

**WIL-576-20.11 Part 2**

**PID No. 99575**

**Structure Quantity Calculations**

**January 2020**



Calculations For W1C-576-20.11 Structure Quantity Calculations

Computed By MAD Date 12-31-19 Sheet 1 of 8

Checked By DJK Date 1-13-20

STRUCTURE OVER 20 FOOT SPAN (8603244) :

Item 202-11003 Structure Removed, over 20 Foot Span, As Per Plan

Lump

Item 202-22900 Approach Slab Removed

Length = 15'

width = 20'

$$\text{Area} = 15' (20') (2 \text{ slabs}) \div 9 = 66.7 \text{ SY}$$

67 SY

Item 202-23500 Wearing Course Removed

Existing Bridge Limits = 79.56'

Existing Bridge Width = 32.0'

$$\text{Bridge Area} = 79.56' (32.0') \div 9 = 282.9 \text{ SY}$$

Approach Slabs = 66.7

$$\text{Total} = 282.9 + 66.7 = 349.6 \text{ SY}$$

350 SY

Item 503-11100 Cofferdams and Excavation Bracing

Lump

Item 503-21300 Unclassified Excavation

Lump

Item 505-11100 Pile Driving Equipment Mobilization

Lump



Calculations For WIL-576-20,11 Structure Quantity Calculations

Computed By MAD Date 12-31-19 Sheet 2 of 8  
 Checked By DJK Date 1-13-20

Item 507-00600 14" Cast-in-Place Reinforced Concrete Piles, Driven

Rear Abutment: 8 piles (50' driven length) = 400'  
 Fwd. Abutment: 8 piles (60' driven length) = 480'  
 880'

Item 507-00650 14" Cast-in-Place Reinforced Concrete Piles, Furnished

Rear Abutment: 8 piles (55' driven length) = 440'  
 Fwd. Abutment: 8 piles (65' driven length) = 520'  
 960'

Item 509-10000 Epoxy Coated Reinforcing Steel

Abutments = 7133 lbs  
 Superstructure = 10,763 lbs  
 Total = 17,896 lbs

Item 511-31610 Class QC2 Concrete, Superstructure

Deck: Width = 32.0' f/a guardrail +  $\frac{1}{4}$ " fit up per joint (7 joints)  $\div 12 = 32.15'$   
 Length = 83.10' bridge limits  
 Thickness = 6" minimum portion

Volume =  $32.15' (83.10') \left(\frac{6''}{12}\right) \div 27 = 49.48 \text{ CY}$

Additional due to camber + road grade:  
 9.00" thickness at ends of bridge  
 6.00" thickness at midspan of bridge  
 Additional thickness =  $(9.00'' - 6.00'') \div 2 = 1.50''$

Volume =  $32.15' (83.10') \left(\frac{1.50''}{12}\right) \div 27 = 12.37 \text{ CY}$

Integral Backwall: Width = 1.5'  
 Length = 33.27' along skew  
 Height = 33" beam + 1" erection strip = 34" = 2.83'

Volume =  $1.5' (33.27') (2.83') (2 \text{ backwalls}) \div 27 = 10.46 \text{ CY}$

Calculations For WIL-576-20.11

Structure Quantity Calculations

Computed By MAD  
 Checked By DJK

Date 1-2-20  
 Date 1-13-20

Sheet 3 of 8

Item 511-31610 Class QC2 Concrete, Superstructure (Cont'd.)

Subtract approach slab notch: width = 0.5'  
 Length = 33.27'  
 Height = 7" = 0.58'

$$\text{Volume} = 0.5' (33.27') (0.58') (2 \text{ notches}) \div 27 = -0.71 \text{ CY}$$

Shear key in beams: Depth = 2.5"  
 Length = 38.0" total; 35.5" avg. full depth  
 Height = 16.5" total; 14.0" avg. full depth

$$\text{Volume} = 2.5" (35.5") (14.0") \left(\frac{1}{12}\right)^3 (16 \text{ locations}) \div 27 = 0.43 \text{ CY}$$

$$\text{Total} = 49.48 + 12.37 + 10.46 - 0.71 + 0.43 = 72.03 \text{ CY}$$

72 CY

Item 511-43510 Class QC1 Concrete, Abutment Including Footing

Rear Abut.:

$$\text{Footing: } 3.0' (3.50') (51.67') \div 27 = 20.09 \text{ CY}$$

$$\text{Subtract piles: } \pi \left(\frac{7}{12}\right)^2 (2.0') (8 \text{ piles}) \div 27 = -0.63 \text{ CY}$$

$$\text{Bridge Seat: } (918.15 - 916.00) (9.03' \text{ avg.}) (3.0') \div 27 = 2.16 \text{ CY}$$

$$\left(\frac{918.15 + 918.54}{2} - 916.00\right) (16.80') (3.0') \div 27 = 4.37 \text{ CY}$$

↖ bridge seat + 1" PEJF

$$\left(\frac{918.54 + 918.41}{2} - 916.00\right) (16.80') (3.0') \div 27 = 4.62 \text{ CY}$$

$$(918.41 - 916.00) (9.03' \text{ avg.}) (3.0') \div 27 = 2.42 \text{ CY}$$

$$\text{Wingwalls: } \left(\frac{919.04 + 921.73}{2} - 918.15\right) (6.58') (3.0') \div 27 = 1.63 \text{ CY}$$

$$(921.73 - 918.15) (2.45' \text{ avg.}) (3.0') \div 27 = 0.97 \text{ CY}$$

$$(921.99 - 918.41) (2.75' \text{ avg.}) (3.0') \div 27 = 1.09 \text{ CY}$$

$$\left(\frac{921.99 + 919.26}{2} - 918.41\right) (6.28') (3.0') \div 27 = 1.55 \text{ CY}$$

$$\text{Total Rear Abut.} = 38.27 \text{ CY}$$



Calculations For WIL-576-20.11

Structure Quantity Calculations

Computed By MAD

Date 1-2-20

Sheet 4 of 8

Checked By DJK

Date 1-13-20

Item 511 - 43510 Class QCI Concrete, Abutment Including Footing (Cont'd):

Fwd. Abut.:

Footing:  $30'(3.50')(51.67') \div 27 = 20.09 \text{ CY}$

Subtract piles:  $\pi \left(\frac{7}{12}\right)^2 (2.0')(8 \text{ piles}) \div 27 = -0.63 \text{ CY}$

Bridge Seat:  $(916.38 - 914.02)(9.03' \text{ avg.})(3.0') \div 27 = 2.37 \text{ CY}$

$\left(\frac{916.38 + 916.55}{2} - 914.02\right)(16.80') \overset{\text{bridge seat + 1" PEIF}}{(3.0')} \div 27 = 4.56 \text{ CY}$

$\left(\frac{916.55 + 916.21}{2} - 914.02\right)(16.80')(3.0') \div 27 = 4.41 \text{ CY}$

$(916.21 - 914.02)(9.03' \text{ avg.})(3.0') \div 27 = 2.20 \text{ CY}$

Wingwalls:  $\left(\frac{917.27 + 919.96}{2} - 916.38\right)(6.58')(3.0') \div 27 = 1.63 \text{ CY}$

$(919.96 - 916.38)(2.45' \text{ avg.})(3.0') \div 27 = 0.97 \text{ CY}$

$(919.79 - 916.21)(2.75' \text{ avg.})(3.0') \div 27 = 1.09 \text{ CY}$

$\left(\frac{919.79 + 917.06}{2} - 916.21\right)(6.28')(3.0') \div 27 = 1.54 \text{ CY}$

Total Fwd. Abut. = 38.23 CY

Grand Total = 38.27 + 38.23 = 76.50 CY

**77 CY**

Item 512 - 10050 Sealing of Concrete Surfaces (Non-Epoxy)

Superstructure: Seal edge of deck, side of beam, and 6" underneath edge beam

Avg. deck height =  $\left(\frac{9.00" + 6.00"}{2}\right)\left(\frac{1}{12}\right) = 0.63'$

Height of beam = 33" = 2.75'

6" underneath beam = 0.50'

Length: sealing stops at face of wingwall =  
 $80.0' \text{ etc bearing} - \left(\frac{1}{10515'}\right)(2 \text{ ends}) = 77.93'$

Area =  $(0.63' + 2.75' + 0.50')(77.93')(2 \text{ sides}) \div 9 = 67.19 \text{ SY}$



Calculations For WIL-576-20.11 Structure Quantity Calculations

Computed By MAD Date 1-2-20 Sheet 5 of 8  
 Checked By DJK Date 1-13-20

Item 512-10050 Sealing of Concrete Surfaces (Non-Epoxy) (Cont'd.)

Abutments: Use Rear Abut. elevations and consider Fwd. Abut. as similar since concrete quantities were the same.  
 Top of rock elev. = 917.00 Seal to top of rock or ground.

Front wall under beams :  $\left[ \left( \frac{918.15 + 918.54}{2} - 917.00 \right) + 0.50' \text{ top seat} \right] (16.80') \div 9 = 3.44 \text{ SY}$

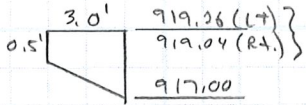
$\left[ \left( \frac{918.54 + 918.41}{2} - 917.00 \right) + 0.50' \text{ top seat} \right] (16.80') \div 9 = 3.69 \text{ SY}$

Front Wingwall:  $\left( \frac{919.04 + 921.73}{2} - 917.00 \right) (6.58') \div 9 = 2.47 \text{ SY}$

$(921.73 - 917.00) (2.04') \div 9 = 1.07 \text{ SY}$

$(921.99 - 917.00) (3.16') \div 9 = 1.75 \text{ SY}$

$\left( \frac{921.99 + 919.26}{2} - 917.00 \right) (6.28') \div 9 = 2.53 \text{ SY}$

End wingwall face:   $\left( \frac{919.15 - 917.00}{2} + 0.50 \right) \div 2 (3.0') (2 \text{ ends}) \div 9 = 0.88 \text{ SY}$

Top wingwall: Length along slope (right) = 7.11'  
 Avg. length along flat part (right) = 2.45'  
 Area =  $(7.11' + 2.45') (3.00') \div 9 = 3.19 \text{ SY}$

Length along slope (left) = 6.85'  
 Avg. length along flat part (left) = 2.75'  
 Area =  $(6.85' + 2.75') (3.00') \div 9 = 3.20 \text{ SY}$

Back of wingwall: Area =  $(7.11' + 2.85') (0.50') \div 9 = 0.55 \text{ SY}$   
 Area =  $(6.85' + 2.35') (0.50') \div 9 = 0.51 \text{ SY}$

Total abutments =  $(3.44 + 3.69 + 2.47 + 1.07 + 1.75 + 2.53 + 0.88 + 3.19 + 3.20 + 0.55 + 0.51) (2 \text{ abutts}) = 46.56 \text{ SY}$

Grand Totals : Superstructure = 67 SY  
Abutments = 47 SY  
 Total = 114 SY

114 SY

Calculations For W1C-576-20,11

Structure Quantity Calculations

Computed By MAD

Date 1-2-20

Sheet 6 of 8

Checked By DKK

Date 1-13-20

Item 515-12091 Prestressed Concrete Composite Box Beam Bridge Members, Level 1,  
CB 33-48, As Per Plan (81'-0 $\frac{1}{2}$ " )

8 Each

Item 516-13600 1" Preformed Expansion Joint Filler

Between beams/backwall and abutment wingwalls.

$$\text{Height} = 9.00'' \text{ deck} + 33'' \text{ beam} + 1'' \text{ erection strip} = 43.00'' = 3.58'$$

$$\text{Width} = 3.00' \div \cos 15^\circ = 3.11'$$

$$\text{Area} = 3.58' (3.11') (4 \text{ locations}) = 44.54 \text{ SF}$$

45 SF

Item 516-14014 Integral Abutment Expansion Joint Seal

Placed vertically between ends of integral backwall and wingwall,  
 Extends from 1'-6" below bridge seat to bottom of proposed approach slab.

$$\text{Rear (Rt.)} = (921.73 - 918.15) + 1.50' - \frac{18.5'' \text{ total}}{12} = 3.54 \text{ FT.}$$

$$\text{Rear (Lt.)} = (921.99 - 918.41) + 1.50' - \frac{18.5'' \text{ total}}{12} = 3.54 \text{ FT.}$$

$$\text{Total} = (3.54 + 3.54) (2 \text{ abuts}) = 14.16'$$

14 FT

Item 516-20010 1" Elastomeric Erection Strip

$$\text{Width} = 1''$$

$$\text{Length at Rear} = (16' - 8\frac{5}{8}'') (2) = 33.44'$$

$$\text{Length at Fwd.} = (16' - 8\frac{5}{8}'') - 2'' \text{ drainage groove} (2) = 33.10'$$

$$\text{Area} = 1.0' (33.44' + 33.10') = 66.54 \text{ SF}$$

67 SF

Calculations For WIL-576-20.11

Structure Quantity Calculations

Computed By MAD Date 1-2-20  
 Checked By DJK Date 1-13-20

Sheet 7 of 8

Item 516-41100  $\frac{1}{8}$ " Preformed Bearing Pad

Furnish 2 shims per beam.  
 Total = 2 (8 beams) = 16

16 Each

Item 517-70000 Railing (Twin Steel Tube)

E Post Fwd. Abut. (right) = Sta. 1063 + 43.00 }  
 E Post Rear Abut. (right) = Sta. 1062 + 61.97 } Length = 81.03'

Payment limits extend 2'-5 $\frac{1}{2}$ " past E post as per TST-1-99.

Length =  $\left[ (2'-5\frac{1}{2}" ) (2) + 81.03' \right] (2 \text{ sides}) = 171.89'$

172 Ft

Item 518-21230 Porous Backfill with Geotextile Fabric

Lump

Item Special 518-22300 Steel Drip Strip

Drip strip runs between abutment faces,

Length = 80.0' c/c bearing -  $\left( \frac{1}{\cos 15^\circ} \right) (2 \text{ ends}) = 77.93' (2 \text{ sides}) = 155.86'$

Add 1.50' at each guardrail post. 13 posts on each side of bridge.

Additional = 1.50' (13 posts/side) (2 sides) = 39.00'

Total = 155.86' + 39.00' = 194.86'

195 Ft

Item 518-40000 6" Perforated Corrugated Plastic Pipe

Behind abutments: 51.67' (2 abuts) = 103.34'

103 Ft

Item 518-40010 6" Non-Perforated Corrugated Plastic Pipe, Including Specials

At each abutment corner: 1' + 11' = 12' (4 corners) = 48'

48 Ft





Calculations For WIL-576-20.11

Structure Quantity Calculations

Computed By MAD

Date 1-3-20

Sheet 8 of 8

Checked By DJK

Date 1-13-20

Item 523 - 20000 Dynamic Load Testing

1 Each

Item 526 - 15000 Reinforced Concrete Approach Slabs (T=13")

$$\text{Length} = 20.0'$$

$$\text{Width} = 32.0'$$

$$\text{Area} = 20.0' (32.0') (2 \text{ slabs}) \div 9 = 142.2 \text{ SY}$$

142 SY

Item 526 - 90021 Type B Installation, As Per Plan

Measured by SY of reinforced joint mesh.

$$\text{Width} = 5.0'$$

$$\text{Length} = 32.0' \div \cos 15^\circ = 33.13'$$

$$\text{Area} = 5.0' (33.13') (2 \text{ joints}) \div 9 = 36.81 \text{ SY}$$

37 SY