

VAN-MARKET STREET
STRUCTURE
QUANTITY
CALCULATIONS

PID NO. 106341

February 2020

Calculations For VAN-Market Street PID No. 106341

Structure Quantity Calculations

Computed By DJK Date 2-26-20 Sheet 1 of 6
 Checked By MAD Date 3-2-20

Item 202E11203 Portions of Structure Removed, over 20 Foot Span, As Per Plan

LS ✓

Item 202E23500 Wearing Course Removed

CADD measured area = $1355.22 \text{ ft}^2 \div (9 \text{ ft}^2/\text{yd}^2) = 150.58 \text{ yd}^2$ ✓

151 SY ✓

Item 503E11100 Cofferdams and Excavation Bracing

LS ✓

Item 503E21300 Unclassified Excavation

LS ✓

Item 509E10000 Epoxy Coated Reinforcing Steel

Abutments = 3182 lbs. ✓
 Superstructure = 9980 lbs. ✓
 Railing on Superstructure = 2205 lbs. ✓
 Railing on Approach Slabs = 1122 lbs. ✓
 Total = 16,489 lbs. ✓

16,489 LBS ✓

Item 510E10000 Dowel Holes with Nonshrink, Nonmetallic Grout

A501 - 64 (2) = 128 ✓
 A504 - 3 (2) = 6 ✓
 A505 - 3 (1) = 3 ✓
 A506 - 3 (2) = 6 ✓
 A507 - 3 (1) = 3 ✓
 A527 - 4 (2) = 8 ✓
 A529 - 2 (2) = 4 ✓
 A531 - 3 (1) = 3 ✓
 A532 - 3 (1) = 3 ✓
 Total = 164 ✓

164 EACH ✓

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Item 51E31610 Class QC2 Concrete, Superstructure

Deck Thickness = 6" min. ✓

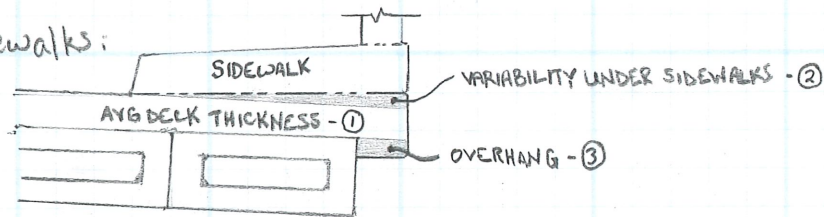
Camber = 1/8" ∴ Avg. Deck Thickness = $(\frac{6" + 7\frac{1}{8}"}{2}) = 6.5625" = 0.547\text{ft}$ ✓

Deck Width = 42'-4" o/o ✓

Bridge Limits = 44.43' ✓

Volume = $(0.547\text{ft})(42.33\text{ft})(44.43\text{ft}) \div (27\text{ft}^3/\text{yd}^3) = 38.02\text{yd}^3 - \textcircled{1}$ ✓

Deck varies under sidewalks:



Width = 7.167 ft ✓

Avg. Th. = $(7.167)(0.016)(\frac{1}{2}) = 0.057\text{ft}$ ✓

Bridge Limits = 44.43 ft ✓

Volume = $(7.167\text{ft})(0.057\text{ft})(44.43\text{ft})(2\text{ sides}) \div (27\text{ft}^3/\text{yd}^3) = 1.34\text{yd}^3 - \textcircled{2}$ ✓

Overhang:

Width = $14" - \frac{1}{2}">(4.5) = 11.75" = 0.98'$ ✓

Avg. Th. = $20" - 9.5" - 6.5625" - (7.167)(12\frac{1}{4})(0.016) + 0.016(11.75)(\frac{1}{2}) = 2.655" = 0.22\text{ft}$ ✓

Bridge Limits = 44.43 ft ✓

Volume = $(0.98\text{ft})(0.22\text{ft})(44.43\text{ft})(2\text{ sides}) \div (27\text{ft}^3/\text{yd}^3) = 0.71\text{yd}^3 - \textcircled{3}$ ✓

Integral Backwall:

Above Optional Joint:

Height = $12" - 7\frac{1}{8}" = 4\frac{3}{8}" = 0.41'$ ✓

Width = $23'-4\frac{3}{4}" + 23'-5\frac{3}{8}" = 46.84\text{ft}$ (R.A.) ✓

Length = 1'-6" ✓

East end of fwd. backwall
 $\frac{1}{2}[(6.75" + 6" \sin(25.4855)) + 6.75"] (6")(12") \div 27 = 0.01\text{yd}^3$

Volume = $(0.41\text{ft})(46.84\text{ft})(1.5\text{ft})(2\text{ backwalls}) \div (27\text{ft}^3/\text{yd}^3) = 2.13\text{yd}^3$ ✓

Below Optional Joint:

Height = $775.76 - 1' - 773.68 = 1.08'$ ✓

Width = $3.5' \pm 2.0'$

Length = 46.84 ft ✓

Volume = $(1.08\text{ft})(3.5\text{ft})(46.84\text{ft})(2\text{ backwalls}) \div (27\text{ft}^3/\text{yd}^3) = 13.12\text{yd}^3$ ✓

Total = $38.02\text{yd}^3 + 1.34\text{yd}^3 + 0.71\text{yd}^3 + 2.13\text{yd}^3 + 0.01\text{yd}^3 + 13.12\text{yd}^3 = 55.33\text{yd}^3$ ✓

50
55 CY



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Item 511E34449 Class QC2 Concrete, Bridge Deck (Parapet), As Per Plan

Texas Railing on both bridge deck and approach slabs are included in this item.

$$\text{Cross-Sectional Area of Railing} = 3.038 \text{ ft}^2 \text{ (CADD measured)}$$

$$\text{Deduction for each window: } \left[\underbrace{(0.3403 \text{ ft}^2)}_{\text{CADD measured}} (1.94 \text{ ft}) + 2 \left(\underbrace{1.6325 \text{ ft}^2}_{\text{CADD measured}} (0.125 \text{ ft}) \right) \right] \div (27 \text{ ft}^3/\text{yd}^3) \\ = 0.0396 \text{ yd}^3 \text{ per window}$$

Length of Railing (measured along \mathcal{C} of railing):

$$\begin{aligned} \text{Left} &= \frac{1}{2}(13.5' + 13.03')(2) + 44.99' = 71.52' \quad \# \text{ windows} = 36 \\ \text{Right} &= \frac{1}{2}(13.5' + 13.03') + 44.99' = 58.26' \quad \# \text{ windows} = 30 \end{aligned}$$

$$\begin{aligned} \text{Total Volume} &= (3.038 \text{ ft}^2)(71.52 \text{ ft} + 58.26 \text{ ft}) \div (27 \text{ ft}^3/\text{yd}^3) - (0.0396 \text{ yd}^3)(36 + 30) \\ &= 11.99 \text{ yd}^3 \end{aligned}$$

12 CY

Item 511E44110 Class QC1 Concrete, Abutment Not Including Footing

$$\begin{aligned} \frac{1}{2}(773.29 + 773.68) - 771.75 &= 1.735' = \frac{1}{2}(773.82 + 773.43) - 771.89 \\ \frac{1}{2}(773.68 + 773.37) - 771.75 &= 1.775' = \frac{1}{2}(773.51 + 773.82) - 771.89 \end{aligned}$$

$$\begin{aligned} [(24.02 \text{ ft})(1.735 \text{ ft}) + (23.98 \text{ ft})(1.775 \text{ ft})](3.5 \text{ ft})(2 \text{ abutments}) \div (27 \text{ ft}^3/\text{yd}^3) &= 21.84 \text{ yd}^3 \\ \text{Keyway: } 0.25'(1.00')(24.02 + 23.98)(2 \text{ abutts}) \div 27 &= 0.89 \text{ yd}^3 \end{aligned}$$

SE wingwall:

$$\begin{aligned} \left[\frac{1}{2}(4.5 \text{ ft} + 5.21 \text{ ft})(771.75 - 768.00)(1.5 \text{ ft}) + \left[\frac{776.30 + 775.16}{2} - 771.75 \right] (5.28 \text{ ft})(1.5 \text{ ft}) + \right. \\ \left. \frac{1}{2}(1 \text{ ft} + 1.72 \text{ ft})(776.30 - 771.75)(1.5 \text{ ft}) \right] \div (27 \text{ ft}^3/\text{yd}^3) &= 2.52 \text{ yd}^3 \end{aligned}$$

SW wingwall:

$$\begin{aligned} \left[\frac{1}{2}(6.58 \text{ ft} + 5.875 \text{ ft})(771.75 - 768.00)(1.5 \text{ ft}) + \left[\frac{776.36 + 775.45}{2} - 771.75 \right] (6 \text{ ft})(1.5 \text{ ft}) + \right. \\ \left. \frac{1}{2}(1 \text{ ft} + 1.72 \text{ ft})(776.30 - 771.75)(1.5 \text{ ft}) \right] \div (27 \text{ ft}^3/\text{yd}^3) &= 3.03 \text{ yd}^3 \end{aligned}$$

NW wingwall:

$$\begin{aligned} \left[\frac{1}{2}(5.30 \text{ ft} + 6.01 \text{ ft})(771.89 - 768.00)(1.5 \text{ ft}) + \left[\frac{775.93 + 776.50}{2} - 771.89 \right] (5.28 \text{ ft})(1.5 \text{ ft}) + \right. \\ \left. \frac{1}{2}(1 \text{ ft} + 1.72 \text{ ft})(776.50 - 771.89)(1.5 \text{ ft}) \right] \div (27 \text{ ft}^3/\text{yd}^3) &= 2.84 \text{ yd}^3 \end{aligned}$$

NE wingwall:

$$\begin{aligned} \left[\frac{1}{2}(5.78 \text{ ft} + 5.07 \text{ ft})(771.89 - 768.00)(1.5 \text{ ft}) + \left[\frac{776.45 + 774.91}{2} - 771.89 \right] (6 \text{ ft})(1.5 \text{ ft}) + \right. \\ \left. \frac{1}{2}(1 \text{ ft} + 1.72 \text{ ft})(776.45 - 771.89)(1.5 \text{ ft}) \right] \div (27 \text{ ft}^3/\text{yd}^3) &= 2.78 \text{ yd}^3 \end{aligned}$$

$$\begin{aligned} \text{Total Volume} &= 21.84 \text{ yd}^3 + 2.52 \text{ yd}^3 + 3.03 \text{ yd}^3 + 2.84 \text{ yd}^3 + 2.78 \text{ yd}^3 + 0.89 \text{ yd}^3 \\ &= 33.0 \text{ yd}^3 \end{aligned}$$

34
33 CY



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Item 511E51510 Class QC2 Concrete, Sidewalk

$$\left[\frac{1}{2}(8'' + 9\frac{1}{2}'') \div 12'' \text{ft} (6\text{ft}) + \left(9\frac{1}{2}'' \div 12\right) (1.167\text{ft}) \right] (44.43\text{ft}) \div (27\text{ft}^3/\text{yd}^3) (2\text{ sides}) = 17.44\text{yd}^3$$

Approach Slab: Avg. th. @ bridge = $\frac{8+9\frac{1}{2}}{2} = 0.73'$ Avg. th. @ ends = $\frac{6''+0.02(12')}{2} = 0.62$

∴ Avg. Th. = $\frac{0.73+0.62}{2} = 0.675'$ CADD measured areas = $147.08\text{ft}^2 + 146.87\text{ft}^2 + 130.47\text{ft}^2 + 40.45\text{ft}^2$

Volume = $0.675(464.87) \div 27 = 11.62\text{yd}^3$ Total = $17.44 + 11.62 = 29.06\text{yd}^3 = 464.87$

29 CY

Item 512E10050 Sealing of Concrete Surfaces (Non-Epoxy)

117 SY

App. Slabs - $\left[\frac{8''}{12} + 6' \right] (44.43') (2\text{ sides}) \div (9\text{ft}^2/\text{yd}^2) = 65.82\text{yd}^2$ - Superstructure

$$\left[116.89\text{ft}^2 + 40.45\text{ft}^2 + 133.45\text{ft}^2 + 133.29\text{ft}^2 + \left(\frac{8''+6''}{24}\right) (15\text{ft} + 15\text{ft} + 15\text{ft}) + \left(\frac{8''}{12}\right) (12.33\text{ft}) \right] \div 9\text{ft}^2/\text{yd}^2 = 50.95\text{yd}^2$$

Item 512E10100 Sealing of Concrete Surfaces (Epoxy-Urethane)

Total = 116.77yd^2

Rear Abutment:

Face: Avg. top of channel wall elevation = 772.98

Top of slope protection on abutment = $772.98 + (2.05' \div 2)(0.02) = 773.02$

$$\left[\frac{1}{2}(773.29 + 773.68) - 773.02 \right] (24.5') + \left[\frac{1}{2}(773.68 + 773.37) - 773.02 \right] (23.5') = 23.26\text{ft}^2 = 2.58\text{yd}^2$$

Sides of Bridge Seat:

$$(773.29 - 773.02)(2') + (773.37 - 773.02)(2') = 1.24\text{ft}^2 = 0.14\text{yd}^2$$

SE Wingwall:

15.31ft^2 (CADD measured) = 1.70yd^2 on face of wall

$(0.5' + 0.875') \frac{1}{2} (1.5') = 1.03\text{ft}^2 = 0.11\text{yd}^2$ end of wall

$\frac{1}{2} (0.5')(6.28') = 1.57\text{ft}^2 = 0.17\text{yd}^2$ behind wall

SW Wingwall:

15.53ft^2 (CADD measured) = 1.73yd^2 on face of wall

0.11yd^2 end of wall

Top of bridge seats:
 $(0.5')(48')(2\text{ abuts.}) = 48\text{ft}^2 = 5.33\text{yd}^2$

East. Abutment: $\frac{1}{2} (0.5')(7.72') = 1.93\text{ft}^2 = 0.21\text{yd}^2$

NW Wingwall:

15.62ft^2 (CADD measured) = 1.74yd^2 on face of wall

0.11yd^2 end of wall

0.17yd^2 behind wall

NE wingwall:

15.70ft^2 (CADD measured) = 1.74yd^2 on face of wall

0.11yd^2 end of wall

0.21yd^2 behind wall

Face: Avg. top of channel wall = 773.00

Top of concrete slope protection on abutment = $773.00 + 0.02(1.97' \div 2) = 773.04$

$$\left[\frac{1}{2}(773.51 + 773.82) - 773.04 \right] (24.5') + \left[\frac{1}{2}(773.82 + 773.43) - 773.04 \right] (23.5') = 29.06\text{ft}^2 = 3.23\text{yd}^2$$

Sides of Bridge Seat:

$$(773.51 - 773.04)(2') + (773.43 - 773.04)(2) = 1.72\text{ft}^2 = 0.19\text{yd}^2$$

Total, Abutment = $2.58\text{yd}^2 + 0.14\text{yd}^2 + 1.70\text{yd}^2 + 0.11\text{yd}^2 + 0.17\text{yd}^2 + 1.73\text{yd}^2 + 0.11\text{yd}^2 + 0.21\text{yd}^2 + 1.74\text{yd}^2 + 0.11\text{yd}^2 + 0.17\text{yd}^2 + 1.74\text{yd}^2 + 0.11\text{yd}^2 + 0.21\text{yd}^2 + 3.23\text{yd}^2 + 0.19\text{yd}^2 + 5.33\text{yd}^2 = 19.58\text{yd}^2$



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Item 512E10100 Sealing of Concrete Surfaces (Epoxy-Urethane)

Railing: Distance around railing = $3.50' + 1.0' + 3.50' = 8.00'$ ✓
 Length of Left Railing = $71.52'$ ✓
 Length of Right Railing = $58.26'$ ✓

Area = $8'(71.52' + 58.26') = 1038.24 \text{ ft}^2 = 115.36 \text{ yd}^2$ ✓

Deduction per window = $2(2.00 \text{ ft}^2) = 4.00 \text{ ft}^2$ ✓

Addition for each window = $2(0.96')(1.97') + 0.65'(0.96') + 0.70'(0.96') = 5.08 \text{ ft}^2$ ✓

Correction per window = $5.08 \text{ ft}^2 - 4.00 \text{ ft}^2 = 1.08 \text{ ft}^2 = 0.12 \text{ yd}^2$ ✓

of windows, left = 36 ✓

of windows, right = 30 ✓

Adjustment for windows = $0.12 \text{ yd}^2 (36 + 30) = 7.92 \text{ yd}^2$ ✓

Total, Railing = $115.36 \text{ yd}^2 + 7.92 \text{ yd}^2 = 123.28 \text{ yd}^2$ ✓

Superstructure: Distance from base of railing to underneath beam =
 $0.17' + 1.67' + 1.167' + 1.42' + 0.5' = 4.92'$ ✓

max. 1'-2" fit-up

Seal s/f wingwalls = $40' + 2(0.5') \cos(25.485^\circ) = 40.90'$ ✓

Area = $(4.92')(40.90')(2 \text{ sides}) = 402.48 \text{ ft}^2 = 44.72 \text{ yd}^2$

Abutments = 19.58 yd^2 ✓

Superstructure = 44.72 yd^2 ✓

Railing = 123.28 yd^2 ✓

Total = 187.58 yd^2 ✓

189

188 SY

Item 515E12031 Prestressed Concrete Composite Box Beam Bridge Members, Level 1, CB17-48, As Per Plans (41'-1/4")

10 EACH ✓

Item 516E13200 1/2" Preformed Expansion Joint Filler

At each end of concrete slope protection: $(48')(4/12)(4) = 64 \text{ ft}^2$

64 SF ✓



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Item 516E13600 1" Preformed Expansion Joint Filler

Between superstructure & wingwalls = $\frac{1.5'}{\cos(25.485^\circ)}(776.30 - 773.29 + 776.36 - 773.37 + 776.50 - 773.51 + 776.45 - 773.43) = 19.96 \text{ ft}^2 \checkmark$

Between fwd. app. slab & integral backwall = $(0.5')(1') = 0.50 \text{ ft}^2 \checkmark$

Between rear app. slab & SE wingwall = $(0.33')(1') = 0.33 \text{ ft}^2 \checkmark$

Between approach slabs & sidewalks = $(4''/12)(5.40' + 5.79' + 11.83' + 11.88') = 11.63 \text{ ft}^2 \checkmark$

Total = $19.96 \text{ ft}^2 + 0.50 \text{ ft}^2 + 0.33 \text{ ft}^2 + 11.63 \text{ ft}^2 = 32.42 \text{ ft}^2 \checkmark$

32 SF \checkmark

Item 516E14014 Integral Abutment Expansion Joint Seal

$2 [24.73' + 22.35' + 1.5'(2) + (776.60 - 773.29 - 14.5''/12 + 1.5') + (776.36 - 773.37 - 14.5''/12 + 1.5') + (776.50 - 773.51 - 14.5''/12 + 1.5') + (776.45 - 773.43 - 14.5''/12 + 1.5')] = 107.95 \text{ ft} \checkmark$

113
108 FT

Item 516E20010 1" Elastomeric Erection Strip

$(45'-2'')(2) = 90'-4'' \checkmark$

90 FT \checkmark

Item 516E41100 1/8" Preformed Bearing Pad

$(10 \text{ beams})(2 \text{ per beam}) = 20 \text{ each} \checkmark$

20 EACH \checkmark

Item 526E10001 Reinforced Concrete Approach Slabs (T=12"), As Per Plan

CADD measured areas:

Rear Approach Slab = $713.95 \text{ ft}^2 \checkmark$

Fwd. Approach Slab = $608.92 \text{ ft}^2 \checkmark$

$\frac{1322.87 \text{ ft}^2}{1322.87 \text{ ft}^2} = 146.99 \text{ yd}^2 \checkmark$

147 SY \checkmark