Date: 10/28/13



# MARINE SAFETY CENTER PLAN APPROVAL EXTENSION REQUEST FORM

**Directions:**

1. Complete the table below with all approved plans and corresponding MSC approval letters for which plan approval extension is requested.
2. Electronically submit this form with a copy of the vessel's Application for Inspection directly to the MSC (MSC@USCG.mil), or submit a paper copy to our mailing address:

Commanding Officer (MSC)
2100 2nd St SW Stop 7102
Washington, DC 20593-7102

**NAME AND IDENTIFICATION (O.N., CG NUMBER) OF VESSEL FOR WHICH PLANS WERE PREVIOUSLY APPROVED:**
CBC 1335, CG1111608, Southwest Shipyard Hull 9628

**NAME AND IDENTIFICATION OF VESSEL(S) TO WHICH PLAN APPROVAL IS TO BE EXTENDED:**
CBC 1370 thru CBC 1379, Southwest Shipyard Hulls 9702 thru 9711

| Drawing Number | # of Sheets | Rev. # | Drawing Title | MSC Project Number | Approval Date | Approval Letter Serial Number | Denied (MSC Use) |
|---|---|---|---|---|---|---|---|
| - | - | - | Vapor Collection System Calculations | P016344 | 5/27/11 | C1-1101625 | |
| - | - | - | Stability Calculations | P016344 | 5/27/11 | C1-1101637 | |
| 081002HL | 1 | 1 | High Level Overfill Alarm System | P016344 | 6/2/11 | E2-1101564 | |
| 081002HZ | 1 | 3 | Hazardous Area Plan | P016344 | 6/2/11 | E2-1101564 | |
| 081002EL | 2 | 2 | Electrical Arrangement | P016344 | 6/2/11 | E2-1101564 | |
| - | - | - | Capacitance and Inductance Calculation | P016344 | 6/2/11 | E2-1101564 | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**By submission of this form, I hereby certify that I am the legal owner of the plans and documents listed herein; or, have the permission of the legal owner to request plan approval extension on their behalf.**

(MSC Use) This PAE Request is addressed in MSC letter Serial No. C1-1303376

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

Commanding Officer
United States Coast Guard
Marine Safety Center

U.S. Coast Guard Stop 7410
4200 Wilson Blvd. Ste 400
Arlington, VA 20598-7410
Staff Symbol: MSC-3
Phone: (703) 872-6731
Email: msc@uscg.mil

16710/P018455
Serial: C1-1303376
October 31, 2013

Marine Solutions, Inc.
Attn: Mr. Chetan Kumaria, P.E.
7985 Boone Trace
Nashville, TN 37221
MarineSolInc@aol.com

Subj: CBC 1370, O.N. 1249103, Southwest Shipyard Hull No. 9702
CBC 1371, O.N. 1249104, Southwest Shipyard Hull No. 9703
CBC 1372, O.N. 1249105, Southwest Shipyard Hull No. 9704
CBC 1373, O.N. 1249106, Southwest Shipyard Hull No. 9705
CBC 1374, O.N. 1249107, Southwest Shipyard Hull No. 9706
CBC 1375, O.N. 1249108, Southwest Shipyard Hull No. 9707
CBC 1376, O.N. 1249109, Southwest Shipyard Hull No. 9708
CBC 1377, O.N. 1249110, Southwest Shipyard Hull No. 9709
CBC 1378, O.N. 1249111, Southwest Shipyard Hull No. 9710
CBC 1379, O.N. 1249112, Southwest Shipyard Hull No. 9711
200' x 35' x 12'-6" Unmanned Double Hull Type I/II/III Tank Barges (D/O)
Grade A (max. 25 psia Reid) and Lower Grades Flammable Liquids Identified in 46 CFR Table 30.25-1 or 46 CFR 153 Table 2, and Specified Hazardous Cargoes
Design Density 8.7 lbs/gal; Maximum Cargo Density 14.07 lbs/gal (at slack load)
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
New Construction: General Arrangement, Plan Approval Extension, and Plan Review Information Sheet (PRIS)

Ref: (a) Marine Solutions, Inc., DWG No. 091301GA-1, Rev. 0, "General Arrangement," Sheet 1 of 2, dated September 2, 2013
(b) Marine Solutions, Inc., DWG No. 091301GA-1, Rev. 1, "General Arrangement," Sheet 2 of 2, dated September 25, 2013
(c) Marine Solutions, Inc., "Calculations for Trunk Side Longitudinal," dated September 25, 2013
(d) American Bureau of Shipping Rules, "Steel Vessels for Service on Rivers and Intracoastal Waterways," 2007

Dear Mr. Kumaria:

We have reviewed the information submitted with your emails dated September 2, 2013 (MSC Document No. 1316021), September 25, 2013 (MSC Document No. 1316675) and October 28, 2013 (MSC Document No. 1317530) for compliance with 46 CFR Subchapters D and O.

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Subj: Southwest Shipyard Hull No. 9702 through 9711
New Construction: General Arrangement, Plan Approval Extension, and Plan Review Information Sheet (PRIS)

References (a) and (b) are "**Approved**." The installation, workmanship, and testing shall be to the satisfaction of the cognizant Officer in Charge Marine Inspection (OCMI). Our approval does not limit in any way 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. Reference (c) has been "**Examined**." Information such as this is not normally approved; however, it is used in the evaluation of the vessels to ensure they comply with the requirements of the applicable regulatory standards. You also requested that plans previously approved under project P016344, Southwest Shipyard Hull No. 9628, be used for the construction of the subject vessels. While we have no objection to you using the plans that were previously approved plans, please be advised that the cognizant OCMI has the final authority for these issues. The following comment applies:

1. We note you have modified the original general arrangement plans by moving the trunk deck lap joint from the trunk top to the trunk side and replacing the trunk side angle (originally 5 x 3 x 5/16") with flat bar (6 x ¾"). Your calculations in reference (c) show that the flat bar has a higher section modulus than the original design. Therefore, we accept these design modifications.

Enclosure (1) includes details regarding MSC approval letters for previously approved plans you wish to use for the construction of the subject vessels. By copy of this letter, we recommend the OCMI extend approval of all drawings and calculations addressed in enclosure (1) to the subject vessels. This extension of plan approval is based on our understanding that:

a. The subject vessel will be built to the same plans as those specified in enclosure (1),
b. The regulations used for the original plan approval have not changed since the original plan approval,
c. The owner of the original plans specifically authorizes the use of the plans for new construction,
d. There are no modifications to subject vessels or any of the installed systems which would require additional review, and
e. All comments provided in the original approval letters, accompanying the approved plans, still apply.

You must provide the OCMI a copy of each item listed in enclosure (1) with its corresponding MSC approval letter. Plans that do not conform to any part of (a) through (e) above shall be submitted to our office for approval. The installation, workmanship, and testing shall be to the satisfaction of the OCMI. Any vessel system, arrangement, structure, or other item that requires plan approval but is not covered by an extension must be either submitted to the MSC for review or reviewed by the OCMI.

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New Construction: General Arrangement, Plan Approval Extension, and Plan Review Information Sheet (PRIS)

Enclosure (2) is the vessel's Plan Review Information Sheet (PRIS). The information on the PRIS is based on the vessel being constructed from all of the plans used to build Southwest Shipyard Hull 9628. Due to the variation in plans, a deadweight survey of one barge must be conducted to verify the assumed lightship characteristics. Provided the deadweight survey results confirm the lightship displacement and LCG assumed for your calculations in enclosure (1), revised calculations will not be required.

The Vapor Control System (VCS) PRIS for the subject vessels is included as enclosures (3). In addition, we have updated each vessel's cargo and vapor control authority. The 46 CFR 151 Cargo List and VCS List of Cargoes are included as enclosures (4) and (5).

The Cargo Authority Attachments (CAAs), containing the cargoes found in enclosure (4) and vapor control authority for the cargoes found in enclosure (5), are now available for issuance by the OCMI.

Please note that only the local OCMI can issue a vessel's CAA as part of the Certificate of Inspection (COI). The OCMI will verify the carriage authority and vapor control tank group characteristics we used as a basis for creating enclosures (4) and (5) are consistent with the vessel's actual design. For the OCMI's convenience, we have included the following recommended COI endorsement:

Only those hazardous cargoes named in the vessel's Cargo Authority Attachment, Serial No. C1-1303376 dated October 31, 2013, may be carried and then only in the tanks indicated.

When the vessel is carrying cargoes containing greater than 0.5% benzene, the person in charge is responsible for ensuring the provisions of 46 US Code of Federal Regulations Part 197, Subpart C are applied.

In accordance with 46 CFR Part 39, excluding part 39.40, this vessel's vapor control system has been inspected to the plans approved by Marine Safety Center letters Serial No. C1-1101625 dated May 27, 2011, and extended by C1-1303376 dated October 31, 2013 and found acceptable for collection of bulk liquid cargo vapors annotated with "Yes" in the CAA's VCS column.

Our Project Number for these vessels is **P018455**. Please ensure that future correspondence includes the Project Number and Official Number (ON) that appears in the subject line.

(continued…)

16710/P018455
Serial: C1-1303376
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Subj: Southwest Shipyard Hull No. 9702 through 9711
New Construction: General Arrangement, Plan Approval Extension, and Plan Review Information Sheet (PRIS)

If you have any questions concerning our review, please contact LT Dan Brahan at the number listed above.

Sincerely,

M. J. SEXTON
Lieutenant, U. S. Coast Guard
Assistant Chief, Tank Vessel and Offshore Division
By direction

Encl: (1) Plan Approval Extension Form, dated October 28, 2013
(2) PRIS for Southwest Shipyard Hull No. 1370 through 1379, dated October 31, 2013
(3) VCS PRIS, CBC 1370 through 1379, Southwest Shipyard Hull Nos. 9702 through 9711, dated October 31, 2013
(4) 46 CFR Part 151 Cargo List, CBC 1370 through 1379, Southwest Shipyard Hull Nos. 9702 through 9711, dated October 31, 2013
(5) VCS List of Cargoes, CBC 1370 through 1379, Southwest Shipyard Hull Nos. 9702 through 9711, dated October 31, 2013

Copy: Commander, Coast Guard Sector Houston-Galveston (spi)

# Plan Review Information Sheet (PRIS) for Unmanned Inland Tank Barge

| 1. Vessel Identification | Hull Type | Service | ABS classed? |
|---|---|---|---|
| CBC 1370, O.N. 1249103, Southwest Shipyard Hull No. 9702 | I/II/III | O/D | No |
| CBC 1371, O.N. 1249104, Southwest Shipyard Hull No. 9703 | I/II/III | O/D | No |
| CBC 1372, O.N. 1249105, Southwest Shipyard Hull No. 9704 | I/II/III | O/D | No |
| CBC 1373, O.N. 1249106, Southwest Shipyard Hull No. 9705 | I/II/III | O/D | No |
| CBC 1374, O.N. 1249107, Southwest Shipyard Hull No. 9706 | I/II/III | O/D | No |
| CBC 1375, O.N. 1249108, Southwest Shipyard Hull No. 9707 | I/II/III | O/D | No |
| CBC 1376, O.N. 1249109, Southwest Shipyard Hull No. 9708 | I/II/III | O/D | No |
| CBC 1377, O.N. 1249110, Southwest Shipyard Hull No. 9709 | I/II/III | O/D | No |
| CBC 1378, O.N. 1249111, Southwest Shipyard Hull No. 9710 | I/II/III | O/D | No |
| CBC 1379, O.N. 1249112, Southwest Shipyard Hull No. 9711 | I/II/III | O/D | No |

## 2. Route Permitted - Routes and Conditions

| | |
|---|---|
| R | Rivers |
| LBS | Lakes, Bays, and Sounds |
| LC 0-12 | Limited Coastwise (0-12 miles offshore b/t St. Marks, FL and Carrabelle, FL) |

## 3. Cargo Authority - "Authorization" Tab in "Cargo" Window

Authorization:

| | | | | | | |
|---|---|---|---|---|---|---|
| 46 CFR Sub. D Authority: | Highst Grade | A | Capacity (bbls) | 11,300 | | |
| 46 CFR Sub. O Authority: | Part 151 | Yes | Part 153 | No | Part 154 | No |
| 33 CFR Sub. O Authority: | Part 151.47 | No | Part 151.49a | No | Part 151.49b | No |

## 4. "Conditions of Carriage" Tab in "Cargo" Window

a. The following statement should appear at the beginning of the COI's "Conditions of Carriage" section:

Only those cargoes named in the vessel's Cargo Authority Attachment may be carried, and then only in the tanks indicated. When the vessel is carrying cargoes containing greater than 0.5% benzene, the person in charge is responsible for ensuring the provisions of 46 US Code of Federal Regulations Part 197, Subpart C are applied.

Per 46 CFR 150.130, the Person In Charge of the vessel is responsible for ensuring that the compatibility requirements of 46 CFR 150 are met. Cargoes must be checked for compatibility using the figures, tables, and appendices of 46 CFR 150 in conjunction with the reactive group numbers from the "Compat Group No" column listed in the vessel's Cargo Authority Attachment.

b. The maximum design density of cargo which may be filled to the tank top is 8.74 lbs/gal. Cargoes with higher densities, up to 14.07 lbs/gal, may be carried as slack loads, but shall not exceed the tank weight limits as listed below.

**Note:** Per 46 CFR 151.10-15(c)(2) the max. tank weights listed below reflect uniform (within 5%) loading at the deepest draft allowed. When carrying Subchapter O cargoes at shallower drafts, the barge(s) should always be loaded uniformly.

## 5. Loading Constraints

**Loading Constraints - Structural**

| Tank | Max Cargo Wgt/Each Tank (ST) | Max Density (lbs/gal) |
|---|---|---|
| 1 C | 585 | 14.07 |
| 2 C | 680 | 14.07 |
| 3 C | 608 | 14.07 |

**Loading Constraints - Stability**

| Hull Type | Route | Max. Load (ST) | Max Draft (ft, in) | Max Density (lbs/gal) |
|---|---|---|---|---|
| I | R, LBS | 1460.00 | 9'-0" | 14.07 |
| II | R, LBS | 1567.00 | 9'-6" | 10.66 |
| III | R, LBS | 1621.00 | 9'-6" | 8.33 |
| III | R, LBS | 1513.00 | 9'-3" | 11.58 |
| III | R | 1675.00 | 10'-0" | 14.07 |
| III | R | 1784.00 | 10'-6" | 11.58 |

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

| | | | |
|---|---|---|---|
| **Vessel Name** | CBC 1370 through CBC 1379 | **Shipyard** | Southwest Shipyard |
| **Official Number** | Various | **Hull Number** | 9702 Through 9711 |

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.

**Raised Trunk** [X]

**2. Tank Maximum Design Working Pressure** 3.50 psig **Flush Deck**

**3. Authorized Maximum Cargo Transfer Rate(s)** 3500 **bbl/hr loading (max 2 tanks simultaneously)**

800 **bbl/hr discharging**

**4. Authorized Maximum Cargo Density** 0.346 $lbm/ft^3$

**5. Authorized VCS Categories** 1 through 7

**6. Cargoes with the highest vapor density and/or pressure drop:**

a. Cargo Name **Iso-Pentane (PTY)**

b. Cargo Name **Iso-Pentane (PTY)**

**7. Pressure Vacuum Valve:**

| | |
|---|---|
| **Manufacturer** | **BERGAN KLPH** |
| **Size** | **6"** |
| **CG Approval** | **162.017/0000144/3** |

**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** | 11504 | **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 GUARD | | |
| b. Overfill Control Shutdown | [X] | Type | BERGAN GUARD | | |
| c. Spill Valve | [ ] | Type | N/A | Meets ASTM F1271 | **Setting in psig** 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 letters Serial No. C1-1101625 dated May 27, 2011, and extended by MSC Letter Serial No. C1-1303376, dated October 31, 2013 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.
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: C1-1101625, dated May 27,2011

| | | | |
|---|---|---|---|
| Letter | C1-1303376, dated October 31, 2013 | MSC Plan Reviewer | LT R. C. BECKMANN |

# VAPOR COLLECTION SYSTEM CALCULATIONS

## FOR

## BARGE NAME(s): "CBC 1335" thru "CBC 1359"

## SOUTHWEST SHIPYARD HULL(s): 9628 thru 9652

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

## CANAL BARGE COMPANY, INC.

**May 17, 2011**

**Prepared by:**

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

# MARINE SOLUTIONS, INC.

Rev. 0 dated May 16, 2011

**VCS SYSTEM INFORMATION:**

**1. GENERAL DESCRIPTION OF VESSEL:**

| | |
|---|---|
| A. NAME (S): | CBC 1335 THRU CBC 1359 |
| B. USCG PROJECT NUMBER: | P016344 |
| 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 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- 1'-7 1/4" B-3'-5 7/8" C-53'-2 23/64" D-42'-3 43/64", E-48'-9 15/16" F- 4'-1 1/4" G-1'-6 1/8" H-8'-0 3/4"

C. P/V VALVE VENTING CAPACITY:

(1) 6" BERGAN KLPH, SET @ 1.0 PSI
(2) MAX. CAPACITY: 21666 BBL/HR OF AIR
(3) 0.5 PSIG VAC.

D. SPILL VALVE RELIEVING CAPACITY: NON INSTALLED

E. MAX. VAPOR-AIR MIXTURE DENSITY: 0.335 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 3 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 | 155.51 | 155.51 |
| Entrance | 1 | 37.05 | 37.05 |
| T Branch | 5 | 39.91 | 199.55 |
| 8"X6"RED | 1 | 39.88 | 39.88 |
| T Run Thru | 6 | 13.3 | 79.8 |
| | | Total | 511.79 |

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 #3 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 1.0 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 (1.228 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 0.512 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 0.512 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 | 163.73 | 163.73 |
| Entrance | 1 | 37.05 | 37.05 |
| T Branch | 4 | 39.91 | 159.64 |
| T Run | 7 | 13.33 | 93.31 |
| 8" Gate Valve | 1 | 5.32 | 5.32 |
| | | Total | 459.05 |

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 (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 (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) | PRESSURI DROP TO SHORE CONNECT IN VCS (ps (UNLOADI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ACT | Acetone | 1 | 0.79 | 10 | 2 | 0.121 | 1.2000 | 0.050 | 4200 | 5372 | 0.045 | 0.003 | 0.002 |
| 2 | ACP | Acetophenone | 1 | 1.03 | 0.6 | 4.14 | 0.082 | 1.0120 | 0.024 | 3542 | 3747 | 0.022 | 0.001 | 0.001 |
| 19 | AAT | Amyl Acetate (iso-) | 1 | 0.88 | 0.33 | 4.48 | 0.079 | 1.0066 | 0.023 | 3523 | 3649 | 0.021 | 0.001 | 0.001 |
| 20 | AAI | Amyl Alcohol (iso-, n-, sec-, primary) (See also IAA) | 1 | 0.82 | 0.3 | 3.04 | 0.077 | 1.0060 | 0.022 | 3521 | 3588 | 0.020 | 0.001 | 0.001 |
| 21 | AAN | Amyl Alcohol (n-) | 1 | 0.82 | 0.3 | 3.04 | 0.077 | 1.0060 | 0.022 | 3521 | 3588 | 0.020 | 0.001 | 0.001 |
| 23 | APM | Amyl Alcohol, Primary | 1 | 0.82 | 0.3 | 3.04 | 0.077 | 1.0060 | 0.022 | 3521 | 3588 | 0.020 | 0.001 | 0.001 |
| 24 | ASE | Amyl Alcohol, (sec-) | 1 | 0.82 | 0.3 | 3.04 | 0.077 | 1.0060 | 0.022 | 3521 | 3588 | 0.020 | 0.001 | 0.001 |
| 26 | IAA | Amyl Alcohol, (iso-) | 1 | 0.82 | 0.3 | 3.04 | 0.077 | 1.0060 | 0.022 | 3521 | 3588 | 0.020 | 0.001 | 0.001 |
| 34 | BAL | Benzyl Alcohol | 1 | 1.05 | 0.1 | 3.73 | 0.075 | 1.0020 | 0.022 | 3507 | 3536 | 0.019 | 0.001 | 0.001 |
| 40 | BAX | Butyl Acetate (iso-, n-) | 1 | 0.87 | 0.6 | 4 | 0.082 | 1.0120 | 0.024 | 3542 | 3738 | 0.022 | 0.001 | 0.001 |
| 42 | BTA | Butyl Acetate (sec-) | 1 | 0.89 | 1.5 | 4 | 0.095 | 1.0300 | 0.029 | 3605 | 4088 | 0.026 | 0.002 | 0.001 |
| 44 | IAL | Butyl Alcohol (iso-) | 1 | 0.81 | 0.9 | 2.6 | 0.080 | 1.0160 | 0.024 | 3563 | 3722 | 0.021 | 0.001 | 0.001 |
| 46 | BAS | Butyl Alcohol (sec-) | 1 | 0.81 | 1.3 | 2.6 | 0.083 | 1.0260 | 0.025 | 3591 | 3820 | 0.023 | 0.001 | 0.001 |
| 47 | BAT | Butyl Alcohol (tert-) | 1 | 0.78 | 2.8 | 2.6 | 0.095 | 1.0560 | 0.030 | 3696 | 4189 | 0.027 | 0.002 | 0.001 |
| 48 | BPH | Butyl Benzyl Phthalate | 1 | 1.12 | 0.01 | 10.8 | 0.074 | 1.0002 | 0.021 | 3501 | 3511 | 0.019 | 0.001 | 0.001 |
| 64 | CLS | Caprolactam Solutions | 1 | 1.02 | 0.05 | 3.9 | 0.074 | 1.0010 | 0.021 | 3504 | 3519 | 0.019 | 0.001 | 0.001 |
| 70 | CUM | Cumene | 1 | 0.86 | 0.60 | 4.20 | 0.083 | 1.0120 | 0.024 | 3542 | 3751 | 0.022 | 0.001 | 0.001 |
| 72 | CHX | Cyclohexane | 1 | 0.78 | 4.5 | 2.9 | 0.114 | 1.0900 | 0.039 | 3815 | 4740 | 0.035 | 0.002 | 0.002 |
| 73 | CHN | Cyclohexanol | 1 | 0.95 | 0.15 | 3.45 | 0.075 | 1.0030 | 0.022 | 3511 | 3550 | 0.020 | 0.001 | 0.001 |
| 74 | CPD | 1,3-Cyclopentadiene dimer (molten) | 1 | 0.89 | 0.25 | 4.55 | 0.078 | 1.0050 | 0.023 | 3518 | 3615 | 0.020 | 0.001 | 0.001 |
| 76 | CMP | Cymene (para-) | 1 | 0.86 | 0.11 | 4.62 | 0.076 | 1.0022 | 0.022 | 3508 | 3551 | 0.020 | 0.001 | 0.001 |
| 77 | DHN | Decahydronaphthalene | 1 | 0.89 | 0.1 | 4.76 | 0.075 | 1.0020 | 0.022 | 3507 | 3548 | 0.019 | 0.001 | 0.001 |
| 78 | IDA | Decaldehyde (iso-) | 1 | 0.83 | 0.01 | 5 | 0.074 | 1.0002 | 0.021 | 3501 | 3504 | 0.019 | 0.001 | 0.001 |
| 79 | DAL | Decaldehyde (n-) | 1 | 0.83 | 0 | 5.01 | 0.074 | 1.0000 | 0.021 | 3500 | 3499 | 0.019 | 0.001 | 0.001 |
| 81 | DCE | Decane | 1 | 0.74 | 0.12 | 4.8 | 0.076 | 1.0024 | 0.022 | 3508 | 3558 | 0.020 | 0.001 | 0.001 |
| 82 | DAX | Decyl Alcohol (all isomers) (Decanol) | 1 | 0.83 | 0.01 | 5.3 | 0.074 | 1.0002 | 0.021 | 3501 | 3505 | 0.019 | 0.001 | 0.001 |
| 83 | ISA | Decyl Alcohol (iso-) | 1 | 0.83 | 0.01 | 5.3 | 0.074 | 1.0002 | 0.021 | 3501 | 3505 | 0.019 | 0.001 | 0.001 |
| 84 | DAN | Decyl Alcohol (n-) | 1 | 0.83 | 0.01 | 5.3 | 0.074 | 1.0002 | 0.021 | 3501 | 3505 | 0.019 | 0.001 | 0.001 |
| 85 | DBZ | Decylbenzene (n-) | 1 | 0.86 | 0.01 | 7.52 | 0.074 | 1.0002 | 0.021 | 3501 | 3507 | 0.019 | 0.001 | 0.001 |
| 87 | DAA | Diacetone Alcohol | 1 | 0.97 | 0.1 | 4 | 0.075 | 1.0020 | 0.022 | 3507 | 3539 | 0.019 | 0.001 | 0.001 |
| 91 | DPA | Dibutyl Phthalate (ortho-) | 1 | 1.05 | 0 | 9.59 | 0.074 | 1.0000 | 0.021 | 3500 | 3499 | 0.019 | 0.001 | 0.001 |
| 92 | DPT | Dicyclopentadiene, See 1,3-Cyclopentadiene Dimer | 2 | 0.98 | 0.25 | 4.55 | 0.078 | 1.0050 | 0.023 | 3518 | 3615 | 0.020 | 0.001 | 0.001 |
| 93 | DEB | Diethybenzene | 1 | 0.87 | 0.08 | 4.62 | 0.075 | 1.0016 | 0.022 | 3506 | 3537 | 0.019 | 0.001 | 0.001 |
| 94 | DEG | Diethylene Glycol | 1 | 1.12 | 0.01 | 3.66 | 0.074 | 1.0002 | 0.021 | 3501 | 3503 | 0.019 | 0.001 | 0.001 |
| 95 | DME | Diethylene Glycol Butyl Ether | 1 | 0.95 | 0.01 | 5.5 | 0.074 | 1.0002 | 0.021 | 3501 | 3505 | 0.019 | 0.001 | 0.001 |
| 100 | DGA | Diethylene Glycol Ethyl Ether Acetate | 1 | 0.99 | 0.02 | 4.62 | 0.074 | 1.0004 | 0.021 | 3501 | 3508 | 0.019 | 0.001 | 0.001 |
| 101 | DGM | Diethylene Glycol Methyl Ether | 1 | 1.03 | 0.03 | 4.14 | 0.074 | 1.0006 | 0.021 | 3502 | 3512 | 0.019 | 0.001 | 0.001 |
| 111 | DBC | Diisobutylcarbinol | 1 | 0.81 | 0.09 | 4.97 | 0.075 | 1.0018 | 0.022 | 3506 | 3545 | 0.019 | 0.001 | 0.001 |
| 112 | DBL | Diisobutylene | 1 | 0.72 | 2 | 3.86 | 0.100 | 1.0400 | 0.031 | 3640 | 4251 | 0.028 | 0.002 | 0.001 |
| 113 | DIX | Diisobutyl Ketone | 1 | 0.81 | 0.16 | 4.9 | 0.077 | 1.0032 | 0.022 | 3511 | 3579 | 0.020 | 0.001 | 0.001 |
| 119 | DIX | Diisopropylbenzene (all isomer) | 1 | 0.86 | 0.03 | 5.6 | 0.074 | 1.0006 | 0.021 | 3502 | 3516 | 0.019 | 0.001 | 0.001 |
| 124 | DTL | Dimethyl Phthalate | 1 | 1.19 | 0 | 6.69 | 0.074 | 1.0000 | 0.021 | 3500 | 3499 | 0.019 | 0.001 | 0.001 |
| 130 | DOP | Dioctyl Phthalate | 1 | 0.98 | 0 | 13.47 | 0.074 | 1.0000 | 0.021 | 3500 | 3499 | 0.019 | 0.001 | 0.001 |
| 131 | DPN | Dipentene | 1 | 0.84 | 0.1 | 4.9 | 0.075 | 1.0020 | 0.022 | 3507 | 3549 | 0.019 | 0.001 | 0.001 |
| 132 | DIL | Diphenyl | 1 | 0.99 | 0.01 | 5.31 | 0.074 | 1.0002 | 0.021 | 3501 | 3505 | 0.019 | 0.001 | 0.001 |
| 133 | DDO | Diphenyl, Diphenyl Ether Mixture | 1 | 1.07 | 0.01 | 5.86 | 0.074 | 1.0002 | 0.021 | 3501 | 3505 | 0.019 | 0.001 | 0.001 |
| 134 | DPE | Diphenyl Ether | 1 | 1.07 | 0.01 | 5.87 | 0.074 | 1.0002 | 0.021 | 3501 | 3505 | 0.019 | 0.001 | 0.001 |
| 136 | DPG | Dipropylene Glycol | 1 | 1.03 | 0.07 | 4.63 | 0.075 | 1.0014 | 0.022 | 3505 | 3532 | 0.019 | 0.001 | 0.001 |
| 139 | DFF | Distillates: Flashed Feed Stocks | 1 | 0.75 | 2.3 | 3.4 | 0.100 | 1.0460 | 0.031 | 3661 | 4255 | 0.028 | 0.002 | 0.001 |
| 140 | DSR | Distillates: Straight Run | 1 | 0.73 | 2.3 | 3.4 | 0.100 | 1.0460 | 0.031 | 3661 | 4255 | 0.028 | 0.002 | 0.001 |
| 145 | DOZ | Dodecene (all isomers) | 1 | 0.76 | 0.02 | 5.81 | 0.074 | 1.0004 | 0.021 | 3501 | 3511 | 0.019 | 0.001 | 0.001 |
| 146 | DOD | Dodecene | 1 | 0.76 | 0.02 | 5.81 | 0.074 | 1.0004 | 0.021 | 3501 | 3511 | 0.019 | 0.001 | 0.001 |
| 147 | DDB | Dodecylbenzene | | 0.86 | 4.7 | 8.4 | 0.237 | 1.0940 | 0.081 | 3829 | 6864 | 0.073 | 0.004 | 0.004 |
| 155 | ETG | Ethoxy Triglycol (crude) | 1 | 1.02 | 0 | 6.14 | 0.074 | 1.0000 | 0.021 | 3500 | 3499 | 0.019 | 0.001 | 0.001 |
| 156 | ETA | Ethyl Acetate | 1 | 0.9 | 4.5 | 3.04 | 0.117 | 1.0900 | 0.040 | 3815 | 4801 | 0.036 | 0.002 | 0.002 |
| 157 | EAA | Ethyl Acetoacetate | 1 | 1.03 | 0.2 | 4.48 | 0.077 | 1.0040 | 0.022 | 3514 | 3590 | 0.020 | 0.001 | 0.001 |
| 158 | EAL | Ethyl Alcohol (Ethanol) | 1 | 0.79 | 3.5 | 1.6 | 0.083 | 1.0700 | 0.027 | 3745 | 3986 | 0.025 | 0.001 | 0.001 |
| 160 | ETB | Ethyl Benzene | 1 | 0.87 | 0.8 | 3.56 | 0.081 | 1.0120 | 0.024 | 3542 | 3710 | 0.021 | 0.001 | 0.001 |
| 161 | EBT | Ethyl Butanol | 1 | 0.83 | 0.12 | 3.52 | 0.075 | 1.0024 | 0.022 | 3508 | 3541 | 0.019 | 0.001 | 0.001 |
| 162 | EBR | Ethyl Butyrate | 1 | 0.88 | 1 | 4 | 0.088 | 1.0200 | 0.026 | 3570 | 3895 | 0.023 | 0.001 | 0.001 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 163 | ECY | Ethyl Cyclohexane | 1 | 0.79 | 0.5 | 3.87 | 0.080 | 1.0100 | 0.024 | 3535 | 3692 | 0.021 | 0.001 | 0.001 |
| 166 | EGL | Ethylene Glycol | 1 | 1.19 | 0.01 | 2.21 | 0.074 | 1.0002 | 0.021 | 3501 | 3501 | 0.019 | 0.001 | 0.001 |
| 169 | EMA | Ethylene Glycol Butyl Ether Acetate | 1 | 0.94 | 0.05 | 5.52 | 0.075 | 1.0010 | 0.021 | 3504 | 3528 | 0.019 | 0.001 | 0.001 |
| 172 | EGY | Ethylene Glycol Diacetate | 1 | 1.1 | 0.01 | 5.03 | 0.074 | 1.0002 | 0.021 | 3501 | 3504 | 0.019 | 0.001 | 0.001 |
| 178 | EME | Ethylene Glycol Methyl Ether | 1 | 1.1 | 0.01 | 4.8 | 0.074 | 1.0002 | 0.021 | 3501 | 3504 | 0.019 | 0.001 | 0.001 |
| 180 | EPE | Ethylene Glycol Phenyl Ether | 1 | 1.1 | 0.01 | 4.8 | 0.074 | 1.0002 | 0.021 | 3501 | 3504 | 0.019 | 0.001 | 0.001 |
| 184 | EHA | 2-Ethylhexaldehyde, See Octyl Aldehydes | 1 | 0.82 | 0.17 | 4.41 | 0.076 | 1.0034 | 0.022 | 3512 | 3575 | 0.020 | 0.001 | 0.001 |
| 186 | EHX | 2-Ethylhexanol , see Octanol (all isomers) | 1 | 0.84 | 0.02 | 4.5 | 0.074 | 1.0004 | 0.021 | 3501 | 3508 | 0.019 | 0.001 | 0.001 |
| 190 | EPR | Ethyl Propionate | 1 | 0.89 | 3.5 | 1.6 | 0.083 | 1.0700 | 0.027 | 3745 | 3986 | 0.025 | 0.001 | 0.001 |
| 191 | ETE | Ethyl Toulene | 1 | 0.88 | 0.28 | 4.15 | 0.078 | 1.0056 | 0.023 | 3520 | 3616 | 0.020 | 0.001 | 0.001 |
| 194 | FAM | Formamide | 1 | 1.13 | 0.1 | 1.55 | 0.074 | 1.0020 | 0.021 | 3507 | 3512 | 0.019 | 0.001 | 0.001 |
| 195 | FAL | Furfuryl Alcohol | 1 | 1.13 | 0.05 | 3.4 | 0.074 | 1.0010 | 0.021 | 3504 | 3516 | 0.019 | 0.001 | 0.001 |
| 197 | GAK | Gasoline Blended Stocks: Alkylates | 1 | 0.75 | 12.5 | 3.4 | 0.214 | 1.2500 | 0.096 | 4375 | 7462 | 0.086 | 0.005 | 0.005 |
| 198 | GRF | Gasoline Blended Stocks: Reformate | 1 | 0.8 | 12.5 | 3.4 | 0.214 | 1.2500 | 0.096 | 4375 | 7462 | 0.086 | 0.005 | 0.005 |
| 199 | GAT | Gasolines: Automotive (containing not over 4.23 gra | 1 | 0.74 | 12.5 | 3.4 | 0.214 | 1.2500 | 0.096 | 4375 | 7462 | 0.086 | 0.005 | 0.005 |
| 200 | GAV | Gasolines: Aviation (containing not over 4.86 grams | 1 | 0.71 | 12.5 | 3.4 | 0.214 | 1.2500 | 0.096 | 4375 | 7462 | 0.086 | 0.005 | 0.005 |
| 201 | GCS | Gasolines: Casinghead | 1 | 0.67 | 12.5 | 3.4 | 0.214 | 1.2500 | 0.096 | 4375 | 7462 | 0.086 | 0.005 | 0.005 |
| 202 | GPL | Gasolines: Polymer | 1 | 0.75 | 12.5 | 3.4 | 0.214 | 1.2500 | 0.096 | 4375 | 7462 | 0.086 | 0.005 | 0.005 |
| 203 | GSR | Gasolines: Straight Run | 1 | 0.75 | 12.5 | 3.4 | 0.214 | 1.2500 | 0.096 | 4375 | 7462 | 0.086 | 0.005 | 0.005 |
| 204 | GCR | Glycerine | 1 | 1.26 | 0 | 3.17 | 0.074 | 1.0000 | 0.021 | 3500 | 3499 | 0.019 | 0.001 | 0.001 |
| 217 | HMX | Heptane (all isomers) (Methylhexane) | 1 | 0.68 | 2.5 | 3.45 | 0.102 | 1.0500 | 0.032 | 3675 | 4332 | 0.029 | 0.002 | 0.002 |
| 218 | HPT | Heptane (n-) | 1 | 0.68 | 2.5 | 3.45 | 0.102 | 1.0500 | 0.032 | 3675 | 4332 | 0.029 | 0.002 | 0.002 |
| 220 | HTX | Heptanol (all isomers) | 1 | 0.82 | 0.04 | 4 | 0.074 | 1.0008 | 0.021 | 3503 | 3515 | 0.019 | 0.001 | 0.001 |
| 221 | HTN | Heptanol (all isomers) | 1 | 0.82 | 0.04 | 4 | 0.074 | 1.0008 | 0.021 | 3503 | 3515 | 0.019 | 0.001 | 0.001 |
| 222 | HPX | Heptene (all isomers) | 2 | 0.7 | 2.9 | 3.4 | 0.106 | 1.0580 | 0.034 | 3703 | 4447 | 0.031 | 0.002 | 0.002 |
| 223 | THE | Heptene (1-) | 1 | 0.7 | 2.8 | 3.4 | 0.105 | 1.0560 | 0.034 | 3696 | 4415 | 0.030 | 0.002 | 0.002 |
| 229 | HXS | Hexane (all isomers) | 1 | 0.66 | 7 | 3 | 0.139 | 1.1400 | 0.052 | 3990 | 5486 | 0.047 | 0.003 | 0.002 |
| 230 | HXA | Hexane | 1 | 0.66 | 7 | 3 | 0.139 | 1.1400 | 0.052 | 3990 | 5486 | 0.047 | 0.003 | 0.002 |
| 231 | HXO | Hexaonic Acid | 1 | 0.93 | 0.01 | 4 | 0.074 | 1.0002 | 0.021 | 3501 | 3503 | 0.019 | 0.001 | 0.001 |
| 232 | HXN | Hexanol | 1 | 0.82 | 1 | 3.52 | 0.085 | 1.0200 | 0.025 | 3570 | 3845 | 0.023 | 0.001 | 0.001 |
| 234 | HEX | Hexene (all isomers) | 2 | 0.67 | 8 | 2.9 | 0.145 | 1.1600 | 0.056 | 4060 | 5694 | 0.050 | 0.003 | 0.003 |
| 235 | HXE | Hexene (1-) | 1 | 0.67 | 8.2 | 2.9 | 0.147 | 1.1640 | 0.057 | 4074 | 5749 | 0.051 | 0.003 | 0.003 |
| 236 | HXT | Hexene (2-) | 1 | 0.67 | 8.2 | 2.9 | 0.147 | 1.1640 | 0.057 | 4074 | 5749 | 0.051 | 0.003 | 0.003 |
| 238 | HXG | Hexylene Glycol | 4 | 0.92 | 0.01 | 1.1 | 0.074 | 1.0002 | 0.021 | 3501 | 3500 | 0.019 | 0.001 | 0.001 |
| 243 | IPH | Isophorone | 1 | 0.93 | 0.01 | 4.75 | 0.074 | 1.0002 | 0.021 | 3501 | 3504 | 0.019 | 0.001 | 0.001 |
| 244 | JPO | Jet Fuels: JP-1 (Kerosene) | 1 | 0.8 | 0.14 | 4.5 | 0.076 | 1.0028 | 0.022 | 3510 | 3563 | 0.020 | 0.001 | 0.001 |
| 245 | JPT | Jet Fuels: JP-3 | 1 | 0.8 | 8.51 | 4.5 | 0.213 | 1.1702 | 0.084 | 4096 | 6969 | 0.075 | 0.004 | 0.004 |
| 246 | JPF | Jet Fuels: JP-4 | 1 | 0.81 | 3.4 | 4 | 0.121 | 1.0680 | 0.040 | 3738 | 4800 | 0.036 | 0.002 | 0.002 |
| 247 | JPV | Jet Fuels: JP-5 (Kerosene, heavy) | 1 | 0.82 | 0.1 | 4 | 0.075 | 1.0020 | 0.022 | 3507 | 3539 | 0.019 | 0.001 | 0.001 |
| 249 | KRS | Kerosene | 1 | 0.81 | 0.15 | 4.5 | 0.076 | 1.0030 | 0.022 | 3511 | 3568 | 0.020 | 0.001 | 0.001 |
| 263 | MTT | Methyl Acetate | 1 | 0.92 | 6.1 | 2.6 | 0.119 | 1.1220 | 0.043 | 3927 | 4999 | 0.039 | 0.002 | 0.002 |
| 265 | MAL | Methyl Alcohol (See Methanol) | 1 | 0.79 | 6.63 | 1.1 | 0.077 | 1.1326 | 0.028 | 3964 | 4046 | 0.025 | 0.001 | 0.001 |
| 266 | MAC | Methyl Amyl Acetate | 1 | 0.86 | 0.33 | 4.97 | 0.080 | 1.0066 | 0.023 | 3523 | 3666 | 0.021 | 0.001 | 0.001 |
| 267 | MAA | Methyl Amyl Alcohol | 1 | 0.81 | 0.43 | 3.52 | 0.079 | 1.0086 | 0.023 | 3530 | 3649 | 0.021 | 0.001 | 0.001 |
| 271 | MBK | Methyl n-Butyl Ketone | 1 | 0.81 | 0.97 | 3.5 | 0.085 | 1.0194 | 0.025 | 3568 | 3832 | 0.023 | 0.001 | 0.001 |
| 273 | MBU | Methyl Butyrate | 1 | 0.9 | 1.26 | 3.53 | 0.089 | 1.0252 | 0.027 | 3588 | 3935 | 0.024 | 0.001 | 0.001 |
| 274 | MEK | Methyl Ethyl Ketone | 1 | 0.8 | 4.5 | 2.5 | 0.105 | 1.0900 | 0.036 | 3815 | 4561 | 0.032 | 0.002 | 0.002 |
| 275 | MTF | Methyl Formal (Dimethyl Formal) | 1 | 0.86 | 15.42 | 2.6 | 0.189 | 1.3084 | 0.093 | 4579 | 7341 | 0.083 | 0.005 | 0.004 |
| 276 | MHK | Methyl Heptyl Ketone | 1 | 0.83 | 0.06 | 4.9 | 0.075 | 1.0012 | 0.021 | 3504 | 3529 | 0.019 | 0.001 | 0.001 |
| 278 | MIK | Methyl Isobutyl Ketone | 1 | 0.8 | 1.15 | 3.45 | 0.087 | 1.0230 | 0.026 | 3581 | 3887 | 0.023 | 0.001 | 0.001 |
| 281 | MNA | 1-Methyl Napthalene | 1 | 1.02 | 0.01 | 4.91 | 0.074 | 1.0002 | 0.021 | 3501 | 3504 | 0.019 | 0.001 | 0.001 |
| 283 | MPN | 2-Methyl-1-Pentene | 1 | 0.69 | 6.3 | 2.9 | 0.130 | 1.1260 | 0.047 | 3941 | 5230 | 0.042 | 0.002 | 0.002 |
| 284 | MTN | 5-Methyl-1-Pentene | 1 | 0.67 | 8.49 | 2.9 | 0.149 | 1.1698 | 0.059 | 4094 | 5828 | 0.053 | 0.003 | 0.003 |
| 286 | MBE | Methyl Tert-Butyl Ether (MTBE) | 1 | 0.74 | 0.04 | 3.1 | 0.074 | 1.0008 | 0.021 | 3503 | 3511 | 0.019 | 0.001 | 0.001 |
| 288 | MNS | Mineral Spirits | 1 | 0.75 | 0.2 | 4.3 | 0.077 | 1.0040 | 0.022 | 3514 | 3586 | 0.020 | 0.001 | 0.001 |
| 289 | MRE | Myrcene | 1 | 0.8 | 0.17 | 4.7 | 0.077 | 1.0034 | 0.022 | 3512 | 3581 | 0.020 | 0.001 | 0.001 |
| 295 | NSV | Naphtha: Solvent | 1 | 0.87 | 0.2 | 3.5 | 0.076 | 1.0040 | 0.022 | 3514 | 3569 | 0.020 | 0.001 | 0.001 |
| 296 | NSS | Naphtha: Stoddard Solvant | 1 | 0.78 | 0.2 | 4.3 | 0.077 | 1.0040 | 0.022 | 3514 | 3586 | 0.020 | 0.001 | 0.001 |
| 297 | NVM | Naphtha: Varnish Maker's and Painters (75%) | 1 | 0.77 | 0.19 | 4.3 | 0.077 | 1.0038 | 0.022 | 3513 | 3582 | 0.020 | 0.001 | 0.001 |
| 300 | NAX | Nonane (all isomers) | 1 | 0.72 | 0.27 | 4.4 | 0.078 | 1.0054 | 0.023 | 3519 | 3619 | 0.020 | 0.001 | 0.001 |
| 301 | NAN | Nonane | 1 | 0.72 | 0.27 | 4.4 | 0.078 | 1.0054 | 0.023 | 3519 | 3619 | 0.020 | 0.001 | 0.001 |
| 304 | NON | Nonene | 1 | 0.73 | 0.35 | 4.3 | 0.079 | 1.0070 | 0.023 | 3525 | 3651 | 0.021 | 0.001 | 0.001 |
| 305 | NNS | Nonyl Alcohol (all isomers) | 1 | 0.94 | 0.1 | 5 | 0.076 | 1.0020 | 0.022 | 3507 | 3550 | 0.020 | 0.001 | 0.001 |
| 306 | NNN | Nonyl Alcohol | 1 | 0.94 | 0.1 | 5 | 0.076 | 1.0020 | 0.022 | 3507 | 3550 | 0.020 | 0.001 | 0.001 |
| 307 | NNI | Nonyl Alcohol (iso-) | 1 | 0.94 | 0.1 | 5 | 0.076 | 1.0020 | 0.022 | 3507 | 3550 | 0.020 | 0.001 | 0.001 |
| 309 | NNP | Nonyl Phenol | 1 | 0.95 | 0.01 | 7.8 | 0.074 | 1.0002 | 0.021 | 3501 | 3507 | 0.019 | 0.001 | 0.001 |
| 316 | OAX | Octane (all isomers) | 1 | 0.7 | 0.79 | 3.9 | 0.084 | 1.0158 | 0.025 | 3555 | 3805 | 0.022 | 0.001 | 0.001 |

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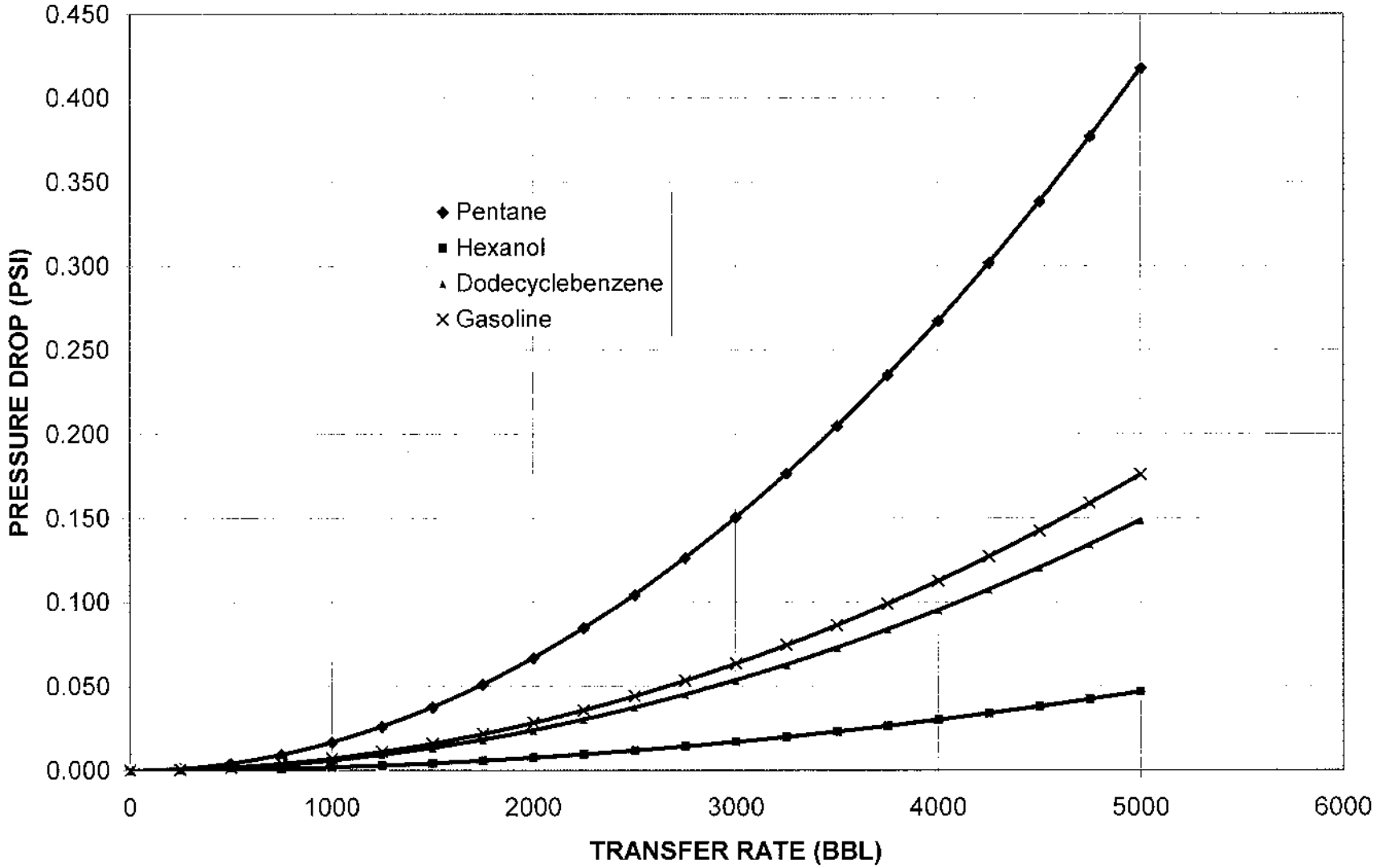
| 317 | OAN | Octane | 1 | 0.7 | 0.79 | 3.9 | 0.084 | 1.0158 | 0.025 | 3555 | 3805 | 0.022 | 0.001 | 0.001 |
| 320 | OTA | Octanol | 1 | 0.83 | 0.01 | 4.48 | 0.074 | 1.0002 | 0.021 | 3501 | 3504 | 0.019 | 0.001 | 0.001 |
| 322 | OTE | Octene (1-) | 1 | 0.72 | 1 | 3.86 | 0.087 | 1.0200 | 0.026 | 3570 | 3880 | 0.023 | 0.001 | 0.001 |
| 324 | OCX | Octyl Alcohol (iso-, n-) ( all isomers), See Octanol ( | 1 | 0.83 | 0.01 | 4.48 | 0.074 | 1.0002 | 0.021 | 3501 | 3504 | 0.019 | 0.001 | 0.001 |
| 325 | IOA | Octyl Alcohol | 1 | 0.83 | 0.01 | 4.48 | 0.074 | 1.0002 | 0.021 | 3501 | 3504 | 0.019 | 0.001 | 0.001 |
| 364 | OTW | Fuel: No. 2 | 1 | 0.88 | 0.56 | 8 | 0.092 | 1.0112 | 0.027 | 3539 | 3955 | 0.024 | 0.001 | 0.001 |
| 366 | OFR | Fuel: No. 4 | 1 | 0.9 | 0.15 | 3.4 | 0.075 | 1.0030 | 0.022 | 3511 | 3550 | 0.019 | 0.001 | 0.001 |
| 367 | OFV | Fuel: No. 5 | 1 | 0.94 | 0.15 | 3.4 | 0.075 | 1.0030 | 0.022 | 3511 | 3550 | 0.019 | 0.001 | 0.001 |
| 368 | OSX | Fuel: No. 6 | 1 | 0.95 | 0.15 | 3.4 | 0.075 | 1.0030 | 0.022 | 3511 | 3550 | 0.019 | 0.001 | 0.001 |
| 382 | OIL | OIL, Misc: Crude | 1 | 0.95 | 0.15 | 3.4 | 0.075 | 1.0030 | 0.022 | 3511 | 3550 | 0.019 | 0.001 | 0.001 |
| 383 | ODS | OIL, Misc: Diesel | 1 | 0.9 | 0.69 | 3.4 | 0.081 | 1.0138 | 0.024 | 3548 | 3730 | 0.022 | 0.001 | 0.001 |
| 389 | OLB | OIL, Misc: Lubricating | 1 | 0.9 | 0.15 | 1 | 0.074 | 1.0030 | 0.021 | 3511 | 3510 | 0.019 | 0.001 | 0.001 |
| 403 | ORS | OIL, Misc: Resin | 1 | 1.02 | 0.15 | 1 | 0.074 | 1.0030 | 0.021 | 3511 | 3510 | 0.019 | 0.001 | 0.001 |
| 418 | OTB | OIL, Misc: Turbine | 1 | 0.87 | 0.3 | 5.4 | 0.080 | 1.0060 | 0.023 | 3521 | 3665 | 0.021 | 0.001 | 0.001 |
| 429 | PDC | Pentadecanol, See Alcohols (C13 and above) | 1 | 0.83 | 0.01 | 7.88 | 0.074 | 1.0002 | 0.021 | 3501 | 3507 | 0.019 | 0.001 | 0.001 |
| 433 | IPT | Pentane (iso-) | 5 | 0.62 | 27 | 2.48 | 0.335 | 1.5400 | 0.228 | 5390 | 11501 | 0.205 | 0.012 | 0.011 |
| 434 | PTA | Pentane (n-) | 5 | 0.63 | 20.44 | 2.5 | 0.256 | 1.4088 | 0.146 | 4931 | 9191 | 0.131 | 0.008 | 0.007 |
| 437 | PTE | Pentene (1-) | 5 | 0.64 | 24.9 | 2.4 | 0.299 | 1.4980 | 0.193 | 5243 | 10568 | 0.173 | 0.010 | 0.009 |
| 442 | PIN | Pinene | 1 | 0.86 | 0.35 | 4.7 | 0.080 | 1.0070 | 0.023 | 3525 | 3666 | 0.021 | 0.001 | 0.001 |
| 448 | PLB | Polybutene | 1 | 0.91 | 0.01 | 79.3 | 0.077 | 1.0002 | 0.022 | 3501 | 3586 | 0.020 | 0.001 | 0.001 |
| 457 | PGC | Polypropylene Glycol | 1 | 1.01 | 0.1 | 1 | 0.074 | 1.0020 | 0.021 | 3507 | 3506 | 0.019 | 0.001 | 0.001 |
| 464 | IAC | Propyl Acetate (iso-) | 1 | 0.89 | 1.8 | 3.52 | 0.095 | 1.0360 | 0.029 | 3626 | 4115 | 0.026 | 0.002 | 0.001 |
| 465 | PAT | Propyl Acetate (n-) | 1 | 0 | 1.85 | 3.52 | 0.095 | 1.0370 | 0.029 | 3630 | 4132 | 0.026 | 0.002 | 0.001 |
| 466 | IPA | Propyl Alcohol (Iso-) | 1 | 0.79 | 3 | 2.07 | 0.089 | 1.0600 | 0.029 | 3710 | 4071 | 0.026 | 0.001 | 0.001 |
| 467 | PAL | Propyl Alcohol (n-) | 1 | 0.8 | 1.2 | 2.07 | 0.080 | 1.0240 | 0.024 | 3584 | 3727 | 0.021 | 0.001 | 0.001 |
| 468 | PBZ | Propylbenzene (n-) | 1 | 0.86 | 0.2 | 4.14 | 0.077 | 1.0040 | 0.022 | 3514 | 3583 | 0.020 | 0.001 | 0.001 |
| 469 | IPX | Iso-Propylcyclohexane | 1 | 0.8 | 0.01 | 4.35 | 0.074 | 1.0002 | 0.021 | 3501 | 3503 | 0.019 | 0.001 | 0.001 |
| 473 | PPG | Propylene Glycol (1,2-Propandiol) | 1 | 1.04 | 0.01 | 2.62 | 0.074 | 1.0002 | 0.021 | 3501 | 3502 | 0.019 | 0.001 | 0.001 |
| 476 | PME | Propylene Glycol Methyl Ether | 1 | 0.92 | 0.7 | 3.11 | 0.081 | 1.0140 | 0.024 | 3549 | 3711 | 0.021 | 0.001 | 0.001 |
| 488 | SFL | Sulfolane | 1 | 1.26 | 0.01 | 4.14 | 0.074 | 1.0002 | 0.021 | 3501 | 3503 | 0.019 | 0.001 | 0.001 |
| 493 | TTN | Tetradecanol | 1 | 0.82 | 0 | 7.39 | 0.074 | 1.0000 | 0.021 | 3500 | 3499 | 0.019 | 0.001 | 0.001 |
| 494 | TTD | 1-Tetradecene, See the olefin or Alpha-Olefin Entrie | 1 | 0.77 | 0.01 | 6.77 | 0.074 | 1.0002 | 0.021 | 3501 | 3506 | 0.019 | 0.001 | 0.001 |
| 496 | TTG | Tetraethylene Glycol | 1 | 1.12 | 0.01 | 6.7 | 0.074 | 1.0002 | 0.021 | 3501 | 3506 | 0.019 | 0.001 | 0.001 |
| 497 | THN | Tetrahydronaphthalene | 1 | 0.97 | 0.04 | 4.56 | 0.074 | 1.0008 | 0.021 | 3503 | 3518 | 0.019 | 0.001 | 0.001 |
| 499 | TOL | Toluene | 1 | 0.87 | 1.5 | 3.14 | 0.089 | 1.0300 | 0.027 | 3605 | 3955 | 0.024 | 0.001 | 0.001 |
| 502 | TCP | Tricresyl Phosphate (less than 1% of the ortho isom | 1 | 1.16 | 0.01 | 12.69 | 0.074 | 1.0002 | 0.021 | 3501 | 3513 | 0.019 | 0.001 | 0.001 |
| 503 | TRD | Tridecane | 1 | 0.76 | 0.02 | 6.4 | 0.074 | 1.0004 | 0.021 | 3501 | 3512 | 0.019 | 0.001 | 0.001 |
| 505 | TDN | Tridecanol , See Alcohols (C13 and above) | 1 | 0.85 | 0.01 | 6.91 | 0.074 | 1.0002 | 0.021 | 3501 | 3506 | 0.019 | 0.001 | 0.001 |
| 506 | TDC | 1-Tridecene | 1 | 0.77 | 0.01 | 6.29 | 0.074 | 1.0002 | 0.021 | 3501 | 3506 | 0.019 | 0.001 | 0.001 |
| 508 | TEB | Triethylbenzene | 1 | 0.86 | 0.02 | 5.6 | 0.074 | 1.0004 | 0.021 | 3501 | 3511 | 0.019 | 0.001 | 0.001 |
| 509 | TEG | Triethylene Glycol | 1 | 1.12 | 0.01 | 5.17 | 0.074 | 1.0002 | 0.021 | 3501 | 3504 | 0.019 | 0.001 | 0.001 |
| 519 | TRE | Trimethylbenzenes (all isomers) | 1 | 0.89 | 0.14 | 4.2 | 0.076 | 1.0028 | 0.022 | 3510 | 3559 | 0.020 | 0.001 | 0.001 |
| 520 | TMB | Trimethyl Benzene (1,2,5-) | 1 | 0.89 | 0.14 | 4.14 | 0.076 | 1.0028 | 0.022 | 3510 | 3558 | 0.020 | 0.001 | 0.001 |
| 521 | TMD | Trimethyl Benzene (1,2,3-) | 1 | 0.89 | 0.14 | 4.14 | 0.076 | 1.0028 | 0.022 | 3510 | 3558 | 0.020 | 0.001 | 0.001 |
| 522 | TME | Trimethyl Benzene (1,2,4-) (Pseudocumene) | 1 | 0.89 | 0.14 | 4.14 | 0.076 | 1.0028 | 0.022 | 3510 | 3558 | 0.020 | 0.001 | 0.001 |
| 529 | TRP | Trixylenyl Phosphate | 1 | 1.16 | 0 | 14.2 | 0.074 | 1.0000 | 0.021 | 3500 | 3499 | 0.019 | 0.001 | 0.001 |
| 546 | XLX | Xylenes (Ortho-, meta-, para-) | 1 | 0.89 | 0.51 | 3.66 | 0.080 | 1.0102 | 0.023 | 3536 | 3684 | 0.021 | 0.001 | 0.001 |
| 547 | XLM | Xylene (M-) | 1 | 0.87 | 0.51 | 3.66 | 0.080 | 1.0102 | 0.023 | 3536 | 3684 | 0.021 | 0.001 | 0.001 |
| 548 | XLO | Xylene (O-) | 1 | 0.89 | 0.4 | 3.66 | 0.079 | 1.0080 | 0.023 | 3528 | 3645 | 0.021 | 0.001 | 0.001 |
| 549 | XLP | Xylene (P-) | 1 | 0.86 | 0.51 | 3.66 | 0.080 | 1.0102 | 0.023 | 3536 | 3684 | 0.021 | 0.001 | 0.001 |
| 550 | XYL | Xylenol | 1 | 1.01 | 0.1 | 3.66 | 0.075 | 1.0020 | 0.022 | 3507 | 3536 | 0.019 | 0.001 | 0.001 |
| 551 | | Zinc Dialkyldithiophosphate | | | | | | | | | | | | |
| | | | Max. | 1.260 | 27.000 | 79.300 | 0.335 | 1.540 | 0.228 | 5390 | 11501 | 0.205 | 0.012 | 0.011 |
| | | | Min. | 0.000 | 0.000 | 1.000 | 0.000 | 1.000 | 0.021 | 3500 | 3499 | 0.019 | 0.000 | 0.000 |

*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)

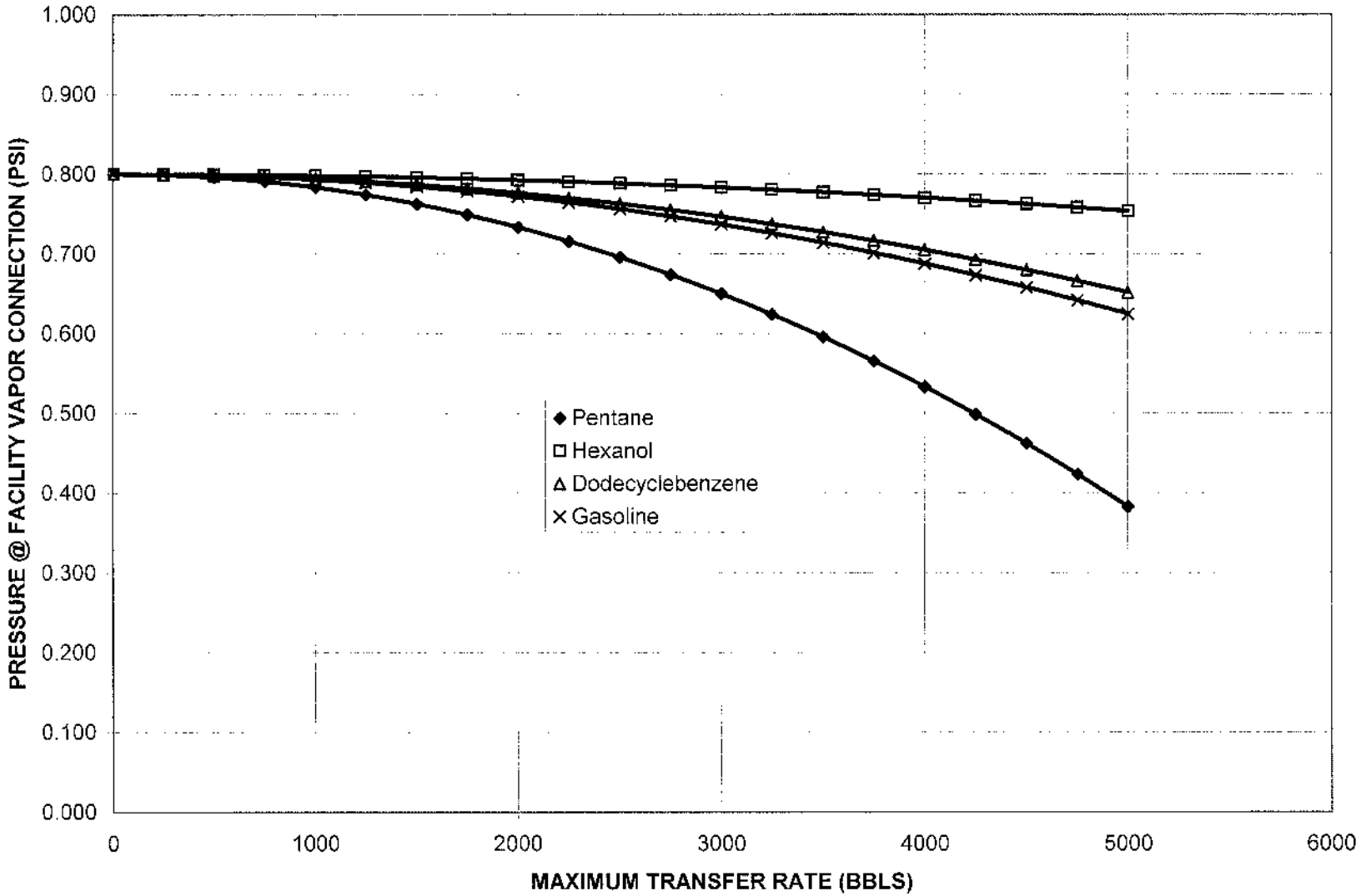
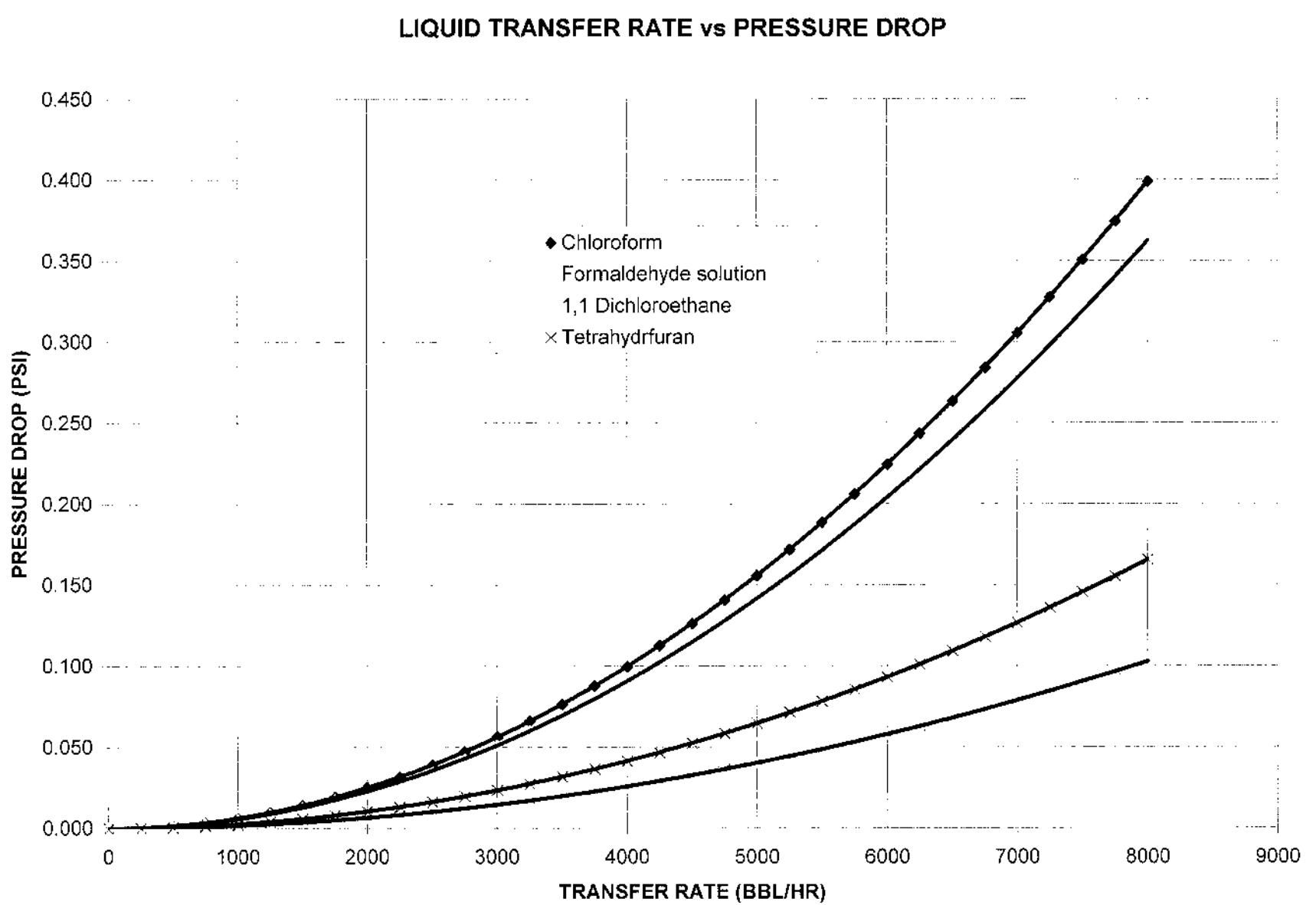


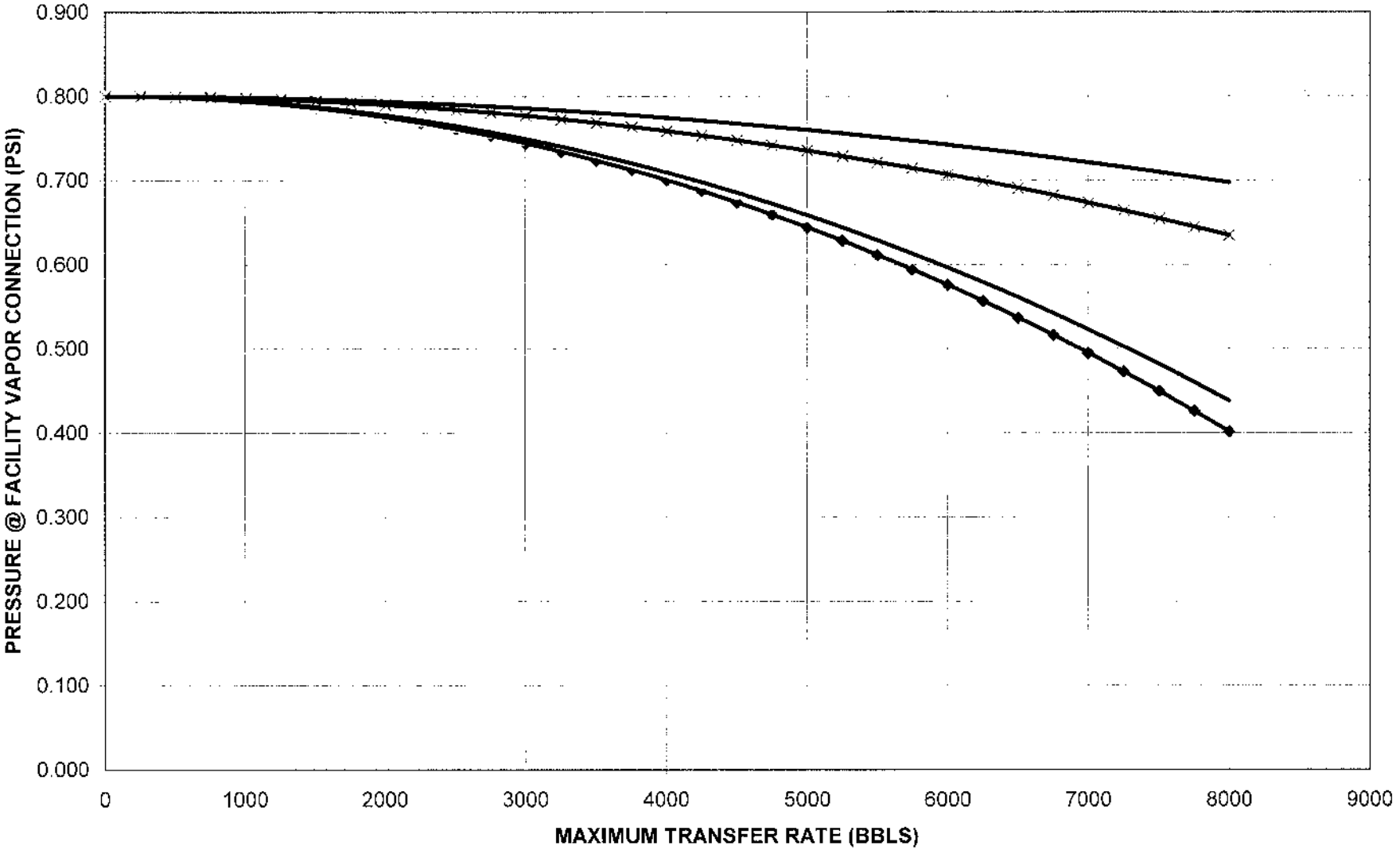
TABLE 4 (SUBCHAPTER "O" CARGOES)

| | 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 | 0.033 | 3850 | 4298 | 0.029 | 0.002 | 0.002 |
| 2 | ADN | Adiponitrile | 1 | 0.95 | 0.01 | 3.73 | 0.076 | 1.0002 | 0.022 | 3501 | 3503 | 0.020 | 0.001 | 0.001 |
| 3 | ATN | Acetonitrile | 3 | 0.78 | 0.03 | 1.41 | 0.076 | 1.0006 | 0.022 | 3502 | 3502 | 0.020 | 0.001 | 0.001 |
| 4 | BAD | Iso-Butyraldehyde | 1 | 0.80 | 7.80 | 2.50 | 0.131 | 1.1560 | 0.050 | 4046 | 5308 | 0.045 | 0.003 | 0.002 |
| 5 | BAR | Butyl acrylate (iso-, n-) | 2 | 0.90 | 0.60 | 4.42 | 0.086 | 1.0120 | 0.025 | 3542 | 3759 | 0.023 | 0.001 | 0.001 |
| 6 | BMH | Butyl Methacrylate | 2 | 0.88 | 0.29 | 4.9 | 0.081 | 1.0058 | 0.024 | 3520 | 3640 | 0.021 | 0.001 | 0.001 |
| 7 | BNZ | Benzene | 1 | 0.88 | 4.50 | 2.80 | 0.114 | 1.0900 | 0.039 | 3815 | 4671 | 0.035 | 0.002 | 0.002 |
| 8 | BTR | n-Butyraldehyde | 1 | 0.80 | 7.80 | 2.50 | 0.131 | 1.1560 | 0.050 | 4046 | 5308 | 0.045 | 0.003 | 0.002 |
| 9 | BTX | Benzene, Toluene, Xylene mixtures (10% Benzene or more) | 1 | 0.84 | 7.30 | 2.80 | 0.138 | 1.1460 | 0.052 | 4011 | 5396 | 0.046 | 0.003 | 0.002 |
| 10 | CCH | Cyclohexanone | 1 | 0.95 | 0.20 | 3.40 | 0.078 | 1.0040 | 0.023 | 3514 | 3565 | 0.020 | 0.001 | 0.001 |
| 11 | CHA | Cyclohexylamine | 1 | 0.87 | 0.62 | 3.42 | 0.083 | 1.0124 | 0.024 | 3543 | 3703 | 0.022 | 0.001 | 0.001 |
| 12 | CRB | Chlorobenzene | 1 | 1.11 | 0.80 | 3.88 | 0.087 | 1.0160 | 0.026 | 3556 | 3799 | 0.023 | 0.001 | 0.001 |
| 13 | CRF | Chloroform | 3 | 1.48 | 9 | 4.25 | 0.213 | 1.1800 | 0.085 | 4130 | 6916 | 0.076 | 0.004 | 0.004 |
| 14 | NCT | Coal Tar Naphtha Solvent | 1 | 0.86 | 0.2 | 4 | 0.079 | 1.0040 | 0.023 | 3514 | 3577 | 0.020 | 0.001 | 0.001 |
| 15 | CRS | Cresols | 1 | 1.05 | 0.06 | 3.72 | 0.077 | 1.0012 | 0.022 | 3504 | 3521 | 0.020 | 0.001 | 0.001 |
| 16 | CTA | Crotonaldehyde | 4 | 0.85 | 2 | 2.41 | 0.089 | 1.0400 | 0.028 | 3640 | 3943 | 0.025 | 0.001 | 0.001 |
| 17 | DCH | 1,1-Dichloroethane | 1 | 1.18 | 9.90 | 3.41 | 0.188 | 1.1980 | 0.077 | 4193 | 6592 | 0.069 | 0.004 | 0.004 |
| 18 | DPP | 1,2-Dichloropropane | 3 | 1.16 | 2.5 | 3.89 | 0.110 | 1.0500 | 0.035 | 3675 | 4418 | 0.031 | 0.002 | 0.002 |
| 19 | DPU | 1,3-Dichloropropene | 4 | 1.23 | 5.5 | 3.84 | 0.149 | 1.1100 | 0.053 | 3885 | 5443 | 0.047 | 0.003 | 0.002 |
| 20 | DEN | Diethylamine | 3 | 0.71 | 1.00 | 2.50 | 0.083 | 1.0200 | 0.025 | 3570 | 3731 | 0.022 | 0.001 | 0.001 |
| 21 | DIP | Diisopropanolamine | 1 | 0.98 | 0.01 | 4.59 | 0.076 | 1.0002 | 0.022 | 3501 | 3504 | 0.020 | 0.001 | 0.001 |
| 22 | DMF | Dimethylformamide | 1 | 0.95 | 0.30 | 2.51 | 0.078 | 1.0060 | 0.023 | 3521 | 3569 | 0.020 | 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 | 0.059 | 3941 | 5747 | 0.053 | 0.003 | 0.003 |
| 24 | EAC | Ethyl acrylate | 2 | 0.93 | 2.00 | 3.50 | 0.099 | 1.0400 | 0.031 | 3640 | 4163 | 0.028 | 0.002 | 0.001 |
| 25 | EAI | 2-Ethylhexyl acrylate | 2 | 0.89 | 0.02 | 6.35 | 0.076 | 1.0004 | 0.022 | 3501 | 3512 | 0.020 | 0.001 | 0.001 |
| 26 | EDC | Ethylene dichloride | 1 | 1.26 | 4.00 | 3.42 | 0.121 | 1.0800 | 0.041 | 3780 | 4776 | 0.036 | 0.002 | 0.002 |
| 27 | ETM | Ethyl Methacrylate | 2 | 0.92 | 1 | 3.94 | 0.090 | 1.0200 | 0.027 | 3570 | 3879 | 0.024 | 0.001 | 0.001 |
| 28 | EPA | 2-Ethyl-3-propylacrolein | 1 | 0.85 | 0.12 | 4.5 | 0.078 | 1.0024 | 0.022 | 3508 | 3553 | 0.020 | 0.001 | 0.001 |
| 29 | FFA | Furfural | 1 | 1.20 | 0.15 | 3.31 | 0.078 | 1.0030 | 0.022 | 3511 | 3547 | 0.020 | 0.001 | 0.001 |
| 30 | FMS | Formaldehyde solution (37% to 50%) | 1 | 1.13 | 0.15 | 1.03 | 0.076 | 1.0030 | 0.022 | 3511 | 3510 | 0.020 | 0.001 | 0.001 |
| 31 | MSO | Mesityl Oxide | 1 | 0.86 | 0.67 | 3.5 | 0.084 | 1.0134 | 0.025 | 3547 | 3725 | 0.022 | 0.001 | 0.001 |
| 32 | MAM | Methyl acrylate | 2 | 0.95 | 4.10 | 3.00 | 0.114 | 1.0820 | 0.038 | 3787 | 4646 | 0.034 | 0.002 | 0.002 |
| 33 | MBE | Methylcyclopentadiene dimer | 1 | 0.74 | 0.04 | 3.10 | 0.076 | 1.0008 | 0.022 | 3503 | 3511 | 0.020 | 0.001 | 0.001 |
| 34 | MMM | Methyl methacrylate | 2 | 0.94 | 2.02 | 3.45 | 0.099 | 1.0404 | 0.031 | 3641 | 4159 | 0.028 | 0.002 | 0.001 |
| 35 | MPL | Morpholine | 1 | 1.00 | 0.80 | 3.00 | 0.083 | 1.0160 | 0.025 | 3556 | 3726 | 0.022 | 0.001 | 0.001 |
| 36 | NPM | 1- or 2-Nitropropane | 1 | 0.99 | 1.05 | 3.06 | 0.086 | 1.0210 | 0.026 | 3574 | 3804 | 0.023 | 0.001 | 0.001 |
| 37 | PRD | Pyridine | 1 | 0.98 | 1.30 | 2.72 | 0.086 | 1.0260 | 0.026 | 3591 | 3830 | 0.023 | 0.001 | 0.001 |
| 38 | STY | Styrene | 2 | 0.92 | 0.40 | 3.60 | 0.081 | 1.0080 | 0.024 | 3528 | 3638 | 0.021 | 0.001 | 0.001 |
| 39 | TCN | 1,2,3-Trichloropropane | 3 | 1.39 | 0.15 | 5.60 | 0.079 | 1.0030 | 0.023 | 3511 | 3583 | 0.020 | 0.001 | 0.001 |
| 40 | TEN | Triethylamine | 3 | 0.73 | 2.50 | 3.49 | 0.105 | 1.0500 | 0.033 | 3675 | 4323 | 0.030 | 0.002 | 0.002 |
| 41 | THF | Tetrahydrfuran | 1 | 0.89 | 8.50 | 1.35 | 0.090 | 1.1700 | 0.035 | 4095 | 4454 | 0.032 | 0.002 | 0.002 |
| 42 | VAM | Vinyl acetate | 2 | 0.94 | 5.80 | 2.97 | 0.130 | 1.1160 | 0.046 | 3906 | 5099 | 0.042 | 0.002 | 0.002 |
| | | | Max. | 1.39 | 12.5 | 8.40 | 0.213 | 1.198 | 0.085 | 4193 | 6916 | 0.076 | 0.004 | 0.004 |
| | | | Min. | 0.63 | 0.01 | 1.03 | 0.076 | 1.000 | 0.022 | 3501 | 3502 | 0.020 | 0.001 | 0.001 |

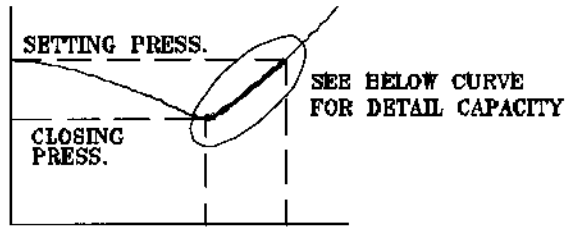
*when barge vapor piping is connected to facility vapor recovery system.


LIQUID TRANSFER RATE vs PRESSURE DROP
PRESSURE DROP (PSI)
0.450
0.400
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
TRANSFER RATE (BBL/HR)
Chloroform
Formaldehyde solution
1,1 Dichloroethane
Tetrahydrfuran

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



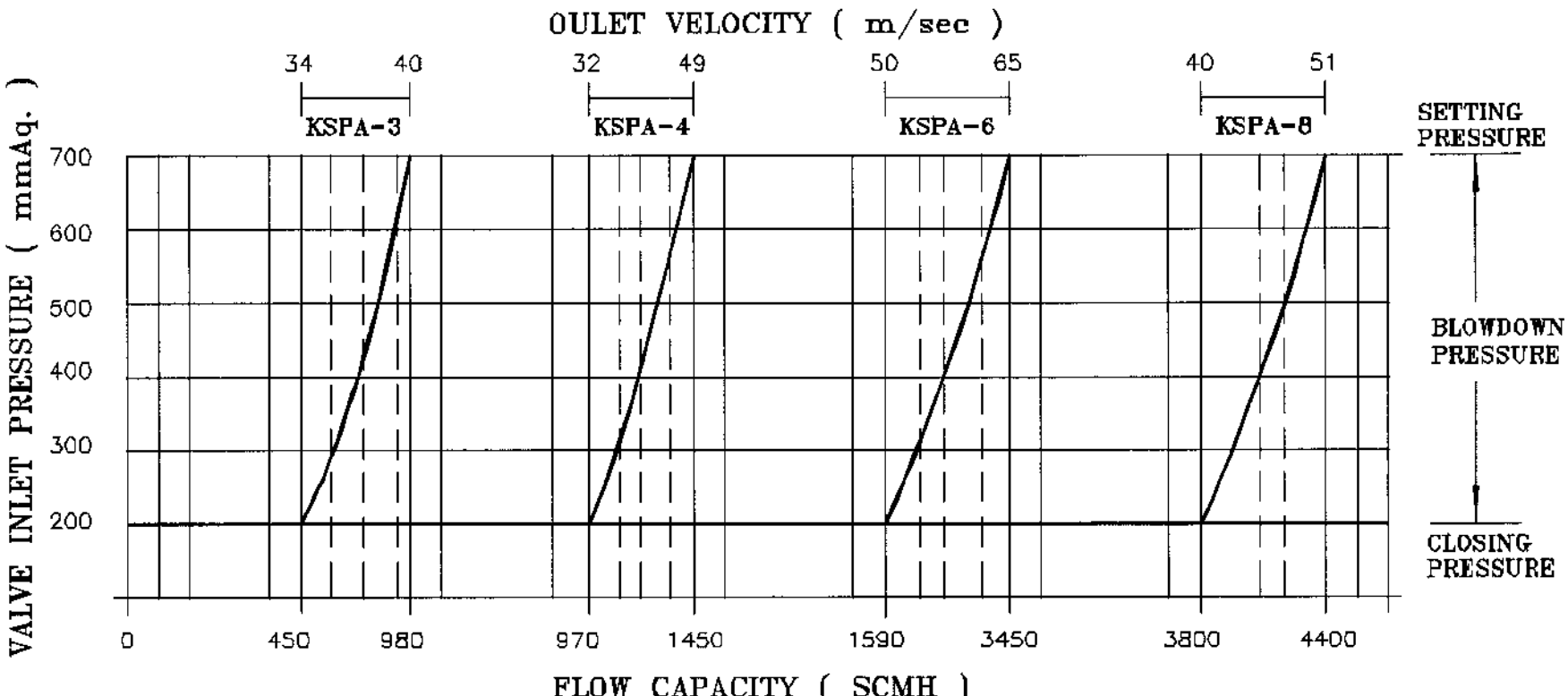
PROGRESS OF VALVE PRESSURE




# TANKTECH HIGH VELOCITY VENT VALVES

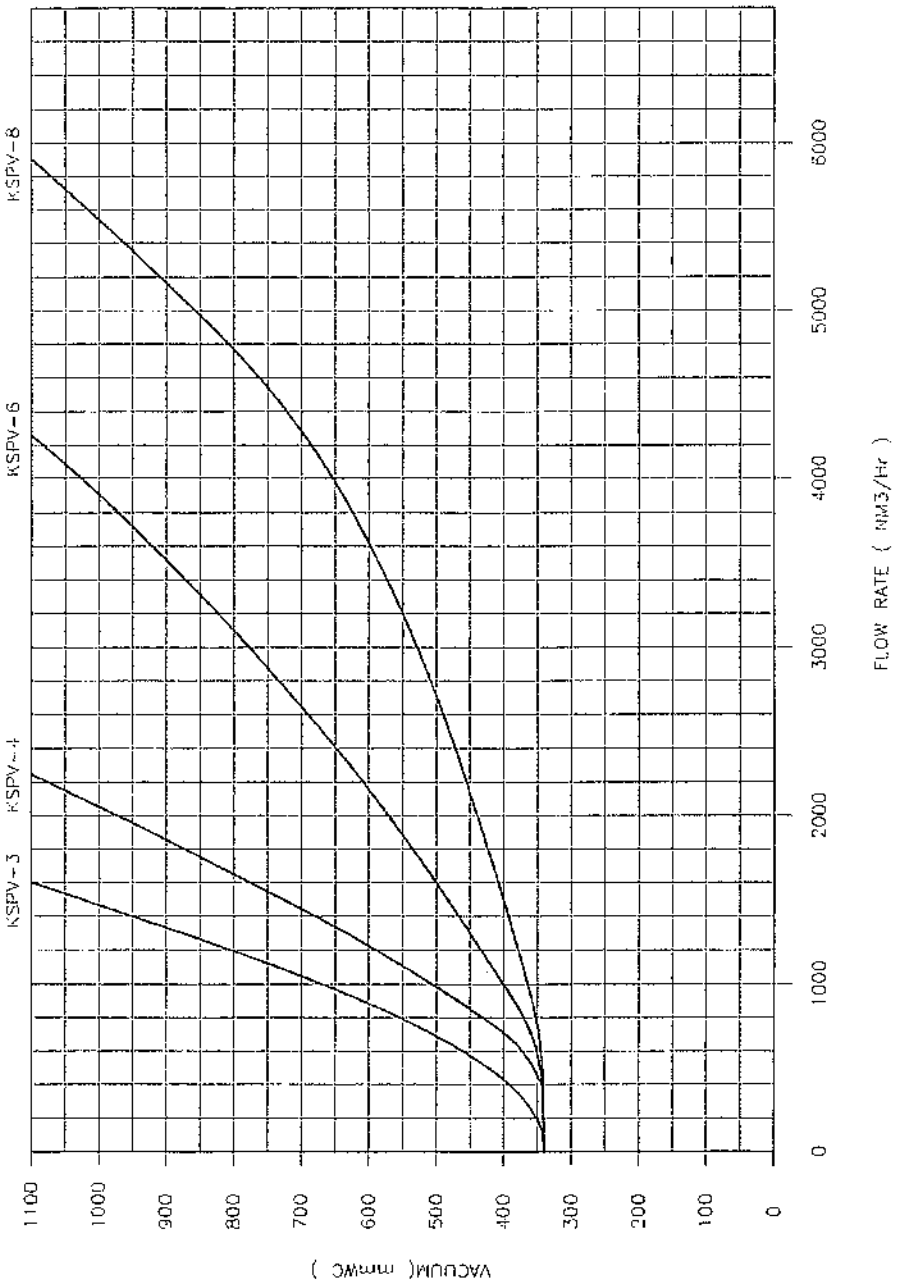
## KSPA TYPE FLOW CAPACITY CURVE

## 700 mmAq. SETTING PRESSURE



# FLOW CAPACITY CURVE GRAPH

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




TANKTECH

TITLE HIGH VELOCITY VACUUM RELIEF VALVE

KSPV TYPE