

CITY OF COLUMBUS, OHIO

**SUPPLEMENT 1060
METHOD FOR
TANK CAR AND TANK TRUCK VOLUME CALCULATIONS
OF ASPHALT MATERIALS FROM NET WEIGHTS**

October 31, 2011

- 1060.01 General**
- 1060.02 Calculating Volume from Net Weight**
- 1060.03 Calculating Volume Correction for Actual Product Temperature**

1060.01 General. The importance of carefully weighing uncalibrated tank trucks and distributors cannot be overemphasized in the correct calculation of volume when asphalt materials are received by tank truck.

1060.02 Calculating Volume from Net Weight.

1. Shipments of asphalt materials in uncalibrated tank trucks, cars and distributors must be weighed to determine the net weight of the material and the net weight converted to volume at the specified pay temperature.
2. The volume to be paid for will be calculated by using the following formula:

$$\text{Gallons to be paid for} = \text{Net weight in Lbs.} / (\text{“K”} \times \text{Specific Gravity})$$

$$\text{Liters to be paid for} = \text{Net weight in Kilograms} / (\text{“K”} \times \text{Specific Gravity})$$

Where “K” is a variable constant depending upon the coefficients of expansion and the pay temperatures for the various materials. The pay temperatures, coefficients of expansion and the values of “K” are given in Table A.

3. Formulas for calculating pay volume from net weight follow. Select the formula which includes under its heading the grade of material in the transport, car or distributor. The material producer’s previous years average specific gravity shall be used to determine which formula is to be used in making the calculation for 702.02 and 702.03 materials. Where a producer average specific gravity is not available use the specific gravity of the original material shown on the Laboratory report.

$$\text{Gallons (Liters)} = \text{Net weight Lbs. (kilograms)} / (\text{K} \times \text{Specific Gravity})$$

Table A - Formula Values

Item	Material	Specific Gravity [77 °F (25 °C)]	t [°F (°C)]	c	K
702.01	PG Binder w/ or w/o Polymer	Any	300.0 (148.9)	0.00035 (0.00063)	7.690 (0.9215)
702.02	MC-30, 70, 250, 800, 3000	0.8458 to 0.9621	100.0 (37.8)	0.00040 (0.00072)	8.236 (0.9869)
		0.9622	100.0 (37.8)	0.00035 (0.00063)	8.245 (0.988)
702.03	CBAE 350, 800; CBAE 350, 800 Special	0.9622	100.0 (37.8)	0.00035 (0.00063)	8.245 (0.988)
		0.8458 to 0.9621	100.0 (37.8)	0.00040 (0.00072)	8.236 (0.9869)
	Primer 20, 100	0.8458 to 0.9621	100.0 (37.8)	0.00040 (0.00072)	8.236 (0.9869)
702.04	Asphalt Emulsions	0.9622	100.0 (37.8)	0.00035 (0.00063)	8.245 (0.988)
702.05	Asphalt Primer for Waterproofing	Any	60.0 (15.5)	0.00040 (0.00072)	8.368 (1.0027)

4. Calculations and other pertinent information should be shown on Form MR-575 (attached). Attach this completed form and submit with the invoice for payment for asphalt material where this method of measurement applies. Use this form as a record on contract projects on which asphalt materials are furnished by weight.

1060.03 Calculating Volume Correction for Actual Product Temperature. The following information is to be used to calculate the volume of asphalt materials, heating oils, diesel fuels, kerosene and gasoline when tank car, truck transport or distributor calculations are from weights taken at a product temperature different from the specified pay temperature shown under 109.01 Measurement of Quantities.

Table B - Index Of Formulas

Specification	Material	Pay Temperature (based on volume)	Formula No.
702.01	PG Binder w/ or w/o polymer	300 °F (148.9 °C)	4
702.02	MC	100 °F (37.8 °C)	3
702.03	CBAE	100 °F (37.8 °C)	3
	Primer 20, 100	100 °F (37.8 °C)	3
702.04	Asphalt Emulsion	100 °F (37.8 °C)	3
702.05	Asphalt Primer for Waterproofing	60 °F (15.5 °C)	2
702.07	MWS Emulsion	100 °F (37.8 °C)	3
702.13	Rubberized Asphalt Emulsion	60 °F (15.5 °C)	3
ASTM D-975	Diesel Fuel Oils No. 1D & 2D	60 °F (15.5 °C)	2
	Gasoline	60 °F (15.5 °C)	1
ASTM D-396	Heating Oils No. 1 & 2	60 °F (15.5 °C)	2
Federal VVK-211-d	Kerosene	60 °F (15.5 °C)	2

Example:

Asphalt Material 702.02, MC-800

Gallons at specified pay temperature, calculated from tank truck or distributor net weights =
6,300 Gal.

Measured temperature of product in tank truck or distributor = **203°F**

Average Producer Specific Gravity 77 _F (25 _C) or from Laboratory Report = **0.973**

Adjust for actual temperature, MC-800 is covered by Formula 3, Part 1 or 0.00035 per degree F.

Calculate “D” = **0.9640.**

Calculate actual volume, **6,300 ÷ 0.9640 = 6,535** net gallons at measured product temperature of 203 °F.

FORMULA 1
VOLUME CORRECTION FOR GASOLINE

Specified pay temperature - 60.0 °F (15.5 °C)

t = Observed product temperature in degrees Fahrenheit (Celsius)

D = Divisor for correcting volumes for temperatures other than 60 °F

Use Part 1 or Part 2 in accordance with Degrees (60F/60F) A.P.I. shown on Laboratory report or producer's current average.

Formula 1

Part 1

51.0 to 63.9 degrees A.P.I. at 60. 0°F (15.5 °C)

Coefficient of Expansion per degree F (C) = 0.00060 (0.00108)

60.0 (15.5) - t (Actual Product Temp F (C)) = A

A x 0.0006 (or .00108 for C) = B

1.0000 + B = D

Formula 1

Part 2

64.0 to 78.9 degrees A.P.I. at 60.0 °F (15.5 °C)

Coefficient of Expansion per degree F (C) = 0.00070 (0.00126)

60.0 (15.5) - Actual Product Temperature F (C) = A

A x 0.00070 (or 0.00126 for C) = B

1.0000 + B = D

FORMULA 2
VOLUME CORRECTION FORMULAS FOR:

702.05 Asphalt Primer for Waterproofing
ASTM D-396 Heating Oils No. 1 and No. 2
ASTM D-975 Diesel Fuel Oils No. 1D and No. 2D
VVK-211-d Kerosene

Specified pay temperature - 60.0 °F (15.5 °C)

t = Observed product temperature in degrees Fahrenheit (Celsius)

D = Divisor for correcting volumes for temperatures other than 60°F

Use Part 1 or Part 2 in accordance with degrees (60 °F/60 °F) A.P.I. or Specific Gravity (77 °F/25 °C) shown on Laboratory report or producer's current average.

Formula 2

Part 1

35.0 to 50.9 degrees A.P.I.

Specific Gravity 0.775 to 0.850

Coefficient of Expansion per degree F (C) = 0.00050 (0.00090)

60.0 (15.5) - t (Actual Product Temperature F (C)) = A

A x 0.00050 (or 0.00090 for C) = B

1.0000 + B = D

Formula 2

Part 2

15.0 to 34.9 degrees A.P.I.

Specific Gravity 0.850 to 0.960

Coefficient of Expansion per degree F (C) = 0.00040

60.0 (15.5) - Actual Product Temperature F (C) = A

A x 0.00040 (or 0.00072 for C) = B

1.0000 + B = D

FORMULA 3
VOLUME CORRECTION TABLE FOR:

702.02 MC 30, 70, 250, 800, 3000
702.03 CBAE 350, 800; CBAE 350, 800 Special
702.04 Asphalt Emulsions
702.07 MWS Emulsion
702.13 Rubberized Asphalt Emulsion

Specified pay temperature 100.0 °F (37.8 °C)

t = Observed product temperature in degrees Fahrenheit (Celsius)

D = Divisor for correcting volumes for temperatures other than 100 °F

Use Part 1 or Part 2 in accordance with Specific Gravity (77 °F/25 °C) shown on Laboratory report or producer's current average.

Formula 3

Part 1

Specific Gravity equal to or greater than 0.9622 at 77 °F (25 °C)

Coefficient of Expansion per degree F (C) = 0.00035 (0.00063)

$$100.0 (37.8) - t (\text{Actual Product Temperature F (C)}) = A$$

$$A \times 0.00035 (\text{or } 0.00063 \text{ for C}) = B$$

$$1.0000 + B = D$$

Formula 3

Part 2

Specific Gravity Range 0.8458 to 0.9621 (77 °F/ 25 °C)

Coefficient of Expansion per degree F (C) = 0.00040 (0.00072)

$$100.0 (37.8) - t (\text{Actual Product Temperature F (C)}) = A$$

$$A \times 0.00040 (\text{or } 0.00072 \text{ for C}) = B$$

$$1.0000 + B = D$$

FORMULA 4
VOLUME CORRECTION TABLE FOR:

702.01 PG Binder w/ or w/o polymer

Specified pay temperature 300.0 °F (148.9 °C)

t = Observed product temperature in degrees Fahrenheit (Celsius)

D = Divisor for correcting volumes for temperatures other than 300.0 °F (148.9 °C)

Coefficient of Expansion per degree F (C) = 0.00035 (0.00063)

Formula 4

$$300.0 (148.9) - t (\text{Actual Product Temperature F (C)}) = A$$

$$A \times 0.00035 (\text{or } 0.00063 \text{ for C}) = B$$

$$1.000 + B = D$$

