WIL-576-20.11 Part 2

PID No. 99575

Pavement Quantity Calculations

January 2020
Revised May 2020

KOHLI & KALIHER ASSOCIATES, INC.
ENGINEERS AND SURVEYORS
2244 Baton Rouge Ave., Lima, Ohio 45805

Form #2

Calculations For WIL-576-20.11 Pavement Quantity Calculations

Computed By MAD Date 12-30-19 Sheet 1 of 9
Checked By DJK Date 1-9-20
REV. MAD 5-5-20

PAVEMENT:

Item 441-50000 Asphalt Concrete Surface Course, Type 1, (448), PG64-22

Roadway Rear of Bridge: Avg. Width = $\frac{(13.5' + 10.0') + (16.0' + 16.0')}{2}$ = 27.75'
Length = 136.45'
Thickness = ~~0.125' (2 - 1½" layers)~~ 1½" = 0.125'
Volume = 27.75' (136.45') (~~0.125'~~ 0.125') ÷ 27 = ~~35.06~~ 17.53 CY

Add Safety Edge:

Volume = ½ (~~3"~~ 3.25" / 12) (4" / 12) (136.45') (2 sides) ÷ 27 = ~~0.48~~ 0.46 CY

Roadway Fwd. of Bridge: Avg. Width = $\frac{(16.0' + 16.0') + (12.0' + 12.0')}{2}$ = 28.00'
Length = 140.45'
Thickness = ~~0.125'~~ 0.125'
Volume = 28.00' (140.45') (~~0.125'~~ 0.125') ÷ 27 = ~~36.44~~ 18.21 CY

Width = 24.00'
Length = 300.00'
Thickness = ~~0.125'~~ 0.125'
Volume = 24.00' (300.00') (~~0.125'~~ 0.125') ÷ 27 = ~~66.67~~ 33.33 CY

Add Safety Edge: Volume = ½ (~~3"~~ 3.25" / 12) (4" / 12) (140.45' + 300.00') (2 sides) ÷ 27 = ~~1.36~~ 1.47 CY

Approach Slabs: Width = 32.00'
Length = 20.00' each
Thickness = ~~0.125' (2 - 1½" layers)~~ 0.125"
Volume = 32.00' (20.00') (2) (~~0.125~~ 0.125') ÷ 27 = ~~11.85~~ 5.93 CY

Total = ~~35.06~~ 17.53 + ~~0.48~~ 0.46 + ~~36.44~~ 18.21 + ~~66.67~~ 33.33 + ~~1.36~~ 1.47 + ~~11.85~~ 5.93 = ~~151.77~~ 76.93 CY

~~152 CY~~

77 CY

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Computed By MAD Date 5-5-20 Sheet 2 of 9
Checked By DJK Date 5-12-20

Item 441- 50300 Asphalt Concrete Intermediate Course, Type 2, (448)

Roadway Rear of Bridge: Avg. Width = $\frac{(13.5' + 10.0') + (16.0' + 16.0')}{2}$ = 27.75' ✓
Length = 136.45' ✓
Thickness = $1\frac{3}{4}$" = 0.146' ✓
Volume = 27.75'(136.45')(0.146') ÷ 27 = 20.48' CY ✓

Roadway Fwd. of Bridge: Avg. Width = $\frac{(16.0' + 16.0') + (12.0' + 12.0')}{2}$ = 28.00'
Length = 140.45'
Thickness = 0.146'
Volume = 28.00'(140.45')(0.146') ÷ 27 = 21.27 CY ✓

Width = 24.00'
Length = 300.00'
Thickness = 0.146'
Volume = 24.00'(300.00')(0.146') ÷ 27 = 38.93 CY ✓

Approach Slabs: Width = 32.00'
Length = 20.00' each
Thickness = 0.146'
Volume = 32.00'(20.00')(2)(0.146') ÷ 27 = 6.92 CY ✓

Total = 20.48 + 21.27 + 38.93 + 6.92 = 87.60 CY ✓

88 CY ✓

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Computed By MAD Date 12-30-19 Sheet 3 of 9
Checked By DJK Date 1-9-20
REV. MAD 5-5-20

Item 407 - ~~40000~~ 20000 Non-Tracking Tack Coat

Roadway Rear of Bridge:
Avg. Width = 27.75'
Length = 136.45'
Rate = 0.055 Gal/SY for new asphalt
Volume = 27.75'(136.45')$(\frac{1}{9})$(2 applications)(0.055) = 46.3 Gal

Roadway Fwd. of Bridge:
Avg. Width = 28.00'
Length = 140.45'
Rate = 0.055 Gal/SY
Volume = 28.00'(140.45')$(\frac{1}{9})$(2 applications)(0.055) = 48.1 Gal

Avg. Width = 24.00'
Length = 300.00'
Rate = 0.055 Gal/SY
Volume = 24.00'(300.00')$(\frac{1}{9})$(2 applications)(0.055) = 88.0 Gal

Approach Slabs:
Width = 32.00'
Length = 20.00' each
Rate = (0.055 new asphalt + 0.07 PCC) ÷ 2 = 0.0625
Volume = 32.00'(20.00')(2)$(\frac{1}{9})$(2 applications)(0.0625) = 17.8 Gal

Total = 46.3 + 48.1 + 88.0 + 17.8 = 200.2 Gal

200 Gal

Item 301 - 46000 Asphalt Concrete Base, PG64-22

Roadway Rear of Bridge:
Avg. Width = 27.75' + $\frac{8"}{12}$ = 28.42'
Length = 136.45'
Thickness = 0.50'
Volume = 28.42'(136.45')(0.50') ÷ 27 = 71.81 CY

Roadway Fwd. of Bridge:
Avg. Width = 28.00' + $\frac{8"}{12}$ = 28.67'
Length = 140.45'
Thickness = 0.50'
Volume = 28.67'(140.45')(0.50') ÷ 27 = 74.57 CY

Avg. Width = 24.00' + $\frac{8"}{12}$ = 24.67'
Length = 300.00'
Thickness = 0.50'
Volume = 24.67'(300.00')(0.50') ÷ 27 = 137.04 CY

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Calculations For WIL-576 20.11 Pavement Quantity Calculations

Computed By MAD Date 12-30-19 Sheet 4 of 9
Checked By DJK Date 1-9-20

Item 301- 46000 Asphalt Concrete Base, PG64-22 (Cont'd.)

Total = 71.81 + 74.57 + 137.04 = 283.42 CY

283 CY

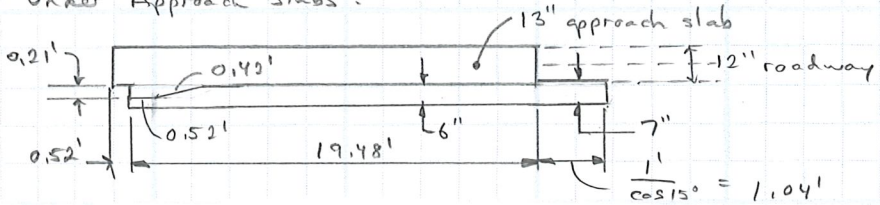
Item 304- 20000 Aggregate Base

Roadway Rear of Bridge: Avg. Width = 27.75' + $\frac{20''}{12}$ = 29.42'
Length = 136.45'
Thickness = 0.50'
Volume = 29.42'(136.45')(0.50') ÷ 27 = 74.33 CY

Roadway Fwd. of Bridge: Avg. Width = 28.00' + $\frac{20''}{12}$ = 29.67'
Length = 140.45'
Thickness = 0.50'
Volume = 29.67'(140.45')(0.50') ÷ 27 = 77.17 CY

Avg. Width = 24.00' + $\frac{20''}{12}$ = 25.67'
Length = 300.00'
Thickness = 0.50'
Volume = 25.67'(300.00')(0.50') ÷ 27 = 142.61 CY

Under Approach Slabs:



Width = 33.0'

Main area under slab = 19.48'(0.50')(33.0') ÷ 27 = 11.90 CY
Extension past slab = 1.04'(0.58')(33.0') ÷ 27 = 0.74 CY
Subtract = [(0.21')(0.52') + ½(0.21')(0.42')](32.0' wide slab) ÷ 27 = -0.18 CY

Total Approach Slabs = (11.90 + 0.74 - 0.18)(2 slabs) = 24.92 CY

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Calculations For WIL-576-20.11 Pavement Quantity Calculations

Computed By MAD Date 12-31-19 Sheet 5 of 9
Checked By DJK Date 1-9-20

Item 304-20000 Aggregate Base (Cont'd.)

Shoulders: Plan Areas:

Left Rear: $(106132.54 - 106100)(2.0) + (106232.16 - 106132.54)\left(\frac{2.0' + 0.0'}{2}\right) = 164.70$ SF

Right Rear: $(106194.74 - 106100)(2.0) + (106240.74 - 106194.74)\left(\frac{2.0' + 0.0'}{2}\right) = 235.48$ SF

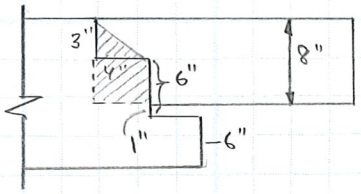
Left Fwd.: $(106425.11 - 106355.26)\left(\frac{0.0' + 2.0'}{2}\right) + (106800 - 106425.11)(2.0') = 819.63$ SF

Right Fwd.: $(106429.60 - 106363.84)\left(\frac{0.0' + 2.0'}{2}\right) + (106800 - 106429.60)(2.0') = 806.56$ SF

Thickness = 8"

Volume = $(164.70 + 235.48 + 819.63 + 806.56)\left(\frac{8"}{12}\right) \div 27 = 50.03$ CY

Subtract Pavement Step + Safety Edge:



Cross-Hatched Area = $\left[\frac{1}{2}(3")(4") + 4"(5")\right] \div 12^2$
= 0.18 SF

Subtract this area from shoulder widths down to 4" 2" (avg.)

Left Rear Length =	115.56'	123.79'
Right Rear Length =	133.07'	137.06'
Left Fwd. Length =	433.10'	438.99'
Right Fwd. Length =	425.20'	430.71'

- 7.54 CY

Volume = $(115.56 + 133.07 + 433.10 + 425.20)(0.18) \div 27 = -7.38$ CY

Total = $74.33 + 77.17 + 142.61 + 24.92 + 50.03 - 7.38 = 361.68$ CY

362 CY ✓

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Computed By MAD Date 12-31-17 Sheet 6 of 9
Checked By DJK Date 1-9-20

ROADWAY:

Item 204-10000 Subgrade Compaction

Compact 18" beyond edges of pavement and approach slabs.

Roadway Rear of Bridge: Avg. Width = 27.75' + $\left(\frac{18"}{12}\right)$(2 sides) = 30.75'
Length = 136.45'
Area = 30.75'(136.45') ÷ 9 = 466.20 SY

Roadway Fwd. of Bridge: Avg. Width = 28.00' + $\left(\frac{18"}{12}\right)$(2 sides) = 31.00'
Length = 140.45'
Area = 31.00'(140.45') ÷ 9 = 483.77 SY

Width = 24.00' + $\left(\frac{18"}{12}\right)$(2 sides) = 27.00'
Length = 300.00'
Area = 27.00'(300.00') ÷ 9 = 900.00 SY

Approach Slabs: Width = 32.00' + $\left(\frac{18"}{12}\right)$(2 sides) = 35.00'
Length = 20.0' − $\left(\frac{0.5}{\cos 15°}\right)$ − $\left(\frac{2.0}{\cos 15°}\right)$ = 17.41'
Area = 35.00'(17.41')(2 slabs) ÷ 9 = 135.41 SY

Total = 466.20 + 483.77 + 900.00 + 135.41 = 1985.38 SY

1985 SY

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Calculations For WIL-576-20.11 Pavement Quantity Calculations

Computed By MAD Date 5-5-20 Sheet 7 of 9
Checked By DJK Date 5-12-20

Item 204-13000 Excavation of Subgrade

Depth = 12" below bottom of Item 304 as per Typical Sections → do not include Item 202 Pavement Removed, Asphalt in this quantity

Width = 18" beyond edge of pavement.

Use end areas from Cross Sections:

Fwd. = 0
Sta. 1062+00: Back = ~~10~~ 10.71 ft²
Sta. 1061+50: ~~31~~ 29.77 ft²
Sta. 1061+00: Fwd. = ~~28~~ 27.14 ft²
Back = 0

$\left(\frac{10+31}{2}\right)(50') \div 27 =$ ~~38.0~~ 37.48 CY

$\left(\frac{31+28}{2}\right)(50') \div 27 =$ ~~54.6~~ 52.69 CY

Total from Sta. 1061+00 to 1062+00 = ~~38.0~~ 37.48 + ~~54.6~~ 52.69 = ~~92.6~~ 90.17 CY

Fwd. = 0
Sta. 1068+00: Back = ~~28~~ 27.53 ft²
Sta. 1067+50: ~~28~~ 27.57 ft²
Sta. 1067+00: ~~28~~ 26.63 ft²
Sta. 1066+50: Fwd. = ~~18~~ 15.06 ft²
Back = 0

$\left(\frac{28+28}{2}\right)(50') \div 27 =$ ~~51.9~~ 51.02 CY

$\left(\frac{28+28}{2}\right)(50') \div 27 =$ ~~51.9~~ 50.19 CY

$\left(\frac{28+18}{2}\right)(50') \div 27 =$ ~~42.6~~ 38.60 CY

Total from Sta. 1066+50 to 1068+00 = ~~51.9~~ 51.02 + ~~51.9~~ 50.19 + ~~42.6~~ 38.60 = ~~146.4~~ 139.81 CY

Grand Total = ~~92.6~~ 90.17 + ~~146.4~~ 139.81 = ~~239.0~~ 229.98 CY

230
~~239~~ CY

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Computed By MAD Date 5-5-20 Sheet 8 of 9
Checked By DJK Date 5-12-20

Item 204-30010 Granular Material, Type B

This quantity will be greater than the Excavation of Subgrade quantity due to Item 202 – Pavement Removed, Asphalt being paid for separately.

Depth = 12" below bottom of Item 304 as per Typical Sections
Width = 18" beyond edge of pavement

Use end areas from Cross Sections:

Sta. 1062+00: Fwd. = 0, Back = 32.9 ft²
Sta. 1061+50: 29.7 ft²
Sta. 1061+00: Fwd = 26.5 ft², Back = 0

$\left(\frac{32.9 + 29.7}{2}\right)(50') \div 27 = 58.0$ CY

$\left(\frac{29.7 + 26.5}{2}\right)(50') \div 27 = 52.0$ CY

Total from Sta. 1061+00 to 1062+00 = 58.0 + 52.0 = 110.0 CY

Sta. 1068+00: Fwd. = 0, Back = 27.0 ft²
Sta. 1067+50: 27.0 ft²
Sta. 1067+00: 27.0 ft²
Sta. 1066+50: Fwd. = 27.0 ft², Back = 0

$\left(\frac{27.0 + 27.0}{2}\right)(50') \div 27 = 50.0$ CY

$\left(\frac{27.0 + 27.0}{2}\right)(50') \div 27 = 50.0$ CY

$\left(\frac{27.0 + 27.0}{2}\right)(50') \div 27 = 50.0$ CY

Total from Sta. 1066+50 to 1068+00 = 50.0 + 50.0 + 50.0 = 150.0 CY

Grand Total = 110.0 + 150.0 = 260.0 CY

260 CY

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Computed By MAD Date 5-5-20 Sheet 9 of 9
Checked By DJK Date 5-12-20

Item 204-50000 Geotextile Fabric

Fwd. = 0
Sta. 1062+00 : Back = 32.7' → $\left(\frac{32.7' + 29.8'}{2}\right)(50') \div 9 = 173.7$ SY
Sta. 1061+50 : 29.8' → $\left(\frac{29.8' + 26.5'}{2}\right)(50') \div 9 = 155.8$ SY
Sta. 1061+00 : Fwd. = 26.5'
Back = 0

Total from Sta. 1061+00 to 1062+00 = 173.7 + 155.8 = 329.5 SY

Fwd. = 0
Sta. 1068+00 : Back = 27.0' → $\left(\frac{27.0' + 27.0'}{2}\right)(50') \div 9 = 150.0$ SY
Sta. 1067+50 : 27.0' → $\left(\frac{27.0' + 27.0'}{2}\right)(50') \div 9 = 150.0$ SY
Sta. 1067+00 : 27.0' → $\left(\frac{27.0' + 27.0'}{2}\right)(50') \div 9 = 150.0$ SY
Sta. 1066+50 : Fwd. = 27.0'
Back = 0

Total from Sta. 1066+50 to 1068+00 = 150.0 + 150.0 + 150.0 = 450.0 SY

Grand Total = 329.5 + 450.0 = 779.5 SY

780
~~779~~ SY