USA STANDARD

METHOD FOR

MEASUREMENT AND CALIBRATION OF BARGES

API Standard 2553
ASTM Designation: D 1407 – 65
(Date of Joint API/ASTM Approval, 1965)

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NOTE: *API Standard 2553-ASTM D 1407* was approved as a USA Standard Dec. 30, 1966.

FOREWORD

The standard in this publication is one of a series approved jointly by the American Petroleum Institute and the American Society for Testing and Materials. This standard is the result of a cooperative arrangement established by the two organizations to develop and jointly approve and publish standards dealing with quantitative and qualitative measurements of petroleum products and lubricants.

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Suggested revisions are invited and should be submitted to the director of the Division of Science and Technology, American Petroleum Institute, 1271 Avenue of the Americas, New York, N. Y. 10020.

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Standard Method for

MEASUREMENT AND CALIBRATION OF BARGES[1]

API Standard: 2553

ASTM Designation: D 1407 - 65

ADOPTED, 1965.[2,3]

This standard of the American Petroleum Institute issued under the fixed designation API 2553 is also a standard of the American Society for Testing and Materials issued under the fixed designation D 1407; the final number indicates the year of original adoption as standard, or, in the case of revision, the year of last revision.

This method was adopted as a joint API-ASTM standard in 1965.

Scope

1. This standard describes procedures for calibrating barge tanks.

NOTE 1.—Calibration procedures for other types of tanks are contained in the following standards:

API Standard 2550—ASTM D 1220: Measurement and Calibration of Upright Cylindrical Tanks

API Standard 2551—ASTM D 1410: Measurement and Calibration of Horizontal Tanks

API Standard 2552—ASTM D 1408: Measurement and Calibration of Spheres and Spheroids

API Standard 2554—ASTM D 1409: Measurement and Calibration of Tank Cars

API Standard 2555—ASTM D 1406: Liquid Calibration of Tanks

Outline of Procedures

2. This standard is presented in two parts.

Part I (Sections 7 to 9) includes procedures for determining the required field measurements data, description of tank measurement equipment, and suggestions for the orderly and complete recording of field data.

Part II (Sections 10 to 13) includes procedures for calculating the total and incremental tank capacities from the field data, suitable for preparation of the capacity gage table. Typical examples of calculations are included in Appendix II.

Tank-Measuring Equipment and Its Calibration

3. The equipment to be used for tank calibration work is covered in Sections 4 and 5. All tapes shall be in one piece (unmended) and free of kinks.

Measuring Tapes

4. (*a*) *Tapes for Height Measurement.*—For height measurements, a steel tape, Fig. 1(*a*), of convenient length, ⅜ or ½ in. wide and 0.008 to 0.012 in. thick—graduated in feet and inches to eighths of an inch, or in feet, tenths, and hundredths of a foot—is recommended. The working tape shall be calibrated against a "standard" tape in a vertical position, with equal tension (1 to 2 lb) applied to both. Graduation shall be accurate to within 1/32 in. or 0.05 ft throughout that portion of the tape length to be used.

(*b*) *Tapes for Length and Width Measurements.*—For length or width measurements a steel tape, Fig. 1(*b*), of convenient length, relative to the length or width of the tanks involved, usually 100 or 200 ft in length, is recommended. The working tape should not be more than ¼ in. wide, and approximately 0.01 in. thick, with graduations in tenths and hundredths of a foot. The tapes shall be checked and established as conforming to specified limits of accuracy when compared to the standard certified tape.

(*c*) *Tape Calibration.*—The standard tape for calibrating tank-measuring (working) tapes shall be identified with a Report of Calibration at 68 F by the National Bureau of Standards attesting to the standard tape accuracy within 0.001 ft (approximately 1/64 in.) per 100 ft of length. The Report of Calibration for a standard tape shall include these factors and/or formulas necessary to correct the tape length for use:

(*1*) At 60 F.

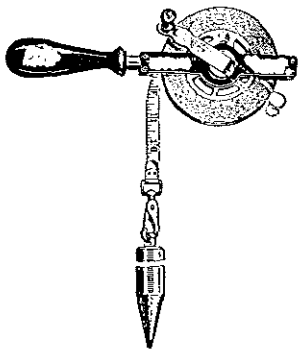
(*2*) Under tension differing from that used in calibration.

[1] Under the standardization procedures of the API and the ASTM, this standard is under the jurisdiction of the API Central Committee on Petroleum Measurement and the ASTM Committee D-2 on Petroleum Products and Lubricants.

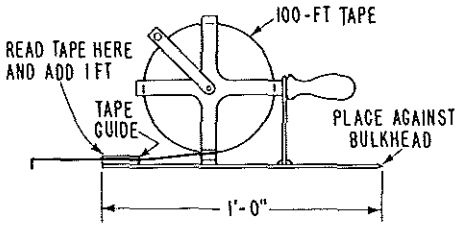
[2] The API method was adopted as API Standard 2553 in October, 1965.

[3] Revised and adopted as standard June, 1965, by action of the ASTM at the Annual Meeting and confirming letter ballot.

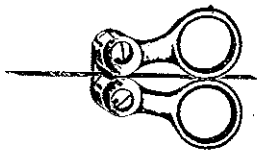
Prior to adoption as ASTM standard, this method was published as tentative in 1956.



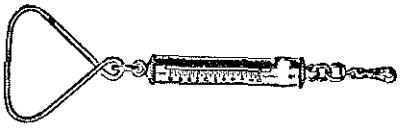
(*a*) Height-measuring tape and bob, usually 50 ft long (including bob) and ⅜ or ½ in. wide.



(*b*) Length- and width-measuring tape with tape bracket and guide, usually 100 or 200 ft long and not more than ¼ in. wide.



(*c*) Tape clamp.

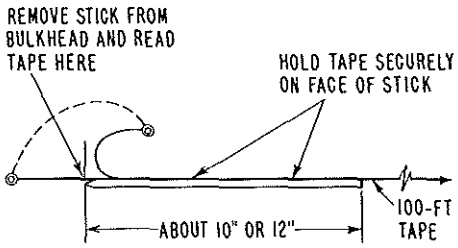


(*d*) Spring tension gage.

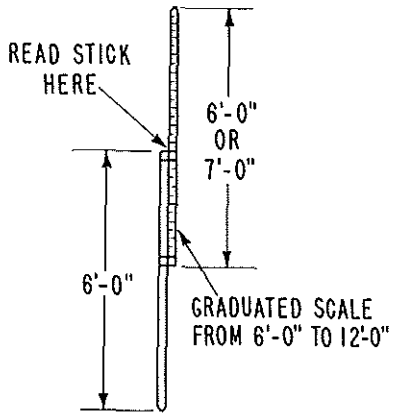
FIG. 1.—MEASURING TAPES.

(*3*) Under conditions of sag in an unsupported tape.

NOTE 2.—The National Bureau of Standards provides for standard tapes (NBS "reference" tapes) only a Report of Calibration at 68 F when the tape is completely supported in a horizontal position and subject to horizontal tension as prescribed in *National Bureau of Standards Test Fee Schedule 202.404—Steel Tapes.* The additional data indicated in Section 4(*c*), Items (*1*), (*2*), and (*3*), are included in the NBS Report of Calibration only when requested by the applicant and to the extent specifically requested.



(*a*) Measuring stick.



(*b*) Suggested height-measuring stick.

FIG. 2.—MEASURING STICKS.

(*d*) *Reels and Brackets.*—Tapes shall be equipped with adequate reels and handles, or 1-ft tape brackets with guides, whichever is appropriate for the tape to be used.

(*e*) *Tape Clamps.*—For assurance of a positive grip on the tape, clamps shall be used.

(*f*) *Measuring Sticks.*—The measuring sticks shall be constructed of straight grain, hard wood, with the scale along the faces graduated in tenths and hundredths of a foot. The measuring sticks shall be fabricated in two sections so that they may be readily adjusted to the required heights, as illustrated in Fig. 2.

(*g*) *Steel Ruler.*—A 6-ft flexible steel ruler.

(*h*) *Line Level or Leveling Device.*

(*i*) *Depth Gage* for determining thickness of strike plate.

(*j*) *Barge-Measuring Forms.*

Accessory Equipment

5. Additional measuring equipment may be required as follows:

(*a*) *Straightedge.*

(*b*) *Crayon, awl, and scriber.*

(*c*) *Cleaning instruments,* such as a putty knife.

(*d*) *Ladders.*

(*e*) *Tape brackets* (see Fig. 1).

(*f*) *Fishing cord* or coil of light gage wire.

Equipment for Determining Temperature and Gravity

6. Related equipment which may be necessary to insure accuracy of the results includes:

(*a*) *Sample Can.*—A clean container of suitable size.

(*b*) *Hydrometer Cylinder.*—Preferably of nonbreakable material, inside diameter 1 in. greater than the outside of the hydrometer to be used, inside height 1 in. greater than the total length of the hydrometer from the bottom of the body to the top of the scale.

NOTE 3.—For making gravity measurements, *API Standard 2544—ASTM D 287: Test for API Gravity of Crude Petroleum and Petroleum Products* should be used.

NOTE 4.—For obtaining temperature measurements, *API Standard 2543—ASTM D 1086: Measuring the Temperature of Petroleum and Petroleum Products* should be used.

PART I. MEASUREMENT PROCEDURES

Liquid Calibration

7. (*a*) For the purpose of transferring known volumes from shore tank or tanks into barge tanks for calibration, shore tanks of relatively small cross-sectional area must be used to achieve the proper degree of accuracy. If calibration tanks are used, they shall be accurately calibrated by the measuring procedure or by means of the National Bureau of Standards standardized measures. It is recommended that the incremental volume of the shore tanks not exceed the incremental volume of the barge tanks. The barge tank increments shall be selected on the basis of barge construction. The shore tank or tanks must have a capacity table prepared in accordance with the "critical measure-

ment" procedure as set forth in API Standard 2550—ASTM D 1220. (For a detailed discussion of liquid calibration, see API Standard 2555—ASTM D 1406.)

(*b*) If the calibration of the barge is to be conducted by the use of meters, then calibration should be conducted in accordance with API Standard 2555—ASTM D 1406 and *API Standard 1101: Measurement of Petroleum Liquid Hydrocarbons by Positive Displacement Meter*. When shore tanks of proper size are not available, it is permissible to use a suitable meter for transferring known volumes into barge tanks. Working meters must be proved at regular intervals during operations by use of a meter prover tank or by a master meter, and correction factors, when necessary, shall be properly recorded.

(*c*) *Filling Procedure.*—Shore tanks or meters should be as close as possible to the barge. Water is recommended as the calibration liquid to be used; however, the use of light oil or kerosine is permissible. Record the liquid used. Lines from the measuring tank to the barge shall be full at all times during operation. It is preferable to use gravity flow for easier control of the liquid. Fill the barge to locations indicated on Fig. 3. Each location will require a preliminary as well as a final gage on the barge and a final gage on the measuring tank. The preliminary gages on the barge will be taken when the liquid has been transferred into each barge tank to the approximate location desired. The final gage will be that taken after all barge tanks are filled to the same approximate level and the barge has resumed its normal trim. All gages taken on the shore or on measuring tanks shall be considered accurate. If this procedure is followed, the barge will maintain a reasonable trim, thereby making it possible to obtain accurate incremental volumes in the barge tanks. It is necessary to coordinate the gages at the measuring tank or meters with those on the barge so that the volumes taken from the measuring tank or meters may be identified in the corresponding barge tanks. Temperatures of the liquid in the measuring tanks and barge tanks should be taken and recorded at each operation (Note 4). Record the exact location of the barge tank gaging points with reference to the centerline and transverse bulkheads of the barge.

(*d*) For barges with main cargo line or lines located below deck and running through cargo compartments, the applicable closed line displacements are automatically deducted, at the proper elevation, from the open (gross) capacity of each affected compartment. A notation should be made on the table indicating that this deduction has been made, giving the total quantity deducted as well as indicating how much of the total quantity was deducted from each designated compartment. Therefore, the total cargo capacity of the barge is the sum of all the cargo compartment net capacities, plus the total underdeck cargo piping capacity. Prepare a diagrammatic sketch of the underdeck pipeline arrangement with all valves shown; show the actual calculated pipeline capacities, horizontal and vertical, between each valve.

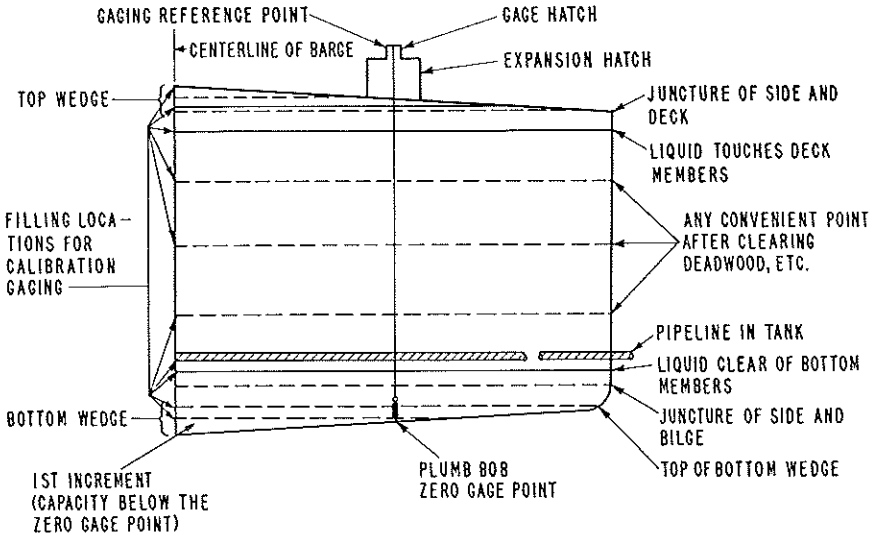


FIG. 3.—TYPICAL LOCATIONS FOR LIQUID CALIBRATION GAGING OF BARGE TANKS.

Linear Measurement Procedure

8. (*a*) *Conditions for Measurement.*—All data, and procedures by which they are obtained, necessary for the preparation of gage tables should be based on sound engineering principles. All construction work and liquid load tests on the barge shall have been completed. All tanks must be clean, gas-free, and safe to enter. Length, width, and height measurements, not including the physical dimensions of deadwood, shall be read and recorded to the nearest 0.01 ft. The size of deadwood shall be read and recorded to the nearest 1/16 in. The location of deadwood with relation to the compartment shall be measured, read, and recorded to the nearest 1/4 in. See Table II in Appendix II for a typical measurement record form for barge tanks.

(*b*) *Preliminary Measurements.*—Prior to entering the barge tanks, there are measurements to be taken on deck. A straight line shall be stretched transversely across the deck to determine the amount of camber. Measure the distances from the line to the deck at the centerline and at each side of the barge (or at a measured distance from the centerline). This camber should be established in at least two separate places on the barge deck. The forward and aft tanks on some barges may have a longitudinal shear, and this should be measured with a straight line fore and aft. Measure the size and heights of the expansion hatches and locate them with respect to the centerline bulkhead and fore and aft bulkheads. The total gage heights of each tank shall be measured and recorded at this time.

(*c*) *Internal Tank Measurements.*—Upon entering a barge tank, choose a tape path that will permit an unobstructed measurement in the following locations (Fig. 3):

(*1*) Length measurements just above the bottom stiffeners:

a. Near the centerline bulkhead,

b. Middle of the tank, and

c. Near the outboard bulkhead or shell.

(*2*) Length measurements approximately 6 ft above the tank bottom:

a. Near the centerline bulkhead,

b. Middle of the tank, and

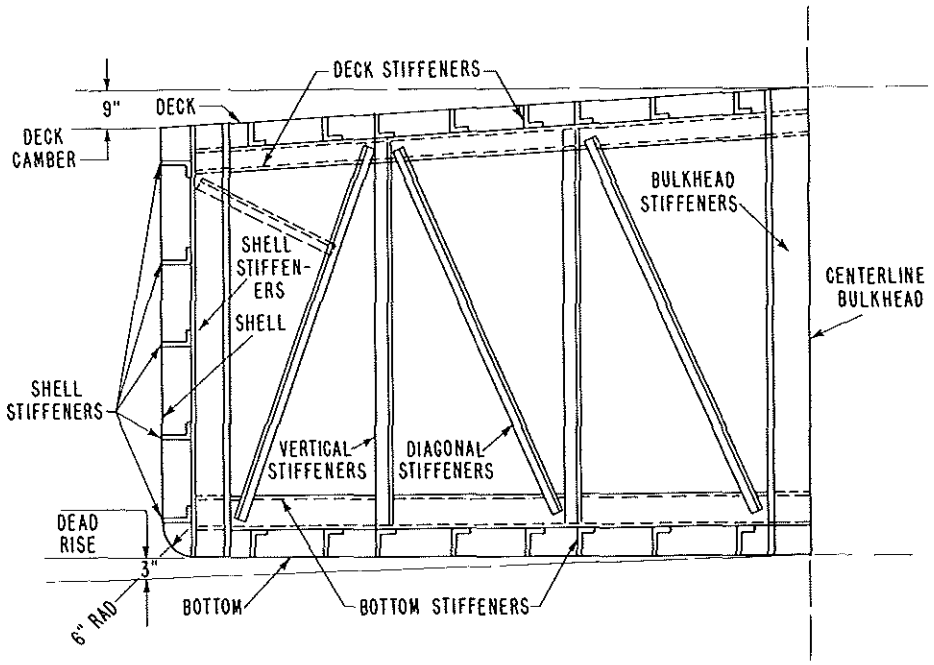


FIG. 4.—TYPICAL TRANSVERSE HALF-SECTION OF A BARGE.

c. Near the outboard bulkhead or shell.

(3) Width measurements just above the bilge:

a. Near the forward bulkhead,

b. Middle of the tank, and

c. Near the aft bulkhead.

(4) Width measurements approximately 6 ft above the tank bottom:

a. Near the forward bulkhead,

b. Middle of the tank, and

c. Near the aft bulkhead.

(5) Height measurements at the forward bulkhead:

a. Against the centerline bulkhead, and

b. A measured distance from the shell (usually just inside the bilge).

(6) Height measurements halfway back from the forward bulkhead:

a. Against the centerline bulkhead, and

b. A measured distance from the shell (usually just inside the bilge).

(7) Height measurements at the aft bulkhead:

a. Against the centerline bulkhead, and

b. A measured distance from the shell (usually just inside the bilge).

(*d*) *Other Measurements.*—Measure the thickness of the strike plate if present. Measure, number, describe, and locate with relation to tank bottom or deck, all deadwood in each tank such as shell stiffeners, bulkhead stiffeners, bottom and deck stiffeners, miscellaneous vertical and diagonal stiffeners, pipelines, etc., as shown in Fig. 4. When suitable construction prints are available, the deadwood may be taken directly from the prints. Measure the bilge radius, if present, in the following manner: Drop a plumb line to the point of tangency with the bottom and measure from the side of the barge tank to the plumb line.

(*e*) Barge tanks that are constructed so as to make lineal measurements impracticable should be calibrated by the liquid calibration method.

(*f*) For barges with main cargo line or lines located below deck and running through cargo compartments, the applicable closed line displacements should be deducted, at the proper elevation, from the open (gross) capacity of each affected compartment. A notation should be made on the table indicating that this deduction has been made, giving the total quantity deducted as well as indicating how much of the total quantity was deducted from each designated compartment. Therefore, the total cargo capacity of the barge is the sum of all the cargo compartment net capacities, plus the total underdeck cargo piping capacity. Prepare a diagrammatic sketch of the underdeck pipeline arrangement with all valves shown. Show the actual calculated pipeline capacities, horizontal and vertical, between each valve.

Construction Prints Procedure

9. (*a*) Adequate detailed drawings or prints depicting the barge construction, including deadwood and tank dimensions, may be available for some barges for which gage tables are to be prepared. Such data may be used in the same manner as the field data by measurements for preparing the capacity gage tables. It must be remembered, however, that changes occur during construction which may not be included as changes on the drawings or prints.

(*b*) The total gage height shall be measured and recorded for each tank.

(*c*) This procedure of preparing capacity gage tables should be restricted to barges that are in service and not safe to enter for actual measurements, or not available for the liquid calibration methods.

(*d*) Account for cargo line capacities in accordance with Section 8(*f*).

PART II. CALCULATIONS

Calculations for Liquid Calibration Procedure

10. The incremental and total capacities of the barge tanks in the form of a gage table shall be calculated from the field data obtained by liquid calibration. Any correction required due to temperature differences between shore tanks and barge tanks must be made at this time. The temperature-corrected volume is apportioned to the various zones of equal incremental volume. The corrected zone volumes are divided by the number of increments for each zone. These corrected incremental volumes are known as proportional volumes and shall be incorporated in the barge capacity table. (See Table I in Appendix I; also, API Standard 2555—ASTM D 1406, Table II of the Appendix.)

Calculations for Linear Measurement Procedure

11. (*a*) The dimensions of all transverse sections of the barge may be obtained from the field report. The dead rise is determined by subtracting the measured deck camber from the difference between the corrected inboard and outboard tank heights. The corrected heights are those that have been extended on a determined slope to the point at which they were intended to be used, that is, the centerline bulkhead and shell. It should be noted that circumferential measurements may be made with working tapes which have been calibrated by a standard tape of length based on 68 F. Measurements recorded on this temperature basis must be mathematically corrected to the equivalent 60 F value for use in computing gage tables.

(*b*) A series of barge tank sections will then be developed for each tank, both port and starboard, each being determined from an average of the applicable measurements. The following sections are typical:

(*1*) *Bottom Wedge.*—The triangular section formed by the bottom from a point at the centerline bulkhead to the theoretical intersection of the bottom with the shell.

$$\text{Volume, bbl} = \frac{L \times W \times H}{2} \times \frac{1728}{9702}$$

where:

L = average length, in feet.
W = average width, in feet.
H = height of wedge, in feet.
1728 = number of cubic inches per cubic foot.
9702 = number of cubic inches per barrel.

This bottom wedge volume shall be spread as the difference in squares, increasing from the bottom up. Should the gage point be other than at the low point of the bottom, the volume below the gage point shall be determined and recorded.

(*2*) *Box Section.*—The main body of the tank above the bottom wedge but below the deck wedge. The height of this box section is determined by the average corrected shell heights, and the shape is considered rectangular.

$$\text{Volume, bbl} = L \times W \times B \times \frac{1728}{9702}$$

where:

L = average length, in feet.
W = average width, in feet.
B = average height of box, in feet.
1728 = number of cubic inches per cubic foot.
9702 = number of cubic inches per barrel.

This volume shall be divided in equal amounts throughout the height of the box in the desired increments.

(*3*) *Deckwedge.*—The section, usually triangular, formed by the deck from a point where the deck intersects the shell and the theoretical line at the top of the box section.

$$\text{Volume, bbl} = \frac{L \times W \times C}{2} \times \frac{1728}{9702}$$

where:

L = average length, in feet.
W = average width, in feet.
C = height of deck camber, in feet.
1728 = number of cubic inches per cubic foot.
9702 = number of cubic inches per barrel.

This top wedge volume shall be spread as the difference in squares, decreasing from the bottom to the top of the wedge.

(*4*) *Expansion Hatch.*—Where the hatch is small and not considered a part of the tank, show the capacity of the hatch in barrels or gallons per inch as a note at the bottom of the capacity table. If the hatch is large in volume, calculate the volume and spread it in equal parts to correspond with Item (*2*).

(*5*) *Deadwood.*—All items or shapes in barge tanks which will displace liquid shall be listed with respect to the amount displaced and the zone in the tank from which the deadwood volume must be deducted.

(*6*) *Net Volume.*—That volume which is determined by deducting the total volume of deadwood from the gross volume as calculated in Items (*1*) to (*5*). This net volume is divided into the desired increments when preparing the capacity table, thereby providing a means for determining the total and incremental capacities of each barge tank (see Appendix II for examples of calculations for the Linear Measurement Procedure).

(*c*) *Correction for Trim.*—Due to the nature of their use, barges sometimes decline toward the stern (possibly the bow). This is commonly known as a trim by the stern (or bow), and the resultant change in the position of the liquid surface can be observed. Should the barge tanks be gaged at any location other than the center with respect to fore and aft bulkheads, then these gages must necessarily be corrected to allow for a rise or fall of the liquid surface, that is, the surface rises at the aft end with a trim by the stern. The correction to be made to the indicated gage height is calculated as follows:

$$X = \frac{TD}{L}$$

where:

X = correction for trim.
T = total trim—the difference in elevation between the fore and aft draft marks.
D = distance from center of tank to gage point.
L = length between draft marks.

NOTE 5.—*Example:* If T = 10 ft 0 in., L = 300 ft 0 in., D = 15 ft 0 in., then

$$X = \frac{10 \times 15}{300} = 0.5 \text{ ft} = 6 \text{ in.}$$

When the trim is by the stern and innages are being taken aft the center of the tank, this correction must be deducted from the indicated gage height before reading the capacity tables. Correction for trim shall not be used if the liquid surface does not completely cover the tank bottom, or if the liquid surface is touching any portion of the tank deck.[4]

Calculations for Construction Prints Procedure

12. The calculations for the Construction Prints Procedure are the same as those described for the Linear Measurement Procedure in Section 11.

Calculation of Barge Calibration Adjustment Factor

13. The barge calibration adjustment factor is calculated by dividing the sum of the receipt and delivery shore tank net

[4] To eliminate the necessity of correcting for trim, it is advisable to locate gage hatches in the center of the tank when barges are constructed.

volumes at origin and destination by the sum of the total quantities of the barge tank net volumes, as follows:

$$F = \frac{V_1^s + V_2^s + \cdots V_{10}^s + \cdots V_n^s}{V_1^b + V_2^b + \cdots V_{10}^b + \cdots V_n^b}$$

where:

F = barge tank calibration factor.

V_1^s, V_2^s, etc. = net volumes of shore tank.

V_1^b, V_2^b, etc. = net volumes of barge tank.

NOTE 6.—*Example:* From the field data obtained, the following volumes have been corrected to 60 F for both shore and barge tanks:

TOTAL AT ORIGIN AND DESTINATION.[a]

Loading Number	Shore Tank Net Volumes, bbl	Barge Tank Net Volumes, bbl
1	5956.57	5917.17
2	5937.55	5941.84
3	5948.69	5914.39
4	5889.88	5890.05
5	5946.50	5918.51
6	5927.26	5957.22
7	5897.33	5890.02
8	5911.05	5905.27
9	5890.62	5868.26
10	5935.81	5919.19
Total	59,241.26	59,121.92

[a] The above volumes have been taken from the capacity tables covering the respective shore tanks and barge tanks, and necessary corrections were made to reduce all volumes to 60 F.

$$F = \frac{59{,}241.26}{59{,}121.92} = 1.00201854$$

Corrected barge tank volume

$$= \frac{59{,}121.92}{10} \times 1.00201854 = 5{,}924.13 \text{ bbl}$$

NOTE 7.—In the example, it is apparent that the barge tank is distorted or bulged in such manner as to have greater capacity than the gage table indicates. Thus, a barge tank calibration factor greater than unity will yield a greater true volume than the gage table indicates. It is equally probable to have internal encrustations or solids which result in less true volume than the gage table indicates. In the latter case, the barge tank calibration factor will be smaller than unity.

(See Appendixes I and II, Tables I through V.)

APPENDIX I

LIQUID CALCULATIONS

TABLE I.—TYPICAL LIQUID CALIBRATION RECORD.

Operation Number	Shore Tank Gages	Volume Delivered from Shore Tank, bbl	Innage Barge Gages	Number of 1/8-in. Increments	Incremental Capacities, bbl per 1/8 in. in Barge	Cumulative Volume of Barge Tank, bbl
2.....	17 ft 2 5/8 in.	7.8810	0 ft	....	....	7.8810[a]
3.....	17 ft 0 1/2 in.	13.4762	0 ft 2 1/8 in.	17	0.7927	21.3569
6.....	16 ft 7 3/4 in.	40.1905	0 ft 6 7/8 in.	38	1.0576	61.5457
7.....	15 ft 8 3/4 in.	102.3095	1 ft 5 7/8 in.	88	1.1626	163.8545
10.....	14 ft 1 in.	171.8571	3 ft 1 5/8 in.	158	1.0877	335.7111
11.....	13 ft 1 7/8 in.	96.1905	4 ft 0 3/4 in.	89	1.0808	431.9023
14.....	10 ft 7 5/16 in.	274.2857	6 ft 7 1/4 in.	244	1.1218	705.6215
			6 ft 7 3/8 in.	1	1.1233	706.7448
15.....	8 ft 1 5/8 in.	267.1429	9 ft 1 in.	237	1.1248	973.3224
18.....	5 ft 7 3/4 in.	271.8095	11 ft 6 7/8 in.	239	1.1373	1245.1371
19.....	3 ft 5 1/8 in.	235.1667	13 ft 9 1/2 in.	213	1.1041	1480.3104
22.....	2 ft 10 1/4 in.	37.0000	14 ft 4 1/8 in.	53	0.6981	1517.3097
Total.....		1517.3096		1377		

[a] Pipeline volume and volume below strike point.

APPENDIX II

LINEAR MEASUREMENT CALCULATIONS

TABLE II.—TYPICAL MEASUREMENT RECORD OF A BARGE TANK.

Name of Barge: Barge No. 20
Owner: Quick Oil Company
Location: Port Arthur, Texas
Built By: Builders Shipyard, Port Arthur, Texas
Date Built: 1948 Date Measured: March 19, 1950
Nominal Capacity: 12,000 bbl
Type Capacity Table: Barrels ⅛ in. Innage
Gallons ¼ in. Ullage
Compartment No.: Tank No. 2—Port
Total Gage Height: 17 ft ⅝ in.
Height of Gage Reference Point above Deck: 2 ft 6¾ in.
Location of Gage Point: From Aft Bulkhead 16 ft 0 in.
From Center Bulkhead 9 ft 6 in.
Size of Expansion Hatch: 30 in. Diameter

	Above Bottom Stiffeners	Six Feet Above Bottom
Length Measurements[a]		
1. Near Centerline Bulkhead:	31.96 ft	31.95 ft
2. Center of Tank:	31.95 ft	31.96 ft
3. Near Outboard Bulkhead:	31.94 ft	31.95 ft
Width Measurements		
1. Near Forward Bulkhead:	18.97 ft	18.99 ft
2. Center of Tank:	19.00 ft	18.99 ft
3. Near Aft Bulkhead:	19.00 ft	19.015 ft

	Near Centerline Bulkhead	Near Outboard Bulkhead
Height Measurements		
1. At Forward End:	14 ft 7⅛ in. (6 in. from Bulkhead)	13 ft 9¾ in. (12 in. from Shell)
2. At Center:	14 ft 7$\frac{3}{16}$ in. (6 in. from Bulkhead)	13 ft 9$\frac{15}{16}$ in. (12 in. from Shell)
3. At Aft End:	14 ft 7¼ in. (6 in. from Bulkhead)	13 ft 10⅛ in. (12 in. from Shell)

[a] Length measurements are recorded as values taken with a tape of length based on 68 F calibration. Each value thus recorded shall be mathematically corrected to the equivalent 60 F value for use in computing gage tables.

DEADWOOD

1. 9—12 in. x 32 ft 0 in. (Serrated) Bottom Stiffeners..... from 0 ft 0 in. to 0 ft 11¼ in.
2. 3—12 in. x 19 ft 0 in. (Serrated) Bottom Stiffeners..... from 0 ft 9 in. to 1 ft 11¼ in.
3. 6—12 in. x 14 ft 3 in. Vertical Bulkhead Stiffeners..... from 0 ft 0 in. to 14 ft 3 in.
4. 6—6 in. x 6 in. x ⅜ in. x 14 ft 3 in. Vertical Deck Stiffeners.... from 0 ft 0 in. to 14 ft 3 in.
5. 9—4 in. x 4 in. x ⅜ in. x 7 ft 9 in. Diagonal Bracing..... from 3 ft 0 in. to 10 ft 0 in.
6. 3—6 in. x 4 in. x ⅜ in. x 7 ft 9 in. Diagonal Bracing..... from 3 ft 0 in. to 10 ft 0 in.
7. 13—9 in. x 32 ft 0 in. Longitudinal Bulkhead and Shell Stiffeners.. from 0 ft 0 in. to 14 ft 3 in.
8. 9—1½ in. Pipe x 32 ft 0 in. Heating Coils..... from 0 ft 2 in. to 0 ft 5½ in.
9. 7—9 in. x 19 ft 0 in. (Serrated) Bulkhead Stiffeners..... from 2 ft 0 in. to 12 ft 7⅝ in.
10. ⅜ in. Strike Plate

(Use reverse side of page for additional deadwood.)

Deck Camber

Elevation of line level at Shell = 12 in.
Elevation of line level at Center = 4¼ in.

7¾ in.

Bilge Radius = 12 in.

GROSS VOLUMES

Average Length = 31.9517 ft
Average Width = 18.9942 ft
Average Outboard Height = 13.8281 ft
Average Inboard Height = 14.5990 ft
Horizontal Distance Between Height Measurements = 17.5000 ft
Slope of Barge Deck and Bottom = (14.5990 ft − 13.8281 ft) ÷ 17.5000 ft = 0.0441 in. per ft
Outboard Heights taken 1 ft 0 in. from Shell
Corrected Outboard Heights = 13.8281 ft
Less (1.0000 × 0.0440) = 0.0441 ft

Corrected 13.7840 ft (13 ft 9⅜ in.)

Inboard Heights taken 0 ft 6 in. from Centerline
Corrected Inboard Heights = 14.5990
Plus (0.5000 × 0.0441) = 0.0221

Corrected: 14.6211 ft (14 ft 7½ in.)

Total Camber and Deadrise = (14.6211 ft − 13.7840 ft) = 0.8371 ft
Measured Deck Camber:
Height of Horizontal Transverse Line at Shell = 1 ft 0 in.
Height of Horizontal Transverse Line at Centerline = 0 ft 4¼ in.

Deck Camber = 0 ft 7¾ in.

Deadrise = (0.8371 ft − 0.6458 ft) = 0.1913 ft
Box Height of Tank = 13.7991 ft (Corrected Outboard Height)

VOLUME OF BOTTOM WEDGE

(0.1913 ft High) $2\frac{1}{4}$ in.

$$\text{Volume} = \frac{(31.9517 \text{ ft} \times 18.9942 \text{ ft} \times 0.1913 \text{ ft})}{2} \times \frac{1728}{9702} = 10.3391 \text{ bbl}$$

Spread Volume over $2\frac{1}{4}$ in.

$$\text{Spread Factor} = \frac{10.3391}{8} \div (2.25)^2 = 0.2552864$$

Increments	Tank Heights	Differences In Squares	Barrels per $\frac{1}{8}$ in. (Factor × Differences in Squares)
8	0 ft 1 in.	1	0.2553
8	0 ft 2 in.	3	0.7659
2	0 ft $2\frac{1}{4}$ in.	(1.0625 × 4)	1.0850
Total			10.3396 bbl

VOLUME OF BOX SECTION

(13.7840 ft) 13 ft $9\frac{3}{8}$ in.

Tank Heights = 0 ft $2\frac{1}{4}$ in. to 13 ft $11\frac{5}{8}$ in. (1323 Increments)

$$\text{Volume} = (31.9517 \text{ ft} \times 18.9942 \text{ ft} \times 13.7840) \times \frac{1728}{9702} = 1{,}489.9535 \text{ bbl}$$

Barrels per $\frac{1}{8}$ in. = 1,489.9535 ÷ [(13 ft $9\frac{3}{8}$ in. × 12) × 8] = 1.1262

Volume = 1.1262 × 1323 = 1,489.9626 bbl

VOLUME OF DECK WEDGE

(0.6458 ft High) $7\frac{3}{4}$ in.

$$\text{Volume} = \frac{(31.9517 \times 18.9942 \times 0.6458)}{2} \times \frac{1781}{9702} = 35.9738 \text{ bbl}$$

Spread Volume over $7\frac{3}{4}$ in.

$$\text{Spread Factor} = \frac{35.9738}{8} \div (7.75)^2 = 0.07486743$$

Increments	Tank Heights	Differences in Squares	Barrels per $\frac{1}{8}$ in. (Factor × Differences in Squares)		
8	14 ft $0\frac{5}{8}$ in.	14.5	1.0856		
8	14 ft $1\frac{5}{8}$ in.	12.5	0.9358		
8	14 ft $2\frac{5}{8}$ in.	10.5	0.7861		
8	14 ft $3\frac{5}{8}$ in.	8.5	0.6364		
8	14 ft $4\frac{5}{8}$ in.	6.5	0.4866		
8	14 ft $5\frac{5}{8}$ in.	4.5	0.3369	*Hatch*	
8	14 ft $6\frac{5}{8}$ in.	2.5	0.1872 + 0.0091 =		0.1963
6	14 ft $7\frac{3}{8}$ in.	(0.5625 × $\frac{4}{6}$)	0.0562 + 0.0091 =		0.0653
			35.9740		36.1014 bbl
Gross				1,536.4036	
Deadwood				−8.1825	
Net				1,528.2211	

Hatch Volume:

Diameter = 30 in.

$$\text{Barrels per } \tfrac{1}{8} \text{ in.} = \frac{30^2 \times 0.7854}{8 \times 9702} = 0.0091$$

Location of Gage Reference Point is 9 ft 6 in. from Centerline Bulkhead.

Rise of Tank Bottom at Gage Point =

$$\frac{0.1913 \text{ (Deadrise)}}{18.9942 \text{ (Width)}} \times 9.500 = 0.0957 \text{ ft} + (\tfrac{3}{8} \text{ in. Strike Plate}) = 0.1270 \text{ ft } (1\tfrac{1}{2} \text{ in.})$$

DEADWOOD

	Increments	Cubic Inches	Cubic Inches per 1/8 in.
0 ft 0 in. to 1 ft 10¼ in. Bottom Stiffener	178		148.38
9—Serrated 12 in. at 20.7 lb × 32 ft 0 in. (Longitudinal Stiffeners)		10 420	
3—Serrated 12 in. at 20.7 lb × 19 ft 0 in. (Transverse Stiffeners)		4 125	
$1 - \frac{(24 \text{ in.})^2 - [(24 \text{ in.})^2 \times 0.7854]}{4} \times 32$ ft 0 in. (Bilge)		11 866	
		26 411	
0 ft 0 in. to 14 ft 7⅜ in. Miscellaneous Stiffeners	1403		18.03
6—12 in. at 20.7 × 14 ft 3 in. (Vertical Shell and Bulkhead Stiffeners)		6 187	
6—6 in. × 6 in. × ⅜ in. × 14 ft 3 in. (Vertical Deck Stiffeners)		4 473	
9—4 in. × 4 in. × ⅜ in. × 7 ft 9 in. (Diagonal Bracing)		2 394	
3—6 in. × 4 in. × ⅜ in. × 7 ft 9 in. (Diagonal Bracing)		1 007	
1—7 in. × 4 in. × ⅜ in. × 32 ft 0 in. (Longitudinal Shell Stiffeners)		1 532	
6—Serrated 9 in. at 13.4 lb × 32 ft 0 in. (Longitudinal Shell Stiffeners)		4 481	
7—Serrated 9 in. at 13.4 lb × 32 ft 0 in. (Longitudinal Bulkhead Stiffeners)		5 228	
		25 302	
0 ft 2 in. to 0 ft 5½ in. Heating Coils	28		350.54
9—1½ in. ϕ Pipe (closed) × 32 ft 0 in.		9 815	
3 ft 4 in. to 4 ft 2 in. Suction Line	80		44.59
1—10 in. ϕ Pipe (open) × 32 ft 0 in.		3 567	
2 ft 0 in. to 2 ft 3 in. Stripping Line	24		35.84
1—3 in. ϕ Pipe (open) × 32 ft 0 in.		860	
2 ft 0 in. to 12 ft 7⅜ in. Transverse Bulkhead Stiffeners	1019		3.05
7—Serrated 9 in. at 13.4 lb × 19 ft 0 in.		3 104	
0 ft 8 in. to 14 ft 1⅜ in. Transverse Bulkhead Stiffeners	1291		1.12
2—10 in. at 15.3 × 13 ft 5⅜ in.		1 445	
12 ft 10¾ in. to 14 ft 7⅜ in. Deck Stiffeners	165		52.55
3—7 in. at 9.8 × 19 ft 0 in. (Transverse Deck Stiffeners)		1 949	
9—Serrated 9 in. at 13.4 lb × 32 ft 0 in. (Longitudinal Stiffeners)		6 722	
		8 671	
		79 175	79 174.83

TABLE III.—RECAPITULATION OF DEADWOOD.

Increments	Heights	Cubic Inches per ⅛ in.	Barrels per ⅛ in.
16	0 ft 2 in.	166.41	0.0172
28	0 ft 5½ in.	516.95	0.0533
20	0 ft 8 in.	166.41	0.0172
114	1 ft 10¼ in.	167.53	0.0173
14	2 ft 0 in.	19.15	0.0020
24	2 ft 3 in.	58.04	0.0060
104	3 ft 4 in.	22.20	0.0023
80	4 ft 2 in.	66.79	0.0069
811	12 ft 7⅜ in.	22.20	0.0023
27	12 ft 10¾ in.	19.15	0.0020
117	14 ft 1⅜ in.	71.70	0.0074
48	14 ft 7⅜ in.	70.58	0.0073
		79,174.83	8.1825 bbl

TABLE IV.—RUN SHEET.

Increments	Tank Heights	Table Heights	Gross gal per ⅛ in.	Deadwood	Net bbl per ⅛ in.	Total
8	0 ft 1 in.	.....	0.2553	0.0172	0.2381	.....
4	0 ft 1½ in.	0 ft 0 in.	0.7659	0.0172	0.7487	4.8996
4	0 ft 2 in.	0 ft 0½ in.	0.7659	0.0172	0.7487	7.8944
2	0 ft 2½ in.	0 ft 0¾ in.	1.0850	0.0533	1.0317	9.9578
26	0 ft 5½ in.	0 ft 4 in.	1.1262	0.0533	1.0729	37.8532
20	0 ft 8 in.	0 ft 6⅛ in.	1.1262	0.0172	1.1090	60.0332
114	1 ft 10¼ in.	1 ft 8¾ in.	1.1262	0.0173	1.1089	186.4478
14	2 ft 0 in.	1 ft 10½ in.	1.1262	0.0020	1.1242	202.1866
24	2 ft 3 in.	2 ft 1½ in.	1.1262	0.0060	1.1202	229.0714
104	3 ft 4 in.	3 ft 2½ in.	1.1262	0.0023	1.1239	345.9570
80	4 ft 2 in.	4 ft 0½ in.	1.1262	0.0069	1.1193	435.5010
811	12 ft 7⅜ in.	12 ft 6⅛ in.	1.1262	0.0023	1.1239	1346.9839
27	12 ft 10¾ in.	12 ft 9½ in.	1.1262	0.0020	1.1242	1377.3373
103	13 ft 11⅝ in.	13 ft 10⅜ in.	1.1262	0.0074	1.1188	1492.5737
8	14 ft 0⅝ in.	13 ft 11⅜ in.	1.0856	0.0074	1.0782	1501.1993
6	14 ft 1⅜ in.	14 ft 0⅛ in.	0.9358	0.0074	0.9284	1506.7697
2	14 ft 1⅝ in.	14 ft 0⅜ in.	0.9358	0.0073	0.9285	1508.6267
8	14 ft 2⅝ in.	14 ft 1⅜ in.	0.7861	0.0073	0.7788	1514.8571
8	14 ft 3⅝ in.	14 ft 2⅜ in.	0.6364	0.0073	0.6291	1519.8899
8	14 ft 4⅝ in.	14 ft 3⅜ in.	0.4866	0.0073	0.4793	1523.7243
8	14 ft 5⅝ in.	14 ft 4⅜ in.	0.3369	0.0073	0.3296	1526.3611
8	14 ft 6⅝ in.	14 ft 5⅜ in.	0.1963	0.0073	0.1890	1527.8731
6	14 ft 7⅜ in.	14 ft 6⅛ in.	0.0653	0.0073	0.0580	1528.2211

TABLE V.—FACSIMILIE OF A BARGE TANK GAGE TABLE WITH VOLUMES RECORDED IN BARRELS.

BARGE NO. 20

QUICK OIL COMPANY

Barge Should Be on Even-Level-Keel When Gages Are Taken — Tank Number: 2-PORT

0 Feet				1 Feet				2 Feet				3 Feet				4 Feet				5 Feet			
in.		in.		in.		in.		in.		in.		in.		in.		in.		in.		in.		in.	
0[a]	4.89	6	55.59	0	108.82	6	162.05	0	215.62	6	269.53	0	323.47	6	377.29	0	431.02	6	484.95	0	538.89	6	592.84
1/8	5.64	1/8	56.70	1/8	109.93	3/8	163.16	1/8	216.74	1/8	270.65	1/8	324.60	1/8	378.41	1/8	432.14	1/8	486.07	1/8	540.02	1/8	593.97
1/4	6.39	1/4	57.81	1/4	111.04	1/4	164.26	1/4	217.86	1/4	271.77	1/4	325.72	1/4	379.53	1/4	433.26	1/4	487.20	1/4	541.14	1/4	595.09
3/8	7.14	3/8	58.92	3/8	112.15	3/8	165.37	3/8	218.98	3/8	272.90	3/8	326.85	3/8	380.65	3/8	434.38	3/8	488.32	3/8	542.27	3/8	596.21
1/2	7.89	1/2	60.03	1/2	113.26	1/2	166.48	1/2	220.10	1/2	274.02	1/2	327.97	1/2	381.77	1/2	435.50	1/2	489.44	1/2	543.39	1/2	597.34
5/8	8.92	5/8	61.14	5/8	114.36	5/8	167.59	5/8	221.23	5/8	275.15	5/8	329.09	5/8	382.89	5/8	436.62	5/8	490.57	5/8	544.51	5/8	598.46
3/4	9.95	3/4	62.25	3/4	115.47	3/4	168.70	3/4	222.35	3/4	276.27	3/4	330.22	3/4	384.01	3/4	437.74	3/4	491.69	3/4	545.64	3/4	599.59
7/8	11.03	7/8	63.35	7/8	116.58	7/8	169.81	7/8	223.47	7/8	277.39	7/8	331.34	7/8	385.13	7/8	438.87	7/8	492.81	7/8	546.76	7/8	600.71
1	12.10	7	64.46	1	117.69	7	170.92	1	224.59	7	278.52	1	332.47	7	386.25	1	439.99	7	493.94	1	547.89	7	601.83
1/8	13.17	1/8	65.57	1/8	118.80	1/8	172.03	1/8	225.71	1/8	279.64	1/8	333.59	1/8	387.37	1/8	441.12	1/8	495.06	1/8	549.01	1/8	602.96
1/4	14.24	1/4	66.68	1/4	119.91	1/4	173.14	1/4	226.83	1/4	280.77	1/4	334.71	1/4	388.49	1/4	442.24	1/4	496.19	1/4	550.13	1/4	604.08
3/8	15.32	3/8	67.79	3/8	121.02	3/8	174.24	3/8	227.95	3/8	281.89	3/8	335.81	3/8	389.60	3/8	443.36	3/8	497.31	3/8	551.26	3/8	605.20
1/2	16.39	1/2	68.90	1/2	122.13	1/2	175.35	1/2	229.07	1/2	283.01	1/2	336.96	1/2	390.72	1/2	444.49	1/2	498.43	1/2	552.38	1/2	606.33
5/8	17.46	5/8	70.01	5/8	123.24	5/8	176.46	5/8	230.19	5/8	284.14	5/8	338.08	5/8	391.84	5/8	445.61	5/8	499.56	5/8	553.51	5/8	607.45
3/4	18.54	3/4	71.12	3/4	124.34	3/4	177.57	3/4	231.31	3/4	285.26	3/4	339.21	3/4	392.96	3/4	446.74	3/4	500.68	3/4	554.63	3/4	608.58
7/8	19.61	7/8	72.23	7/8	125.45	7/8	178.68	7/8	232.44	7/8	286.39	7/8	340.33	7/8	394.08	7/8	447.86	7/8	501.81	7/8	555.75	7/8	609.70
2	20.68	8	73.34	2	126.56	8	179.79	2	233.56	8	287.51	2	341.46	8	395.20	2	448.98	8	502.93	2	556.88	8	610.82
1/8	21.75	1/8	74.44	1/8	127.67	1/8	180.90	1/8	234.69	1/8	288.63	1/8	342.58	1/8	396.32	1/8	450.11	1/8	504.05	1/8	558.00	1/8	611.95
1/4	22.83	1/4	75.55	1/4	128.78	1/4	182.01	1/4	235.81	1/4	289.76	1/4	343.70	1/4	397.44	1/4	451.23	1/4	505.18	1/4	559.13	1/4	613.07
3/8	23.90	3/8	76.66	3/8	129.89	3/8	183.12	3/8	236.93	3/8	290.88	3/8	344.83	3/8	398.56	3/8	452.35	3/8	506.30	3/8	560.25	3/8	614.20
1/2	24.97	1/2	77.77	1/2	131.00	1/2	184.23	1/2	238.06	1/2	292.00	1/2	345.95	1/2	399.68	1/2	453.48	1/2	507.43	1/2	561.37	1/2	615.32
5/8	26.05	5/8	78.88	5/8	132.11	5/8	185.33	5/8	239.18	5/8	293.13	5/8	347.07	5/8	400.80	5/8	454.60	5/8	508.55	5/8	562.50	5/8	616.44
3/4	27.12	3/4	79.99	3/4	133.22	3/4	186.44	3/4	240.31	3/4	294.25	3/4	348.19	3/4	401.92	3/4	455.73	3/4	509.67	3/4	563.62	3/4	617.57
7/8	28.19	7/8	81.10	7/8	134.32	7/8	187.57	7/8	241.43	7/8	295.38	7/8	349.31	7/8	403.04	7/8	456.85	7/8	510.80	7/8	564.74	7/8	618.69
3	29.27	9	82.21	3	135.43	9	188.69	3	242.55	9	296.50	3	350.43	9	404.16	3	457.97	9	511.92	3	565.87	9	619.82
1/8	30.34	1/8	83.32	1/8	136.54	1/8	189.82	1/8	243.68	1/8	297.62	1/8	351.55	1/8	405.27	1/8	459.10	1/8	513.05	1/8	566.99	1/8	620.94
1/4	31.41	1/4	84.42	1/4	137.65	1/4	190.94	1/4	244.80	1/4	298.75	1/4	352.67	1/4	406.39	1/4	460.22	1/4	514.17	1/4	568.12	1/4	622.06
3/8	32.48	3/8	85.53	3/8	138.76	3/8	192.06	3/8	245.92	3/8	299.87	3/8	353.79	3/8	407.51	3/8	461.35	3/8	515.29	3/8	569.24	3/8	623.19
1/2	33.56	1/2	86.64	1/2	139.87	1/2	193.19	1/2	247.05	1/2	301.00	1/2	354.91	1/2	408.63	1/2	462.47	1/2	516.42	1/2	570.36	1/2	624.31
5/8	34.63	5/8	87.75	5/8	140.98	5/8	194.31	5/8	248.17	5/8	302.12	5/8	356.03	5/8	409.75	5/8	463.59	5/8	517.54	5/8	571.49	5/8	625.44
3/4	35.70	3/4	88.86	3/4	142.09	3/4	195.44	3/4	249.30	3/4	303.24	3/4	357.15	3/4	410.87	3/4	464.72	3/4	518.66	3/4	572.61	3/4	626.56
7/8	36.78	7/8	89.97	7/8	143.20	7/8	196.56	7/8	250.42	7/8	304.37	7/8	358.26	7/8	411.99	7/8	465.84	7/8	519.79	7/8	573.74	7/8	627.68
4	37.85	10	91.08	4	144.30	10	197.68	4	251.54	10	305.49	4	359.38	10	413.11	4	466.97	10	520.91	4	574.86	10	628.81
1/8	38.96	1/8	92.19	1/8	145.41	1/8	198.81	1/8	252.67	1/8	306.62	1/8	360.50	1/8	414.23	1/8	468.09	1/8	522.04	1/8	575.98	1/8	629.93
1/4	40.07	1/4	93.30	1/4	146.52	1/4	199.93	1/4	253.79	1/4	307.74	1/4	361.62	1/4	415.35	1/4	469.21	1/4	523.16	1/4	577.11	1/4	631.05
3/8	41.18	3/8	94.40	3/8	147.63	3/8	201.06	3/8	254.92	3/8	308.86	3/8	362.74	3/8	416.47	3/8	470.34	3/8	524.28	3/8	578.23	3/8	632.18
1/2	42.28	1/2	95.51	1/2	148.74	1/2	202.18	1/2	256.04	1/2	309.99	1/2	363.86	1/2	417.59	1/2	471.46	1/2	525.41	1/2	579.36	1/2	633.30
5/8	43.39	5/8	96.62	5/8	149.85	5/8	203.30	5/8	257.16	5/8	311.11	5/8	364.98	5/8	418.71	5/8	472.58	5/8	526.53	5/8	580.48	5/8	634.43
3/4	44.50	3/4	97.73	3/4	150.96	3/4	204.42	3/4	258.29	3/4	312.24	3/4	366.10	3/4	419.83	3/4	473.71	3/4	527.66	3/4	581.60	3/4	635.55
7/8	45.61	7/8	98.84	7/8	152.07	7/8	205.54	7/8	259.41	7/8	313.36	7/8	367.22	7/8	420.95	7/8	474.83	7/8	528.78	7/8	582.73	7/8	636.67
5	46.72	11	99.95	5	153.18	11	206.66	5	260.54	11	314.48	5	368.34	11	422.06	5	475.96	11	529.90	5	583.85	11	637.80
1/8	47.83	1/8	101.06	1/8	154.28	1/8	207.78	1/8	261.66	1/8	315.61	1/8	369.46	1/8	423.18	1/8	477.08	1/8	531.03	1/8	584.97	1/8	638.92
1/4	48.94	1/4	102.17	1/4	155.39	1/4	208.90	1/4	262.78	1/4	316.73	1/4	370.58	1/4	424.30	1/4	478.20	1/4	532.15	1/4	586.10	1/4	640.05
3/8	50.05	3/8	103.28	3/8	156.50	3/8	210.02	3/8	263.91	3/8	317.85	3/8	371.70	3/8	425.42	3/8	479.33	3/8	533.28	3/8	587.22	3/8	641.17
1/2	51.16	1/2	104.38	1/2	157.61	1/2	211.14	1/2	265.03	1/2	318.98	1/2	372.82	1/2	426.54	1/2	480.45	1/2	534.40	1/2	588.35	1/2	642.29
5/8	52.27	5/8	105.49	5/8	158.72	5/8	212.26	5/8	266.16	5/8	320.10	5/8	373.93	5/8	427.66	5/8	481.58	5/8	535.52	5/8	589.47	5/8	643.42
3/4	53.37	3/4	106.60	3/4	159.83	3/4	213.38	3/4	267.28	3/4	321.23	3/4	375.05	3/4	428.78	3/4	482.70	3/4	536.65	3/4	590.59	3/4	644.54
7/8	54.48	7/8	107.71	7/8	160.94	7/8	214.50	7/8	268.40	7/8	322.35	7/8	376.17	7/8	429.90	7/8	483.82	7/8	537.77	7/8	591.72	7/8	645.67

Total Gage Height to Top of Gage Hatch: 17 ft — 0⅝ in. Ullage Table

April 26, 1955.

[a] Capacity below strike point.

NOTE: Capacity (in U. S. barrels) determined from linear measurements.