2001(h). Equipment used for

handling vapor collection hoses must be designed to preclude kinking or collapse of the hose as required in 46 CFR 39.2001(l); hose saddles may be acceptable for complying with this requirement.

4. Enclosure (2) contains VCS Category 2 and 4 cargoes. Polymerization and residue build-up of these cargoes can adversely affect the operation of the vapor collection system. The barge owner must develop a method for internal visual inspection to verify that fouling of VCS components is not occurring. In addition, the vessel owner must test the pressure-vacuum valves and spill valves prior to each transfer, and ensure vapor piping systems and valves are inspected annually in accordance with 46 CFR 39.2014.

As an agreed-upon condition for your participation in the Marine Safety Center's electronic commerce program, you must provide the OCMI with a copy of this letter and references (a) and (b).

Our Project Number for these vessels is P022811. Please ensure that all future correspondence includes the Project Number and the Official Numbers that appear in the subject line.

Please contact LT Joel MacArthur at (202) 795-6779 with questions concerning our review.

Sincerely,

K. C. BERRY
Lieutenant Commander, U. S. Coast Guard
Chief, Vessel and Cargo Branch
By direction

Encl: (1) VCS PRIS; CBC 1010 through 1014, O.N. 1302990 through 1302994; dated May 6, 2020
(2) Vapor Collection System List of Cargoes; CBC 1010 through 1014, O.N. 1302990 through 1302994; dated May 6, 2020

Copy: Commander, Coast Guard Sector Houston-Galveston, Prevention Department

MARINE SOLUTIONS, INC.
www.marinesolutionsinc.net

E-mail

MSI/101907/S02 April 19, 2020
Commanding Officer (MSC)
Attn: Chief-Cargo Branch
United States Coast Guard, STOP 7430
2703 Martin Luther King Jr. Ave., SE
Washington, DC 20593.

Sub: 200'-0" x 35' x 12'-0" Double Skin Tank Barges (D/O) (Type I Hull)
Barge Name(s): "CBC 1010 thru CBC 1014"
Southwest Shipyard Hulls: 9830 thru 9832, 9834 and 9836
Plan Submittal

Encl.: 1. Dwg. No. 101907VP-1, SH 1 of 2, Rev 1 "Vapor Piping"
2. Dwg. No. 101907VP-1, SH 2 of 2, Rev 1 "Vapor Piping"
3. Tank Group Characteristic Form
4. Vapor Collection System Calculations
5. VCS Form

Ref.: 1. USCG Project P022811

Dear Commanding Officer:

The subject barges are presently under construction at Southwest Shipyard, Galveston, TX.

The vessels will be certificate with Subchapter D and limited Subchapter O cargoes for services on Rivers, Lakes, Bays and Sounds. The hull will be classed as Type I.

The OCMI-Galveston Texas is inspecting these vessels.

With this letter, we are submitting enclosures 1 thru 5 for your review. Please advise us your approval with/without comments.

Please do not hesitate to call at 615-364-9598 if you have question.

Thank you,

Chetan Kumaria, PE, MBA

Marine Solution Inc., P.O. Box 218197 Nashville, TN 37221-8197
Tel: 615-364-9598 Fax: 615-662-9608
Marinesolinc@aol.com

VAPOR COLLECTION SYSTEM CALCULATIONS

FOR

BARGE NAME(s): "CBC 1010" thru "CBC 1014"

SOUTHWEST SHIPYARD HULL(s): 9830, 9831, 9832,9834 thru 9836
(MSC PROJECT No. P022811)

200'-0" X 35'-0" X 12'-6" DOUBLE SKIN TANK BARGE (O/D)

CANAL BARGE COMPANY, INC.

April 19, 2020

Prepared by:

Chetan Kumaria, PE, MBA
MARINE SOLUTIONS, INC.
P.O. Box 218197
NASHVILLE, TN. 37221-8197.
615-364-9598

MARINE SOLUTIONS, INC.

VCS SYSTEM INFORMATION:

1. GENERAL DESCRIPTION OF VESSEL:

A. NAME (S):	CBC 1010 THRU CBC 1014
B. USCG PROJECT NUMBER:	P022811
C. DIMENSIONS:	200'-0" X 35'-0" X 12'-6"
D. SERVICE:	TANK BARGE (O/D)
E. MAX. DESIGN WORKING PRESSURE:	3.5 PSIG
F. PV VALVE PRESSURE SETTING:	1.5 PSIG
G. PV VALVE VACUUM SETTING:	0.5 PSIG
H. MAX. DISCHARGE RATE:	800 BBLS/HR

2. VAPOR CONTROL SYSTEM

A. PIPE DIAMETER: 7.981 INCHES IPS

B. PIPE LENGTHS: A- 2'-4" B-2'-7 3/16" C-44'-11 11/32" D-8'-3 61/64", E-42'-3 43/64" F- 4'-10 19/32" G-22'-8 7/32" H-21'-3 1/8" I-3'-4 9/16" J-4'-1 1/4" K-8'-3 7/8"

C. P/V VALVE VENTING CAPACITY:

(1) 6" BERGAN KLPH, SET @ 1.5 PSI
(2) MAX. CAPACITY: 19433 BBL/HR OF AIR
(3) 0.5 PSIG VAC.

D. SPILL VALVE RELIEVING CAPACITY: NON INSTALLED

E. MAX. VAPOR-AIR MIXTURE DENSITY: 0.346 LBM/FT^3 FOR SUB D
0.213 LBM/FT^3 FOR SUB O

F. MAX. LIQUID LOADING RATE: 3500 BBLS/HR

G. DARCY FRICTION FACTOR: 0.014

H. VCS CARGOES: SEE TABLE 1 & TABLE 4

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, Table 4 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 heighest vapor growth rate (see Table 1)

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

Tank 1 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. LENGHT (FT)	TOTAL EQ. LENGTH (FT)
Straight Pipe	1	100.513	100.513
Entrance	1	37.05	37.05
T Branch	4	39.91	159.64
8"X6"RED	1	39.88	39.88
T Run Thru	6	13.3	79.8
		Total	416.883

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 #1 cargo tank and the P/V valve for each cargo is shown in Table 1 & Table 4.

Using a 3500 bbl/h liquid transfer rate, the vapor-air mixture and air-equivalent volumetric flow rate for each cargo are given in Table 1 & Table 4. At a setting of 1.5 psig, the Bergan KLPH-6 PV Valve has an adequate pressure relieving capacity of air for each cargo listed in Table 1 & Table 4. The greatest pressure drop in the venting system (1.692 psig) does not exceed the cargo tank maximum design working pressure of 3.5 psi.

The maximum vacuum that can exist in a tank is 0.513 psig. The barges are constructed as per ABS rules and regulations for a pressure of 3.5 psig and are tested for a pressure of 3.5 psig. Therefor the maximum vacuum of 0.513 psig is with in the design capacity of these barges and an unloading rate of 800 bbl/h is acceptable.

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

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

The #1 cargo tank has a trunk top dimension of 46'-8" x 27'-0". The set point of the overfill alarm is set at 9" below the trunk top at tank centerline. With a liquid transfer rate of 3500 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 3 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	165.138	165.138
Entrance	1	37.05	37.05
T Branch	6	39.91	239.46
T Run	6	13.33	79.98
8" Gate Valve	1	5.32	5.32
		Total	526.948

Pressure drop at the maximum liquid transfer rate of 3500 bbl/h along this path for each cargo is given in Tables 1 & 4. The largest pressure drop does not exceed 80 percent of the P/V valve pressure setting (1.2 psig).

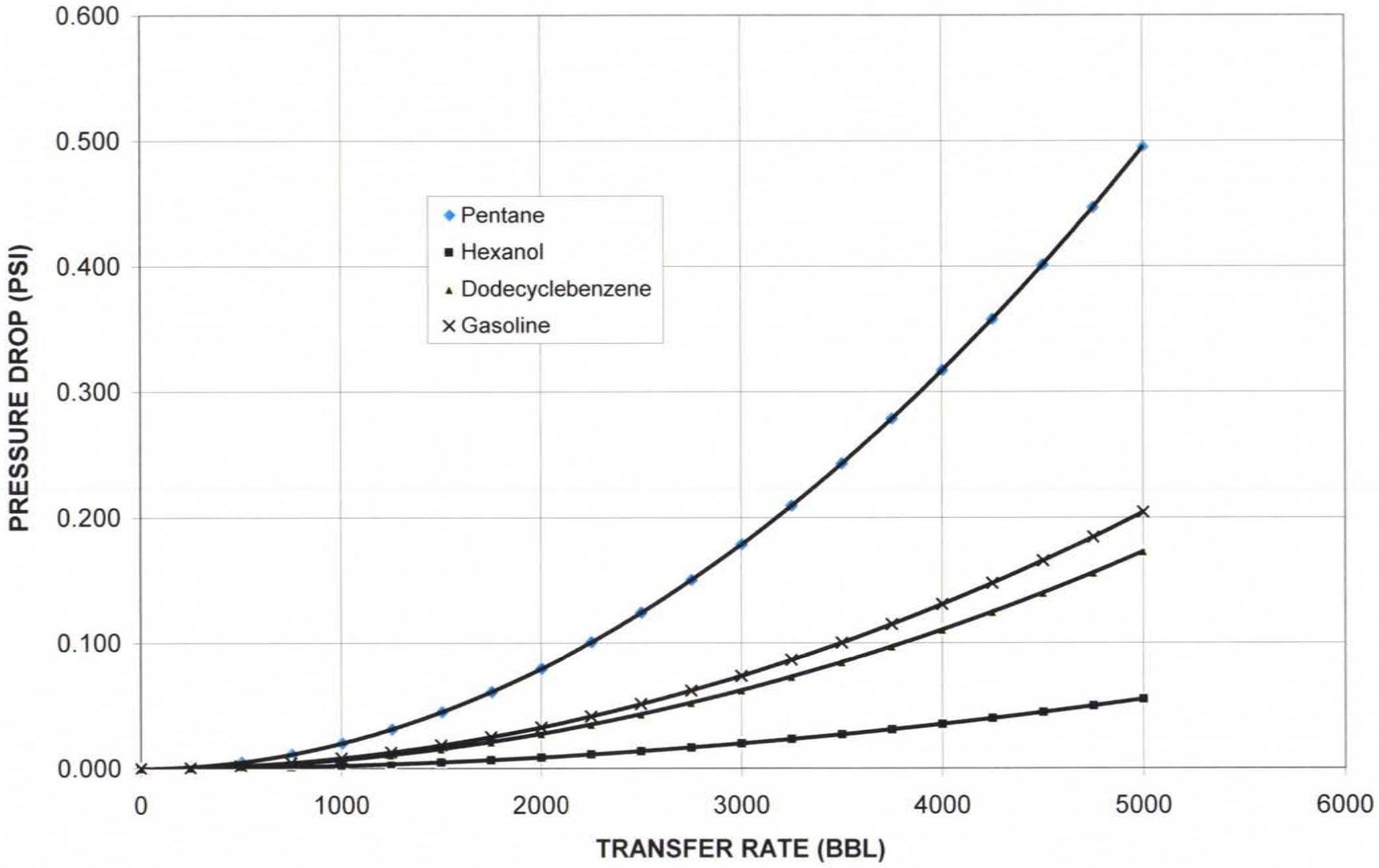
TABLE 1 (SUB CHAPTER "D" CARGOES)

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 (bbl/h)	AIR EQUIVALENT VOLUMETRIC FLOW RATE	PRESSURE DROP TO SHORE CONNECTION IN VCS (psig) (LOADING)*	PRESSURE DROP TO PV VALVE IN VCS(psig) (UNLOADING)	PRESSURE DROP TO SHORE CONNECTION IN VCS (psig) (UNLOADING)*
1 ACT	Acetone	1	0.79	10	2	0.123	1.2000	0.041	4200	5340	0.052	0.002	0.003
2 ACP	Acetophenone	1	1.03	0.6	4.14	0.085	1.0120	0.020	3542	3741	0.026	0.001	0.001
19 AAT	Amyl Acetate (iso-)	1	0.88	0.33	4.48	0.081	1.0066	0.019	3523	3645	0.024	0.001	0.001
20 AAI	Amyl Alcohol (iso-, n-, sec-, primary) (See also IAA	1	0.82	0.3	3.04	0.079	1.0060	0.019	3521	3586	0.024	0.001	0.001
21 AAN	Amyl Alcohol (n-)	1	0.82	0.3	3.04	0.079	1.0060	0.019	3521	3586	0.024	0.001	0.001
23 APM	Amyl Alcohol, Primary	1	0.82	0.3	3.04	0.079	1.0060	0.019	3521	3586	0.024	0.001	0.001
24 ASE	Amyl Alcohol, (sec-)	1	0.82	0.3	3.04	0.079	1.0060	0.019	3521	3586	0.024	0.001	0.001
26 IAA	Amyl Alcohol, (iso-)	1	0.82	0.3	3.04	0.079	1.0060	0.019	3521	3586	0.024	0.001	0.001
34 BAL	Benzyl Alcohol	1	1.05	0.1	3.73	0.077	1.0020	0.018	3507	3535	0.023	0.001	0.001
40 BAX	Butyl Acetate (iso-, n-)	1	0.87	0.6	4	0.084	1.0120	0.020	3542	3733	0.026	0.001	0.001
42 BTA	Butyl Acetate (sec-)	1	0.89	1.5	4	0.097	1.0300	0.024	3605	4074	0.030	0.001	0.002
44 IAL	Butyl Alcohol (iso-)	1	0.81	0.9	2.6	0.083	1.0180	0.020	3563	3717	0.025	0.001	0.001
46 BAS	Butyl Alcohol (sec-)	1	0.81	1.3	2.6	0.086	1.0260	0.021	3591	3814	0.027	0.001	0.001
47 BAT	Butyl Alcohol (tert-)	1	0.78	2.8	2.6	0.097	1.0560	0.025	3696	4175	0.032	0.001	0.002
48 BPH	Butyl Benzyl Phthalate	1	1.12	0.01	10.8	0.076	1.0002	0.018	3501	3510	0.023	0.001	0.001
64 CLS	Caprolactam Solutions	1	1.02	0.05	3.9	0.077	1.0010	0.018	3504	3518	0.023	0.001	0.001
70 CUM	Cumene	1	0.86	0.60	4.20	0.085	1.0120	0.020	3542	3745	0.026	0.001	0.001
72 CHX	Cyclohexane	1	0.78	4.5	2.9	0.116	1.0900	0.032	3815	4714	0.041	0.002	0.002
73 CHN	Cyclohexanol	1	0.95	0.15	3.45	0.078	1.0030	0.018	3511	3549	0.023	0.001	0.001
74 CPD	1,3-Cyclopentadiene dimer (molten)	1	0.69	0.25	4.55	0.080	1.0050	0.019	3518	3612	0.024	0.001	0.001
76 CMP	Cymene (para-)	1	0.86	0.11	4.62	0.078	1.0022	0.018	3508	3550	0.023	0.001	0.001
77 DHN	Decahydronaphthalene	1	0.89	0.1	4.76	0.078	1.0020	0.018	3507	3546	0.023	0.001	0.001
78 IDA	Decaldehyde (iso-)	1	0.83	0.01	5	0.076	1.0002	0.018	3501	3504	0.022	0.001	0.001
79 DAL	Decaldehyde (n-)	1	0.83	0	5.01	0.076	1.0000	0.018	3500	3499	0.022	0.001	0.001
81 DCE	Decane	1	0.74	0.12	4.8	0.078	1.0024	0.018	3508	3556	0.023	0.001	0.001
82 DAX	Decyl Alcohol (all isomers) (Decanol)	1	0.83	0.01	5.3	0.076	1.0002	0.018	3501	3504	0.023	0.001	0.001
83 ISA	Decyl Alcohol (iso-)	1	0.83	0.01	5.3	0.076	1.0002	0.018	3501	3504	0.023	0.001	0.001
84 DAN	Decyl Alcohol (n-)	1	0.83	0.01	5.3	0.076	1.0002	0.018	3501	3504	0.023	0.001	0.001
85 DBZ	Decylbenzene (n-)	1	0.86	0.01	7.52	0.076	1.0002	0.018	3501	3507	0.023	0.001	0.001
87 DAA	Diacetone Alcohol	1	0.97	0.1	4	0.077	1.0020	0.018	3507	3538	0.023	0.001	0.001
91 DPA	Dibutyl Phthalate (ortho-)	1	1.05	0	9.59	0.076	1.0000	0.018	3500	3499	0.022	0.001	0.001
92 DPT	Dicyclopentadiene, See 1,3-Cyclopentadiene Dimer	2	0.98	0.25	4.55	0.080	1.0050	0.019	3518	3612	0.024	0.001	0.001
93 DEB	Diethybenzene	1	0.87	0.08	4.62	0.077	1.0016	0.018	3506	3536	0.023	0.001	0.001
94 DEG	Diethylene Glycol	1	1.12	0.01	3.66	0.076	1.0002	0.018	3501	3503	0.022	0.001	0.001
95 DME	Diethylene Glycol Butyl Ether	1	0.95	0.01	5.5	0.076	1.0002	0.018	3501	3505	0.023	0.001	0.001
100 DGA	Diethylene Glycol Ethyl Ether Acetate	1	0.99	0.02	4.62	0.076	1.0004	0.018	3501	3508	0.023	0.001	0.001
101 DGM	Diethylene Glycol Methyl Ether	1	1.03	0.03	4.14	0.076	1.0006	0.018	3502	3511	0.023	0.001	0.001
111 DBC	Diisobutylcarbinol	1	0.81	0.09	4.97	0.078	1.0018	0.018	3506	3544	0.023	0.001	0.001
112 DBL	Diisobutylene	1	0.72	2	3.86	0.103	1.0400	0.026	3640	4233	0.033	0.001	0.002
113 DIX	Diisobutyl Ketone	1	0.81	0.16	4.9	0.079	1.0032	0.019	3511	3577	0.023	0.001	0.001
119 DIX	Diisopropylbenzene (all isomer)	1	0.86	0.03	5.6	0.077	1.0006	0.018	3502	3516	0.023	0.001	0.001
124 DTL	Dimethyl Phthalate	1	1.19	0	6.69	0.076	1.0000	0.018	3500	3499	0.022	0.001	0.001
130 DOP	Dioctyl Phthalate	1	0.98	0	13.47	0.076	1.0000	0.018	3500	3499	0.022	0.001	0.001
131 DPN	Dipentene	1	0.84	0.1	4.9	0.078	1.0020	0.018	3507	3548	0.023	0.001	0.001
132 DIL	Diphenyl	1	0.99	0.01	5.31	0.076	1.0002	0.018	3501	3504	0.023	0.001	0.001
133 DDO	Diphenyl, Diphenyl Ether Mixture	1	1.07	0.01	5.86	0.076	1.0002	0.018	3501	3505	0.023	0.001	0.001
134 DPE	Diphenyl Ether	1	1.07	0.01	5.87	0.076	1.0002	0.018	3501	3505	0.023	0.001	0.001
136 DPG	Dipropylene Glycol	1	1.03	0.07	4.63	0.077	1.0014	0.018	3505	3531	0.023	0.001	0.001
139 DFF	Distillates: Flashed Feed Stocks	1	0.75	2.3	3.4	0.102	1.0460	0.026	3661	4238	0.033	0.001	0.002
140 DSR	Distillates: Straight Run	1	0.73	2.3	3.4	0.102	1.0460	0.026	3661	4238	0.033	0.001	0.002
145 DOZ	Dodecene (all isomers)	1	0.76	0.02	5.81	0.076	1.0004	0.018	3501	3511	0.023	0.001	0.001
146 DOD	Dodecene	1	0.76	0.02	5.81	0.076	1.0004	0.018	3501	3511	0.023	0.001	0.001
147 DDB	Dodecylbenzene		0.86	4.7	8.4	0.239	1.0940	0.067	3829	6791	0.084	0.003	0.004
155 ETG	Ethoxy Triglycol (crude)	1	1.02	0	6.14	0.076	1.0000	0.018	3500	3499	0.022	0.001	0.001
156 ETA	Ethyl Acetate	1	0.9	4.5	3.04	0.119	1.0900	0.033	3815	4774	0.042	0.002	0.002
157 EAA	Ethyl Acetoacetate	1	1.03	0.2	4.48	0.079	1.0040	0.019	3514	3588	0.024	0.001	0.001
158 EAL	Ethyl Alcohol (Ethanol)	1	0.79	3.5	1.6	0.086	1.0700	0.023	3745	3979	0.029	0.001	0.002
160 ETB	Ethyl Benzene	1	0.87	0.6	3.56	0.083	1.0120	0.020	3542	3705	0.025	0.001	0.001
161 EBT	Ethyl Butanol	1	0.83	0.12	3.52	0.077	1.0024	0.018	3508	3540	0.023	0.001	0.001
162 EBR	Ethyl Butyrate	1	0.88	1	4	0.090	1.0200	0.022	3570	3885	0.028	0.001	0.001
163 ECY	Ethyl Cyclohexane	1	0.79	0.5	3.87	0.083	1.0100	0.020	3535	3687	0.025	0.001	0.001
166 EGL	Ethylene Glycol	1	1.19	0.01	2.21	0.076	1.0002	0.018	3501	3501	0.022	0.001	0.001

169 EMA	Ethylene Glycol Butyl Ether Acetate	1	0.94	0.05	5.52	0.077	1.0010	0.018	3504	3527	0.023	0.001	0.001
172 EGY	Ethylene Glycol Diacetate	1	1.1	0.01	5.03	0.076	1.0002	0.018	3501	3504	0.023	0.001	0.001
178 EME	Ethylene Glycol Methyl Ether	1	1.1	0.01	4.8	0.076	1.0002	0.018	3501	3504	0.022	0.001	0.001
180 EPE	Ethylene Glycol Phenyl Ether	1	1.1	0.01	4.8	0.076	1.0002	0.018	3501	3504	0.022	0.001	0.001
184 EHA	2-Ethylhexaldehyde, See Octyl Aldehydes	1	0.82	0.17	4.41	0.079	1.0034	0.019	3512	3573	0.023	0.001	0.001
186 EHX	2-Ethylhexanol , see Octanol (all isomers)	1	0.84	0.02	4.5	0.076	1.0004	0.018	3501	3508	0.023	0.001	0.001
190 EPR	Ethyl Propionate	1	0.89	3.5	1.6	0.086	1.0700	0.023	3745	3979	0.029	0.001	0.002
191 ETE	Ethyl Toulene	1	0.88	0.28	4.15	0.080	1.0056	0.019	3520	3613	0.024	0.001	0.001
194 FAM	Formamide	1	1.13	0.1	1.55	0.076	1.0020	0.018	3507	3512	0.023	0.001	0.001
195 FAL	Furfuryl Alcohol	1	1.13	0.05	3.4	0.077	1.0010	0.018	3504	3515	0.023	0.001	0.001
197 GAK	Gasoline Blended Stocks: Alkylates	1	0.75	12.5	3.4	0.217	1.2500	0.079	4375	7386	0.100	0.004	0.005
198 GRF	Gasoline Blended Stocks: Reformate	1	0.8	12.5	3.4	0.217	1.2500	0.079	4375	7386	0.100	0.004	0.005
199 GAT	Gasolines: Automotive (containing not over 4.23 gr	1	0.74	12.5	3.4	0.217	1.2500	0.079	4375	7386	0.100	0.004	0.005
200 GAV	Gasolines: Aviation (containing not over 4.86 grams	1	0.71	12.5	3.4	0.217	1.2500	0.079	4375	7386	0.100	0.004	0.005
201 GCS	Gasolines: Casinghead	1	0.67	12.5	3.4	0.217	1.2500	0.079	4375	7386	0.100	0.004	0.005
202 GPL	Gasolines: Polymer	1	0.75	12.5	3.4	0.217	1.2500	0.079	4375	7386	0.100	0.004	0.005
203 GSR	Gasolines: Straight Run	1	0.75	12.5	3.4	0.217	1.2500	0.079	4375	7386	0.100	0.004	0.005
204 GCR	Glycerine	1	1.26	0	3.17	0.076	1.0000	0.018	3500	3499	0.022	0.001	0.001
217 HMX	Heptane (all isomers) (Methylhexane)	1	0.68	2.5	3.45	0.105	1.0500	0.027	3675	4313	0.034	0.001	0.002
218 HPT	Heptane (n-)	1	0.68	2.5	3.45	0.105	1.0500	0.027	3675	4313	0.034	0.001	0.002
220 HTX	Heptanol (all isomers)	1	0.82	0.04	4	0.077	1.0008	0.018	3503	3515	0.023	0.001	0.001
221 HTN	Heptanol (all isomers)	1	0.82	0.04	4	0.077	1.0008	0.018	3503	3515	0.023	0.001	0.001
222 HPX	Heptene (all isomers)	2	0.7	2.9	3.4	0.109	1.0580	0.028	3703	4426	0.036	0.001	0.002
223 THE	Heptene (1-)	1	0.7	2.8	3.4	0.107	1.0560	0.028	3696	4395	0.035	0.001	0.002
229 HXS	Hexane (all isomers)	1	0.66	7	3	0.142	1.1400	0.043	3990	5446	0.054	0.002	0.003
230 HXA	Hexane	1	0.66	7	3	0.142	1.1400	0.043	3990	5446	0.054	0.002	0.003
231 HXO	Hexaonic Acid	1	0.93	0.01	4	0.076	1.0002	0.018	3501	3503	0.022	0.001	0.001
232 HXN	Hexanol	1	0.82	1	3.52	0.088	1.0200	0.021	3570	3837	0.027	0.001	0.001
234 HEX	Hexene (all isomers)	2	0.67	8	2.9	0.147	1.1600	0.046	4060	5651	0.059	0.002	0.003
235 HXE	Hexene (1-)	1	0.67	8.2	2.9	0.149	1.1640	0.047	4074	5705	0.060	0.002	0.003
236 HXT	Hexene (2-)	1	0.67	8.2	2.9	0.149	1.1640	0.047	4074	5705	0.060	0.002	0.003
238 HXG	Hexylene Glycol	4	0.92	0.01	1.1	0.076	1.0002	0.018	3501	3500	0.022	0.001	0.001
243 IPH	Isophorone	1	0.93	0.01	4.75	0.076	1.0002	0.018	3501	3504	0.022	0.001	0.001
244 JPO	Jet Fuels: JP-1 (Kerosene)	1	0.8	0.14	4.5	0.078	1.0028	0.018	3510	3561	0.023	0.001	0.001
245 JPT	Jet Fuels: JP-3	1	0.8	8.51	4.5	0.216	1.1702	0.069	4096	6899	0.087	0.004	0.005
246 JPF	Jet Fuels: JP-4	1	0.81	3.4	4	0.124	1.0680	0.033	3738	4770	0.042	0.002	0.002
247 JPV	Jet Fuels: JP-5 (Kerosene, heavy)	1	0.82	0.1	4	0.077	1.0020	0.018	3507	3538	0.023	0.001	0.001
249 KRS	Kerosene	1	0.81	0.15	4.5	0.078	1.0030	0.018	3511	3566	0.023	0.001	0.001
263 MTT	Methyl Acetate	1	0.92	6.1	2.6	0.122	1.1220	0.036	3927	4970	0.045	0.002	0.002
265 MAL	Methyl Alcohol (See Methanol)	1	0.79	6.63	1.1	0.079	1.1326	0.024	3964	4043	0.030	0.001	0.002
266 MAC	Methyl Amyl Acetate	1	0.86	0.33	4.97	0.082	1.0066	0.019	3523	3662	0.025	0.001	0.001
267 MAA	Methyl Amyl Alcohol	1	0.81	0.43	3.52	0.081	1.0086	0.019	3530	3645	0.024	0.001	0.001
271 MBK	Methyl n-Butyl Ketone	1	0.81	0.97	3.5	0.087	1.0194	0.021	3568	3825	0.027	0.001	0.001
273 MBU	Methyl Butyrate	1	0.9	1.26	3.53	0.091	1.0252	0.022	3588	3924	0.028	0.001	0.001
274 MEK	Methyl Ethyl Ketone	1	0.8	4.5	2.5	0.108	1.0900	0.030	3815	4539	0.038	0.002	0.002
275 MTF	Methyl Formal (Dimethyl Formal)	1	0.86	15.42	2.6	0.192	1.3084	0.077	4579	7272	0.097	0.004	0.005
276 MHK	Methyl Heptyl Ketone	1	0.83	0.06	4.9	0.077	1.0012	0.018	3504	3528	0.023	0.001	0.001
278 MIK	Methyl Isobutyl Ketone	1	0.8	1.15	3.45	0.089	1.0230	0.022	3581	3878	0.028	0.001	0.001
281 MNA	1-Methyl Napthalene	1	1.02	0.01	4.91	0.076	1.0002	0.018	3501	3504	0.022	0.001	0.001
283 MPN	2-Methyl-1-Pentene	1	0.69	6.3	2.9	0.132	1.1260	0.039	3941	5195	0.049	0.002	0.003
284 MTN	5-Methyl-1-Pentene	1	0.67	8.49	2.9	0.152	1.1698	0.048	4094	5782	0.061	0.003	0.003
286 MBE	Methyl Tert-Butyl Ether (MTBE)	1	0.74	0.04	3.1	0.076	1.0008	0.018	3503	3511	0.023	0.001	0.001
288 MNS	Mineral Spirits	1	0.75	0.2	4.3	0.079	1.0040	0.019	3514	3584	0.024	0.001	0.001
289 MRE	Myrcene	1	0.8	0.17	4.7	0.079	1.0034	0.019	3512	3578	0.023	0.001	0.001
295 NSV	Naphtha: Solvent	1	0.87	0.2	3.5	0.078	1.0040	0.018	3514	3567	0.023	0.001	0.001
296 NSS	Naphtha: Stoddard Solvant	1	0.78	0.2	4.3	0.079	1.0040	0.019	3514	3584	0.024	0.001	0.001
297 NVM	Naphtha: Varnish Maker's and Painters (75%)	1	0.77	0.19	4.3	0.079	1.0038	0.019	3513	3580	0.023	0.001	0.001
300 NAX	Nonane (all isomers)	1	0.72	0.27	4.4	0.080	1.0054	0.019	3519	3616	0.024	0.001	0.001
301 NAN	Nonane	1	0.72	0.27	4.4	0.080	1.0054	0.019	3519	3616	0.024	0.001	0.001
304 NON	Nonene	1	0.73	0.35	4.3	0.081	1.0070	0.019	3525	3647	0.024	0.001	0.001
305 NNS	Nonyl Alcohol (all isomers)	1	0.94	0.1	5	0.078	1.0020	0.018	3507	3549	0.023	0.001	0.001
306 NNN	Nonyl Alcohol	1	0.94	0.1	5	0.078	1.0020	0.018	3507	3549	0.023	0.001	0.001
307 NNI	Nonyl Alcohol (iso-)	1	0.94	0.1	5	0.078	1.0020	0.018	3507	3549	0.023	0.001	0.001
309 NNP	Nonyl Phenol	1	0.95	0.01	7.6	0.076	1.0002	0.018	3501	3507	0.023	0.001	0.001
316 OAX	Octane (all isomers)	1	0.7	0.79	3.9	0.087	1.0158	0.021	3555	3797	0.026	0.001	0.001
317 OAN	Octane	1	0.7	0.79	3.9	0.087	1.0158	0.021	3555	3797	0.026	0.001	0.001
320 OTA	Octanol	1	0.83	0.01	4.48	0.076	1.0002	0.018	3501	3503	0.022	0.001	0.001
322 OTE	Octene (1-)	1	0.72	1	3.86	0.089	1.0200	0.022	3570	3871	0.027	0.001	0.001
324 OCX	Octyl Alcohol (iso-, n-) (all isomers), See Octanol (	1	0.83	0.01	4.48	0.076	1.0002	0.018	3501	3503	0.022	0.001	0.001

325	IOA	Octyl Alcohol	1	0.83	0.01	4.48	0.076	1.0002	0.018	3501	3503	0.022	0.001	0.001
364	OTW	Fuel: No. 2	1	0.88	0.56	8	0.094	1.0112	0.023	3539	3943	0.028	0.001	0.001
366	OFR	Fuel: No. 4	1	0.9	0.15	3.4	0.078	1.0030	0.018	3511	3548	0.023	0.001	0.001
367	OFV	Fuel: No. 5	1	0.94	0.15	3.4	0.078	1.0030	0.018	3511	3548	0.023	0.001	0.001
368	OSX	Fuel: No. 6	1	0.95	0.15	3.4	0.078	1.0030	0.018	3511	3548	0.023	0.001	0.001
382	OIL	OIL, Misc: Crude	1	0.95	0.15	3.4	0.078	1.0030	0.018	3511	3548	0.023	0.001	0.001
383	ODS	OIL, Misc: Diesel	1	0.9	0.69	3.4	0.084	1.0138	0.020	3548	3724	0.025	0.001	0.001
389	OLB	OIL, Misc: Lubricating	1	0.9	0.15	1	0.076	1.0030	0.018	3511	3510	0.023	0.001	0.001
403	ORS	OIL, Misc: Resin	1	1.02	0.15	1	0.076	1.0030	0.018	3511	3510	0.023	0.001	0.001
418	OTB	OIL, Misc: Turbine	1	0.87	0.3	5.4	0.082	1.0060	0.019	3521	3661	0.025	0.001	0.001
429	PDC	Pentadecanol, See Alcohols (C13 and above)	1	0.83	0.01	7.88	0.076	1.0002	0.018	3501	3507	0.023	0.001	0.001
433	IPT	Pentane (iso-)	5	0.62	27	2.48	0.346	1.5400	0.192	5390	11501	0.242	0.010	0.013
434	PTA	Pentane (n-)	5	0.63	20.44	2.5	0.264	1.4088	0.122	4931	9191	0.155	0.006	0.008
437	PTE	Pentene (1-)	5	0.64	24.9	2.4	0.309	1.4980	0.162	5243	10568	0.205	0.008	0.011
442	PIN	Pinene	1	0.86	0.35	4.7	0.082	1.0070	0.019	3525	3662	0.025	0.001	0.001
448	PLB	Polybutene	1	0.91	0.01	79.3	0.080	1.0002	0.019	3501	3583	0.024	0.001	0.001
457	PGC	Polypropylene Glycol	1	1.01	0.1	1	0.076	1.0020	0.018	3507	3506	0.023	0.001	0.001
464	IAC	Propyl Acetate (iso-)	1	0.89	1.8	3.52	0.097	1.0360	0.024	3626	4101	0.031	0.001	0.002
465	PAT	Propyl Acetate (n-)	1	0	1.85	3.52	0.098	1.0370	0.025	3630	4118	0.031	0.001	0.002
466	IPA	Propyl Alcohol (iso-)	1	0.79	3	2.07	0.091	1.0600	0.024	3710	4060	0.030	0.001	0.002
467	PAL	Propyl Alcohol (n-)	1	0.8	1.2	2.07	0.082	1.0240	0.020	3584	3722	0.025	0.001	0.001
468	PBZ	Propylbenzene (n-)	1	0.86	0.2	4.14	0.079	1.0040	0.019	3514	3580	0.023	0.001	0.001
469	IPX	Iso-Propylcyclohexane	1	0.8	0.01	4.35	0.076	1.0002	0.018	3501	3503	0.022	0.001	0.001
473	PPG	Propylene Glycol (1,2-Propandiol)	1	1.04	0.01	2.62	0.076	1.0002	0.018	3501	3501	0.022	0.001	0.001
476	PME	Propylene Glycol Methyl Ether	1	0.92	0.7	3.11	0.083	1.0140	0.020	3549	3706	0.025	0.001	0.001
488	SFL	Sulfolane	1	1.26	0.01	4.14	0.076	1.0002	0.018	3501	3503	0.022	0.001	0.001
493	TTN	Tetradecanol	1	0.82	0	7.39	0.076	1.0000	0.018	3500	3499	0.022	0.001	0.001
494	TTD	1-Tetradecene, See the olefin or Alpha-Olefin Entrie	1	0.77	0.01	6.77	0.076	1.0002	0.018	3501	3506	0.023	0.001	0.001
496	TTG	Tetraethylene Glycol	1	1.12	0.01	6.7	0.076	1.0002	0.018	3501	3506	0.023	0.001	0.001
497	THN	Tetrahydronaphthalene	1	0.97	0.04	4.56	0.077	1.0008	0.018	3503	3517	0.023	0.001	0.001
499	TOL	Toluene	1	0.87	1.5	3.14	0.091	1.0300	0.023	3605	3945	0.029	0.001	0.001
502	TCP	Tricresyl Phosphate (less than 1% of the ortho isor	1	1.16	0.01	12.69	0.077	1.0002	0.018	3501	3512	0.023	0.001	0.001
503	TRD	Tridecane	1	0.76	0.02	6.4	0.076	1.0004	0.018	3501	3512	0.023	0.001	0.001
505	TDN	Tridecanol , See Alcohols (C13 and above)	1	0.85	0.01	6.91	0.076	1.0002	0.018	3501	3506	0.023	0.001	0.001
506	TDC	1-Tridecene	1	0.77	0.01	6.29	0.076	1.0002	0.018	3501	3505	0.023	0.001	0.001
508	TEB	Triethylbenzene	1	0.86	0.02	5.6	0.076	1.0004	0.018	3501	3510	0.023	0.001	0.001
509	TEG	Triethylene Glycol	1	1.12	0.01	5.17	0.076	1.0002	0.018	3501	3504	0.023	0.001	0.001
519	TRE	Trimathylbenzenes (all isomers)	1	0.89	0.14	4.2	0.078	1.0028	0.018	3510	3557	0.023	0.001	0.001
520	TMB	Trimethyl Benzene (1,2,5-)	1	0.89	0.14	4.14	0.078	1.0028	0.018	3510	3556	0.023	0.001	0.001
521	TMD	Trimethyl Benzene (1,2,3-)	1	0.89	0.14	4.14	0.078	1.0028	0.018	3510	3556	0.023	0.001	0.001
522	TME	Trimethyl Benzene (1,2,4-) (Pseudocumene)	1	0.89	0.14	4.14	0.078	1.0028	0.018	3510	3556	0.023	0.001	0.001
529	TRP	Trixylenyl Phosphate	1	1.16	0	14.2	0.076	1.0000	0.018	3500	3499	0.022	0.001	0.001
546	XLX	Xylenes (Ortho-, meta-, para-)	1	0.89	0.51	3.66	0.082	1.0102	0.020	3536	3680	0.025	0.001	0.001
547	XLM	Xylene (M-)	1	0.87	0.51	3.66	0.082	1.0102	0.020	3536	3680	0.025	0.001	0.001
548	XLO	Xylene (O-)	1	0.89	0.4	3.66	0.081	1.0080	0.019	3528	3641	0.024	0.001	0.001
549	XLP	Xylene (P-)	1	0.86	0.51	3.66	0.082	1.0102	0.020	3536	3680	0.025	0.001	0.001
550	XYL	Xylenol	1	1.01	0.1	3.66	0.077	1.0020	0.018	3507	3535	0.023	0.001	0.001
551		Zinc Dialkyldithiophosphate												
			Max.	1.260	27.000	79.300	0.346	1.540	0.192	5390	11501	0.242	0.010	0.013
			Min.	0.000	0.000	1.000	0.000	1.000	0.018	3500	3499	0.022	0.000	0.000

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


LIQUID TRANSFER RATE vs PRESSURE DROP
PRESSURE DROP (PSI)
0.600
0.500
0.400
0.300
0.200
0.100
0.000
Pentane
Hexanol
Dodecyclebenzene
Gasoline
0
1000
2000
3000
4000
5000
6000
TRANSFER RATE (BBL)

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

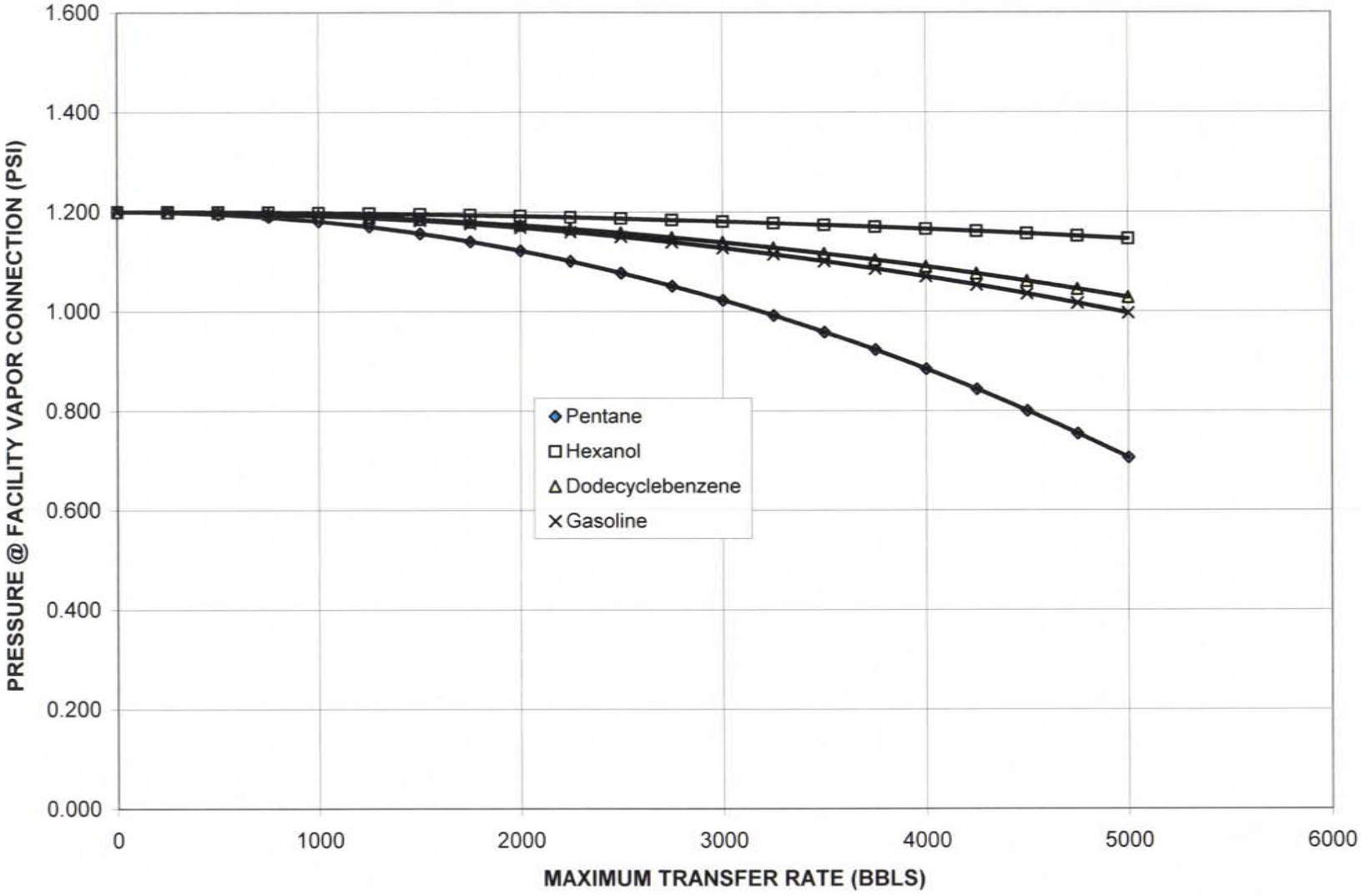
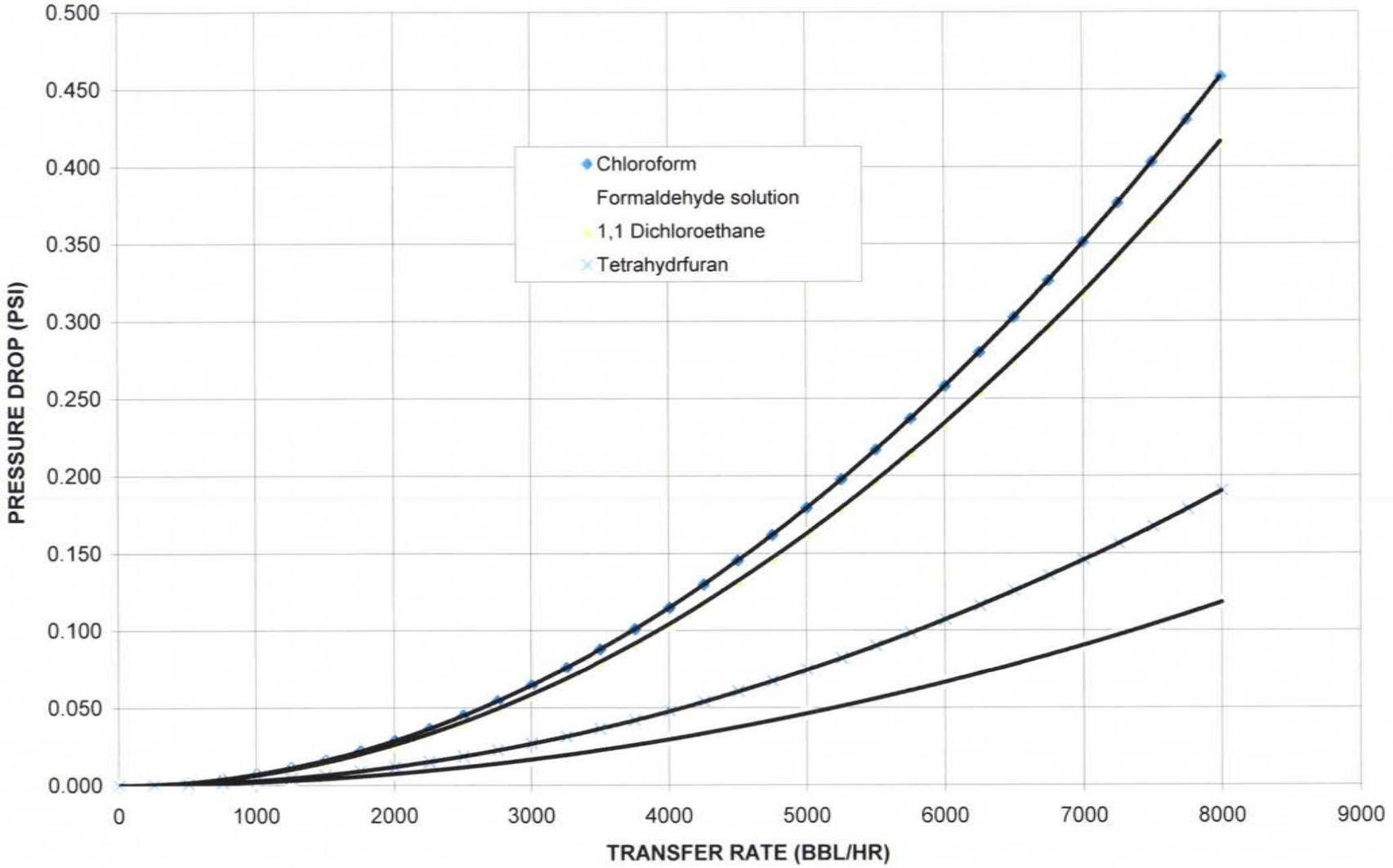


TABLE 4 (SUBCHAPTER "O" CARGOES)

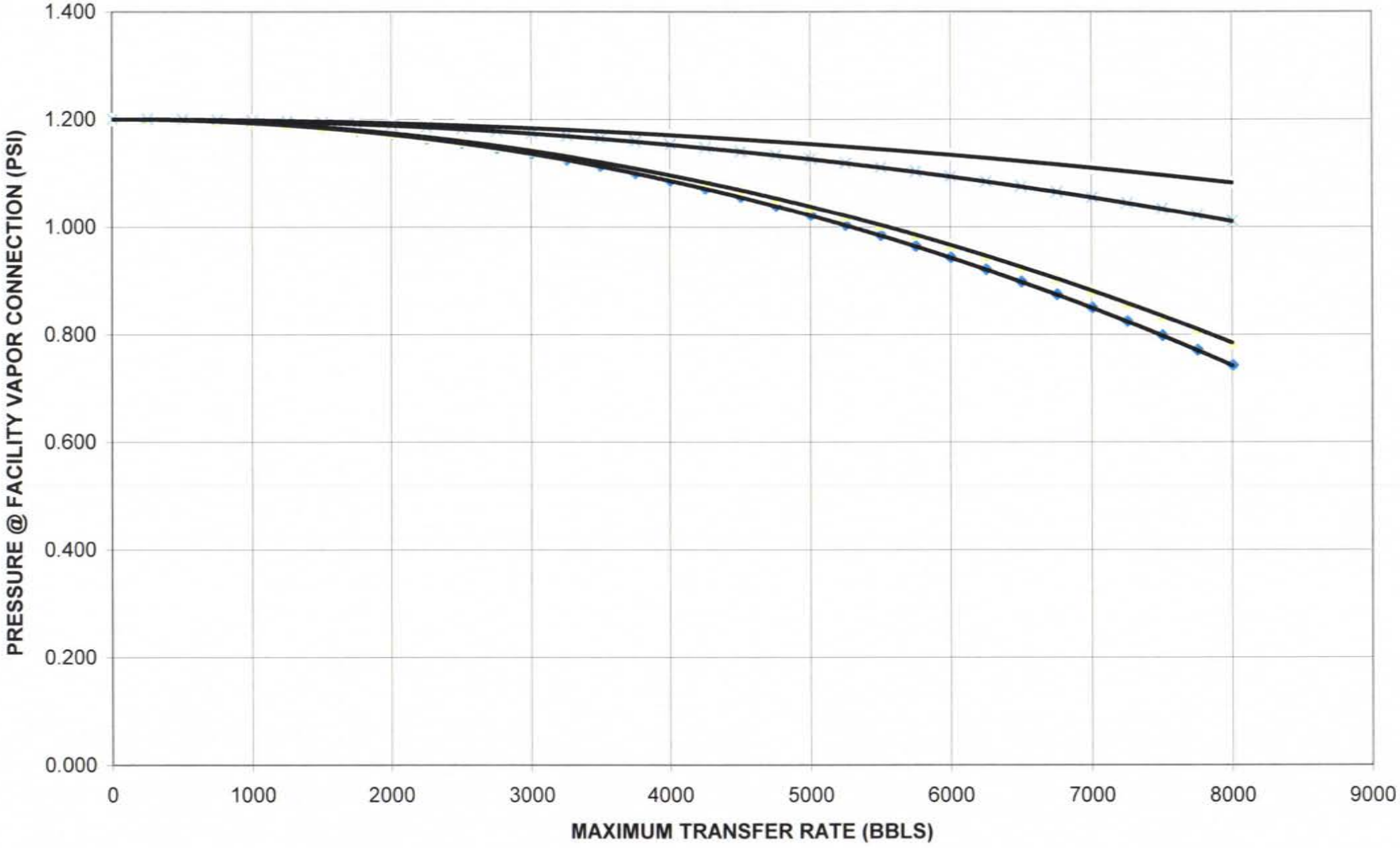
	CHRIS CODE	NAME	VCS CAT	LIQ SG	VAPOR PRESS	VAPOR SG	VAPOR AIR WEIGHT DENSITY	VAPOR GROWTH RATE	PRESSURE DROP TO PV VALVE IN VCS(psig) (LOADING)	VAPOR VOLUMETRIC FLOW RATE (bbl/h)	AIR EQUIVALENT VOLUMETRIC FLOW RATE	PRESSURE DROP TO SHORE CONNECTION IN VCS (psig) (LOADING)*	PRESSURE DROP TO PV VALVE IN VCS(psig) (UNLOADING)	PRESSURE DROP TO SHORE CONNECTION IN VCS (psig) (UNLOADING)*
1	ACN	Acrylonitrile	4	0.81	5.00	1.80	0.095	1.1000	0.027	3850	4298	0.034	0.001	0.002
2	ADN	Adipontrile	1	0.95	0.01	3.73	0.076	1.0002	0.018	3501	3503	0.022	0.001	0.001
3	ATN	Acetonitrile	3	0.78	0.03	1.41	0.076	1.0006	0.018	3502	3502	0.022	0.001	0.001
4	BAD	Iso-Butyraldehyde	1	0.80	7.80	2.50	0.131	1.1560	0.041	4046	5308	0.052	0.002	0.003
5	BAR	Butyl acrylate (iso-, n-)	2	0.90	0.60	4.42	0.086	1.0120	0.020	3542	3759	0.026	0.001	0.001
6	BMH	Butyl Methacrylate	2	0.88	0.29	4.9	0.081	1.0058	0.019	3520	3640	0.024	0.001	0.001
7	BNZ	Benzene	1	0.88	4.50	2.80	0.114	1.0900	0.032	3815	4671	0.040	0.002	0.002
8	BTR	n-Butyraldehyde	1	0.80	7.80	2.50	0.131	1.1560	0.041	4046	5308	0.052	0.002	0.003
9	BTX	Benzene, Toluene, Xylene mixtures (10% Benzene or more)	1	0.84	7.30	2.80	0.138	1.1460	0.042	4011	5396	0.053	0.002	0.003
10	CCH	Cyclohexanone	1	0.95	0.20	3.40	0.078	1.0040	0.018	3514	3565	0.023	0.001	0.001
11	CHA	Cyclohexylamine	1	0.87	0.62	3.42	0.083	1.0124	0.020	3543	3703	0.025	0.001	0.001
12	CRB	Chlorobenzene	1	1.11	0.80	3.88	0.087	1.0160	0.021	3556	3799	0.026	0.001	0.001
13	CRF	Chloroform	3	1.48	9	4.25	0.213	1.1800	0.069	4130	6916	0.088	0.004	0.005
14	NCT	Coal Tar Naphtha Solvent	1	0.86	0.2	4	0.079	1.0040	0.019	3514	3577	0.023	0.001	0.001
15	CRS	Cresols	1	1.05	0.06	3.72	0.077	1.0012	0.018	3504	3521	0.023	0.001	0.001
16	CTA	Crotonaldehyde	4	0.85	2	2.41	0.089	1.0400	0.023	3640	3943	0.028	0.001	0.001
17	DCH	1,1-Dichloroethane	1	1.18	9.90	3.41	0.188	1.1980	0.063	4193	6592	0.080	0.003	0.004
18	DPP	1,2-Dichloropropane	3	1.16	2.5	3.89	0.110	1.0500	0.028	3675	4418	0.036	0.001	0.002
19	DPU	1,3-Dichloropropene	4	1.23	5.5	3.84	0.149	1.1100	0.043	3885	5443	0.054	0.002	0.003
20	DEN	Diethylamine	3	0.71	1.00	2.50	0.083	1.0200	0.020	3570	3731	0.026	0.001	0.001
21	DIP	Diisopropanolamine	1	0.98	0.01	4.59	0.076	1.0002	0.018	3501	3504	0.022	0.001	0.001
22	DMF	Dimethylformamide	1	0.95	0.30	2.51	0.078	1.0060	0.018	3521	3569	0.023	0.001	0.001
23	DPX	1,1-,1,2-, or 1,3-Dichloropropane	3	1.16	6.30	3.90	0.162	1.1260	0.048	3941	5747	0.061	0.003	0.003
24	EAC	Ethyl acrylate	2	0.93	2.00	3.50	0.099	1.0400	0.025	3640	4163	0.032	0.001	0.002
25	EAI	2-Ethylhexyl acrylate	2	0.89	0.02	6.35	0.076	1.0004	0.018	3501	3512	0.023	0.001	0.001
26	EDC	Ethylene dichloride	1	1.26	4.00	3.42	0.121	1.0800	0.033	3780	4776	0.042	0.002	0.002
27	ETM	Ethyl Methacrylate	2	0.92	1	3.94	0.090	1.0200	0.022	3570	3879	0.028	0.001	0.001
28	EPA	2-Ethyl-3-propylacrolein	1	0.85	0.12	4.5	0.078	1.0024	0.018	3508	3553	0.023	0.001	0.001
29	FFA	Furfural	1	1.20	0.15	3.31	0.078	1.0030	0.018	3511	3547	0.023	0.001	0.001
30	FMS	Formaldehyde solution (37% to 50%)	1	1.13	0.15	1.03	0.076	1.0030	0.018	3511	3510	0.023	0.001	0.001
31	MSO	Mesityl Oxide	1	0.86	0.67	3.5	0.084	1.0134	0.020	3547	3725	0.025	0.001	0.001
32	MAM	Methyl acrylate	2	0.95	4.10	3.00	0.114	1.0820	0.031	3787	4646	0.040	0.002	0.002
33	MBE	Methylcyclopentadiene dimer	1	0.74	0.04	3.10	0.076	1.0008	0.018	3503	3511	0.023	0.001	0.001
34	MMM	Methyl methacrylate	2	0.94	2.02	3.45	0.099	1.0404	0.025	3641	4159	0.032	0.001	0.002
35	MPL	Morpholine	1	1.00	0.80	3.00	0.083	1.0160	0.020	3556	3726	0.025	0.001	0.001
36	NPM	1- or 2-Nitropropane	1	0.99	1.05	3.06	0.086	1.0210	0.021	3574	3804	0.027	0.001	0.001
37	PRD	Pyridine	1	0.98	1.30	2.72	0.086	1.0260	0.021	3591	3830	0.027	0.001	0.001
38	STY	Styrene	2	0.92	0.40	3.60	0.081	1.0080	0.019	3528	3638	0.024	0.001	0.001
39	TCN	1,2,3-Trichloropropane	3	1.39	0.15	5.60	0.079	1.0030	0.019	3511	3583	0.024	0.001	0.001
40	TEN	Triethylamine	3	0.73	2.50	3.49	0.105	1.0500	0.027	3675	4323	0.034	0.001	0.002
41	THF	Tetrahydrfuran	1	0.89	8.50	1.35	0.090	1.1700	0.029	4095	4454	0.036	0.002	0.002
42	VAM	Vinyl acetate	2	0.94	5.80	2.97	0.130	1.1160	0.038	3906	5099	0.048	0.002	0.002
			Max.	1.39	12.5	8.40	0.213	1.198	0.069	4193	6916	0.088	0.004	0.005
			Min.	0.63	0.01	1.03	0.076	1.000	0.018	3501	3502	0.022	0.001	0.001

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

LIQUID TRANSFER RATE vs PRESSURE DROP

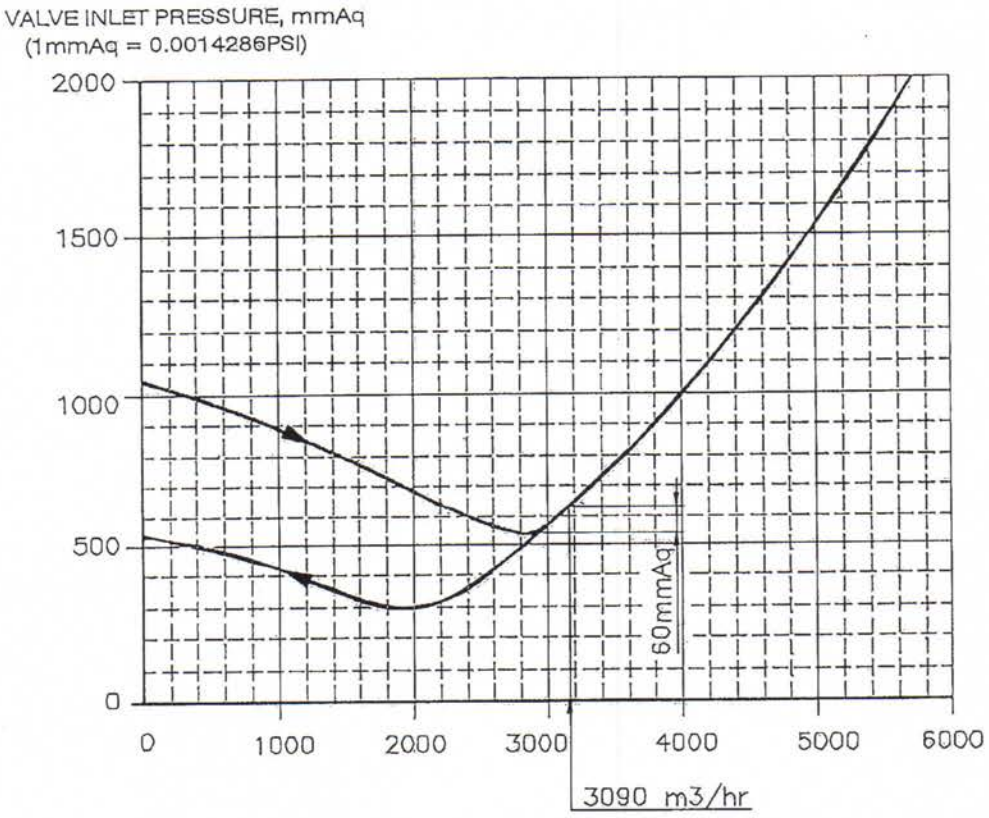


PRESSURE vs MAXIMUM TRANSFER RATE (FOR SUB-CHAPTER "O" CARGOES)



HIGH VELOCITY VENT VALVE FLOW CAPACITY CURVE

MODEL : KSPA-6
SIZE : 6"(150A)
SETTING PRESSURE : 1050mmAq

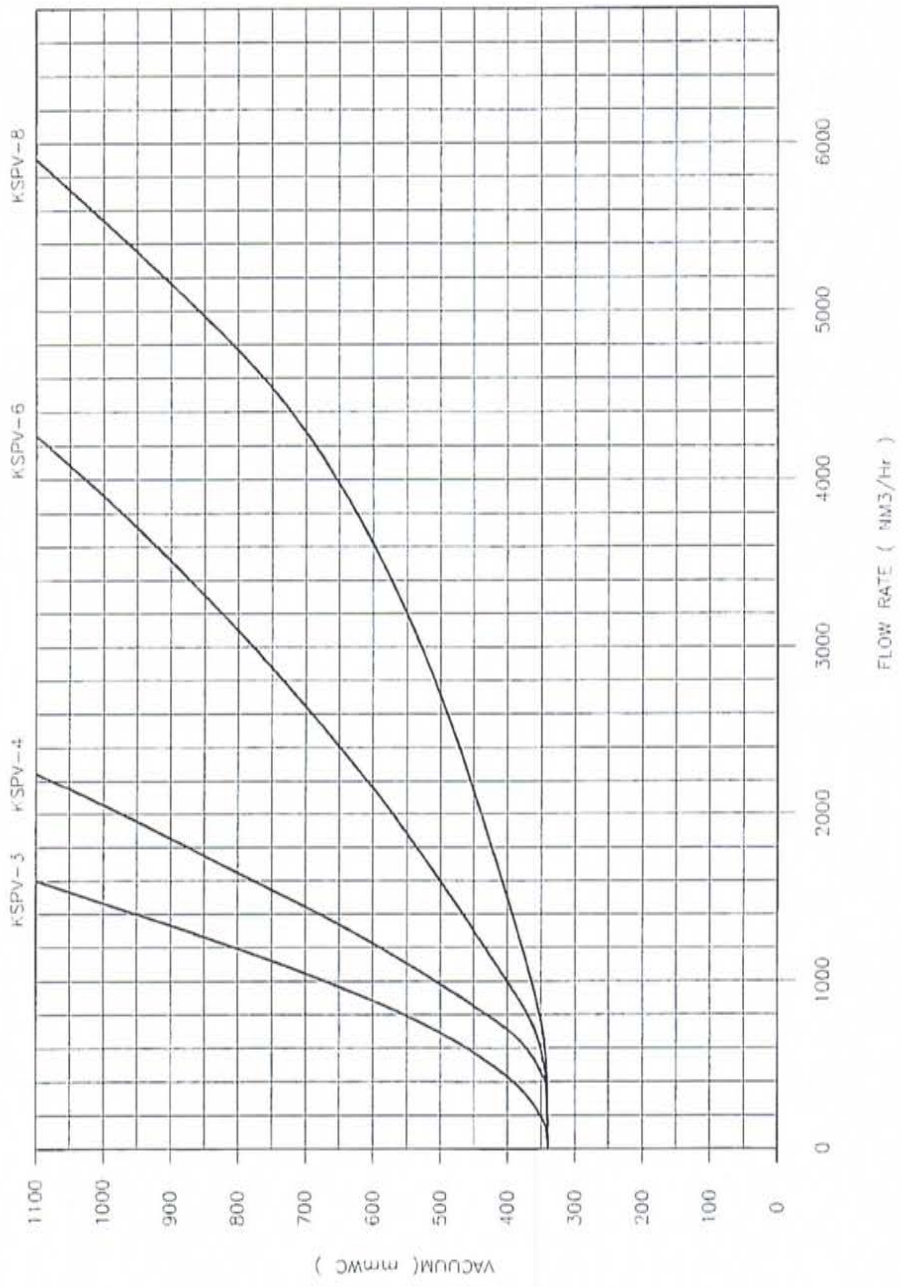


FLOW CAPACITY OURVE, SCMH(Standard cubic meter per hour)
(1SCMH = 6.289BBL/hr)

APPLICABLE STANDARD	TEST CONDITION	
IMO MSC/Circ.677 API Standard 2000	FLOW TEST PERFORMED ON EQUIPMENT USING AIR, AT TEMP.T=15.6℃ AND AMBIENT PRESSURE P=1.0332Kg/cm²	SHEET NO. 1/1

FLOW CAPACITY CURVE GRAPH

FLOW TEST PERFORMED ON EQUIPMENT
USING AIR, AT TEMP. T=15.6°C AND
AMBIENT PRESSURE P=1.0332 KG/CM2.



TANKTECH

TITLE HIGH VELOCITY VACUUM RELIEF VALVE

KSPV TYPE

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

Vessel Name	CBC 1010 through CBC 1014	**Shipyard**	Southwest
Official Number	1302990 through 1302994	**Hull Number**	9830, 9831, 9832, 9824, 9836

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 3.50 psig

Raised Trunk [X]
Flush Deck [ ]

3. Authorized Maximum Cargo Transfer Rate(s)
3,500 bbl/hr discharging
800 bbl/hr discharging

4. Authorized Maximum Vapor-Air Mixture Density 0.348 lbm/ft^3

5. Authorized VCS Categories 1 Through 5

6. Cargoes with the highest vapor density and/or pressure drop:
a. Cargo Name: **Pentane (all isomers) [PTY]**
b. Cargo Name: **Pentane (all isomers) [PTY]**

7. Pressure Vacuum Valve:

Manufacturer	**Tanktech**
Size	**KLPH-6**
CG Approval	**162.017/144/3**

Settings in psig:
Pressure-side 1.5
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	**9337**	**bbl/hr (air)**
Required Venting Capacity of Vacuum-Side of P/V valve	**800**	**bbl/hr (air)**

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

a. High Level/Tank Overfill Alarm	[X]	Type	Bergan		
b. Overfill Control Shutdown	[X]	Type	Bergan		**Setting in psig**
c. Spill Valve	[ ]	Type	N/A	Meets ASTM F1271	**N/A**
d. Rupture Disk	[ ]	Type	N/A		

10. Closed Gauging Verify the vessel has closed gauging that satisfies 46 CFR 39.2003 and 151.15-10(c).

11. Instructions/Guidelines for the OCMI:

11a. The Marine Safety Center's recommended COI endorsements can be found in the following approval letters:

C1-2001653 dated May 6, 2020

11b. The MSC approval letters 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. Verify the set-point of the overfill shutdown system. It shall be no higher than 9 inches (0.75 feet) below the tank tops of cargo tanks #1-3.

11e. 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.

Current VCS Approval Letter	C1-2001653 dated May 6, 2020	MSC Plan Reviewer	LT J. D. MacArthur