

# **STRUCTURE ESTIMATED QUANTITIES**

**Bridge No. SUM-77-0810 L/R  
I.R. 77 over The Tuscarawas River**

**SUM-77/277/224-VARIOUS  
PID No. 106002**

**Summit County, Ohio**

**Prepared For:**

**The Ohio Department of Transportation  
District 4**



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**January 18, 2021**



Client: ODOT District 4  
PID No.: 106002  
Subject: SUM-77/277/224-VARIOUS  
SUM-77-0810 L/R - Tracings Est. Quantities

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Chk'd By: RHC Date: 1/4/2021

**ITEM 202 - PORTIONS OF STRUCTURE REMOVED, OVER 20 FOOT SPAN, AS PER PLAN**

NB deck area = 8,848 sf  
SB deck area = 8,848 sf  
Removal unit price = 15.00 \$/sf  
**Total = 266,000 \$ Lump Sum**

**ITEM 202 - APPROACH SLAB REMOVED**

NB rear approach slab area = 900 sf  
NB forward approach slab area = 900 sf  
SB rear approach slab area = 900 sf  
SB forward approach slab area = 900 sf  
**Total = 400 sy**

**ITEM 202 - WEARING COURSE REMOVED**

NB paved area = 11,024 sf  
SB paved area = 11,024 sf  
**Total = 2,450 sy**

**ITEM 503 - COFFERDAMS AND EXCAVATION BRACING, AS PER PLAN**

Cofferdams at piers:

Average height = 26 ft  
Average width = 108 ft  
No. of locations = 2  
*Assume 14' embedment.*

Excavation bracing at abutment phase construction joints:

Average height = 27 ft  
Average width = 27 ft  
No. of locations = 4  
Unit price = 15 \$/sf

**Total = 128,000 \$ Lump Sum**

**ITEM 503 - UNCLASSIFIED EXCAVATION**

Avg. abutment footing excavation depth = 7.00 ft  
Abutment footing excavation width = 8.25 ft  
Abutment footing length = 42.82 ft  
Avg. abutment stem excavation depth = 4.00 ft  
Abutment stem excavation width = 5.75 ft  
Avg. abutment stem length = 2.38 ft  
No. of abutments = 2  
Abutment volume = 5,164 cf

*Average length from the end of existing abutment stem to the end of the existing abutment footing in the medians.*

Avg. pier excavation depth = 7.00 ft  
Pier excavation width = 10.00 ft  
Pier length = 44.00 ft  
No. of piers = 2  
Pier volume = 6,160 cf

**Abutment Total = 192 cy**  
**Pier Total = 229 cy**



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**ITEM 505 - PILE DRIVING EQUIPMENT MOBILIZATION**

Mobilization = 20,000 \$  
Total = 20,000 \$ Lump Sum

**ITEM 507 - 12" CAST-IN-PLACE REINFORCED CONCRETE PILES, DRIVEN**

No. of abutment piles = 24  
Abutment pile estimated length = 50 ft  
No. of pier 1 piles = 14  
Pier 1 pile estimated length = 70 ft  
No. of pier 2 piles = 14  
Pier 2 pile estimated length = 40 ft  
  
Abutment Total = 1,200 ft  
Pier Total = 1,540 ft

**ITEM 507 - 12" CAST-IN-PLACE REINFORCED CONCRETE PILES, FURNISHED**

No. of abutment piles = 24  
Abutment pile order length = 55 ft  
No. of pier 1 piles = 14  
Pier 1 pile order length = 75 ft  
No. of pier 2 piles = 14  
Pier 2 pile order length = 45 ft  
  
Abutment Total = 1,320 ft  
Pier Total = 1,680 ft

**ITEM 509 - EPOXY COATED REINFORCING STEEL**

Abutment bar weight = 7,408 lbs      *From reinforcing bar list.*  
Pier bar weight = 40,021 lbs      *From reinforcing bar list.*  
Diaphragm bar weight = 19,314 lbs      *From reinforcing bar list.*  
Superstructure bar weight = 204,459 lbs      *From reinforcing bar list.*  
Railing bar weight = 22,190 lbs      *From reinforcing bar list.*  
  
Abutment Total = 7,408 lbs  
Pier Total = 40,021 lbs  
Superstructure Total = 245,963 lbs

**ITEM 509 - NO. 4 GFRP DEFORMED BARS**

Railing bar length = 6,400 ft      *From reinforcing bar list.*  
Total = 6,400 ft

**ITEM 509 - NO. 6 GFRP DEFORMED BARS**

Railing bar length = 5,020 ft      *From reinforcing bar list.*  
Total = 5,020 ft

**ITEM 510 - DOWEL HOLES WITH NONSHRINK, NONMETALLIC GROUT**

Rear abutment = 86 each  
Forward abutment = 84 each  
Total = 170 each



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**ITEM 511 - SEMI-INTEGRAL DIAPHRAGM GUIDE**

Rear abutment = 2 each  
 Forward abutment = 2 each  
**Total = 4 each**

**ITEM 511 - CLASS QC2 CONCRETE WITH QC/QA, BRIDGE DECK, AS PER PLAN**

NB deck area = 12,700 sf  
 SB deck area = 12,704 sf  
 Deck thickness = 8.50 in  
 Deck volume = 17,995 cf

No. of diaphragms = 4  
 Diaphragm length = 80.98 ft  
 Diaphragm width = 3.75 ft  
 Avg. diaphragm height = 3.50 ft  
 Less approach slab seat section area = 0.27 sf  
 Diaphragm volume = 4,164 cf

No. of beams = 20  
 Haunch width = 12.00 in  
 Haunch Length = 153.95 ft  
 Avg. haunch thickness = 2.48 in  
 Haunch volume = 635 cf

Prop. beam top splice plate volume = 0.14 cf  
 No. of prop. beam top splice plates = 12 each  
 Ex. beam top cover plate volume = 0.39 cf  
 No. of ex. beam top cover plates = 28 each  
 Ex. beam top fill/retrofit plates volume = 0.69 cf  
 No. of ex. beam top retrofit plates = 28 each  
 Less plate volume = 32 cf  
**Total = 844 cy**

**ITEM 511 - CLASS QC2 CONCRETE WITH QC/QA, BRIDGE DECK (PARAPET)**

Section area = 4.08 sf  
 Avg. length = 182.45 ft  
 No. of sides = 2  
 Transition volume = 1.82 cy  
 No. of transitions = 4

*Outside railings*  
 Length of normal railing section between transition sections.

Section area = 12.32 sf  
 Avg. length = 160.62 ft  
 Transition start area = 9.14 sf  
 Transition end area = 13.11 sf  
 Transition length = 26.96 ft  
 No. of transitions = 2

*Median railings*

**Total = 151 cy**

**ITEM 511 - CLASS QC1 CONCRETE WITH QC/QA, PIER ABOVE FOOTINGS**

No. of piers = 2  
 Average beam seat elevation = 1012.09  
 Top of footing elevation = 992.80  
 Plan area = 97.41 sf  
 Seismic pedestal addition = 0.86 cy  
**Total = 141 cy**



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**ITEM 511 - CLASS QC1 CONCRETE WITH QC/QA, ABUTMENT NOT INCLUDING FOOTING**

No. of abutments = 2  
Average face area = 215.40 sf  
Thickness = 3.75 ft  
  
No. of wingwalls = 4  
Average face area = 26.94 sf  
Thickness = 1.75 ft  
  
**Total = 67 cy**

**ITEM 511 - CLASS QC1 CONCRETE WITH QC/QA, FOOTING**

No. of abutments = 2  
Average length = 42.82 ft  
Width = 6.25 ft  
Height = 3.00 ft  
  
No. of piers = 2  
Length = 42.00 ft  
Width = 8.00 ft  
Height = 3.00 ft  
  
**Abutment Total = 60 cy**  
**Pier Total = 75 cy**



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**ITEM 512 - SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)**

Abutments:

No. of abutments = 2  
Length = 161.50 ft  
Height = 1.00 ft  
Abutment area = 323 sf

No. of wingwalls = 4  
Average surface area = 26.94 sf  
Back + top length = 10.50 ft  
Back + top width = 2.25 ft  
Wingwall area = 202 sf

Piers:

No. of existing piers = 4  
Average height = 15.25 ft  
Perimeter = 113.85 ft  
Top area = 137.41 sf  
Existing pier area = 7,494 sf

No. of proposed piers = 2  
Average height = 15.25 ft  
Perimeter = 81.85 ft  
Top area = 97.41 sf  
Proposed pier area = 2,691 sf

Superstructure:

No. of diaphragms = 2  
Length = 161.50 ft  
Height = 3.00 ft  
Diaphragm area = 969 sf

No. of outside railings = 2 each  
Outside railing avg. length = 160.61 ft  
Outside railing perimeter = 9.45 ft  
Outside railing area = 3,036 sf

No. of approach slab outside railings = 4 each  
Approach slab outside railing avg. length = 24.91 ft  
Approach slab outside railing perimeter = 8.00 ft  
Approach slab outside railing area = 797 sf

Median railing length = 160.61 ft  
Median railing perimeter = 11.54 ft  
Median railing area = 1,853 sf

No. of median transition railings = 2 each  
Avg. median transition railing length = 26.96 ft  
Avg. median transition railing perimeter = 11.17 ft  
Median transition railing area = 602 sf

**Abutment Total = 59 sy**  
**Pier Total = 1,132 sy**  
**Superstructure Total = 807 sy**



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**ITEM 512 - CONCRETE REPAIR BY EPOXY INJECTION**

Rear abutment = 0 ft  
Pier 1 = 0 ft  
Pier 2 = 0 ft  
Forward abutment = 2 ft  
Contingency = 8 ft

**Abutment Total = 6 ft**  
**Pier Total = 4 ft**

**ITEM 512 - TYPE 2 WATERPROOFING**

No. of wingwall locations = 4  
Average length = 8.65 ft  
Width = 3.00 ft

No. of abutment locations = 4  
Average height = 5.05 ft  
Width = 3.00 ft

**Total = 19 sy**

**ITEM 513 - STRUCTURAL STEEL MEMBERS, LEVEL 3, AS PER PLAN**

**Total = 194,393 lbs**

**Total = 194,393 lbs**

*See last two pages for detailed calculations.*

**ITEM 513 - WELDED STUD SHEAR CONNECTORS**

No. per row = 3 each  
Rows per proposed beam = 207  
No. of proposed beams = 6  
Rows of 3 per existing beam = 172  
No. of studs over cover plates per beam = 150  
No. of existing beams = 14

**Total = 13,050 ft**

**ITEM 514 - SURFACE PREPARATION OF EXISTING STRUCTURAL STEEL**

No. of existing beam ends to be painted = 28  
Estimated disturbed area per beam end = 8.00 sf  

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Total beam end area = 224 sf

No. of top flange edges to be painted = 28  
Top flange thickness = 0.94 in  
Top flange length = 151.67 ft  

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Total top flange edge area = 333 sf

No. of crossframes replaced = 28  
Area per crossframe replacement = 4.00 sf  

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Total crossframe replacement area = 112 sf

No. of crossframes added to ex. beams = 28  
Area per crossframe addition = 3.00 sf  

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Total crossframe addition area = 84 sf

**Total = 753 sf**



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**ITEM 514 - FIELD PAINTING OF EXISTING STRUCTURAL STEEL, PRIME COAT**

Total = 753 sf Existing surfaces prepared above.

**ITEM 514 - FIELD PAINTING STRUCTURAL STEEL, INTERMEDIATE COAT**

No. of new beams to be painted = 6  
Length to be painted = 157.50 ft  
Beam depth = 3.00 ft  
Beam flange width = 1.00 ft  
New beam total area = 8,505 sf

No. of replacement crossframes = 28  
Replacement crossframe area = 26.30 sf  
Total replacement crossframe area = 736 sf

No. of new crossframes = 80  
Average new crossframe area = 35.86 sf  
Total new crossframe area = 2,869 sf

No. of beam retrofit locations = 28  
End retrofit plate perimeter = 4.00 ft  
End retrofit plate length per location = 6.17 ft  
Middle retrofit plate perimeter = 1.50 ft  
Middle retrofit plate length = 4.83 ft  
Total ex. Beam retrofit area = 894 sf

Proposed steel area = 13,004 sf  
Existing steel area = 753 sf

Total = 13,757 sf

**ITEM 514 - FIELD PAINTING STRUCTURAL STEEL, FINISH COAT**

Total = 13,757 sf Same as intermediate coat.

**ITEM 514 - GRINDING FINIS, TEARS, SLIVERS ON EXISTING STRUCTURAL STEEL**

Time = 1 min/ft  
No. of existing beam ends to be painted = 28  
Length to be painted = 2.50 ft  
Length per crossframe replacement = 2.00 ft  
No. of crossframes replaced = 28  
Length per crossframe addition = 1.00 ft  
No. of crossframes added to ex. beams = 28

Total = 3 mnhr

**ITEM 514 - FINAL INSPECTION REPAIR**

No. of new beams to be painted = 6  
Length to be painted = 157.50 ft  
No. of existing beam ends to be painted = 28  
Length to be painted = 2.50 ft  
Painted length = 1015.00 ft

No. of new crossframe locations = 80  
No. of replacement crossframe locations = 28  
Painted crossframes = 108

Total = 13 each





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**ITEM 516 - ARMORLESS PREFORMED JOINT SEAL**

Length = 158.64 ft  
No. of ends = 2  
**Total = 318 ft**

**ITEM 516 - 1" PREFORMED EXPANSION JOINT FILLER**

No. of median railing locations = 2  
Area = 12.32 sf  
No. of outside railing locations = 4  
Area = 4.08 sf  
**Total = 41 sf**

**ITEM 516 - 2" PREFORMED EXPANSION JOINT FILLER**

No. at centerline = 2  
Average height = 4.30 ft  
Length = 3.84 ft  
No. at wingwalls = 4  
Average height = 4.28 ft  
Length = 1.79 ft  
**Total = 64 sf**

**ITEM 516 - SEMI-INTEGRAL ABUTMENT EXPANSION JOINT SEAL**

No. of abutments = 2  
Average length = 165.66 ft  
Height at ends = 5.53 ft  
**Total = 354 ft**

**ITEM 516 - ELASTOMERIC BEARING WITH INTERNAL LAMINATES AND LOAD PLATE (NEOPRENE) (9" X 1'-1" X 1.85" THICK), AS PER PLAN**

No. of beams = 20 each  
No. of substructure units = 2  
**Abutment Total = 40 each**

**ITEM 516 - ELASTOMERIC BEARING WITH INTERNAL LAMINATES AND LOAD PLATE (NEOPRENE) (11" X 1'-5" X 2.25" THICK), AS PER PLAN**

No. of beams = 20 each  
No. of substructure units = 2  
**Pier Total = 40 each**

**ITEM 516 - JACKING AND TEMPORARY SUPPORT OF SUPERSTRUCTURE, AS PER PLAN**

Unit price = 1,500 \$  
No. of locations = 56  
**Total = 84,000 \$ Lump Sum**



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**ITEM 518 - POROUS BACKFILL WITH GEOTEXTILE FABRIC**

No. of abutments = 2  
Average length = 162.32 ft  
Width = 2.00 ft  
Height = 7.25 ft  
No. of wingwalls = 4  
Average length = 8.82 ft  
Width = 2.00 ft  
Average height = 6.50 ft  
**Total = 192 cy**

**ITEM 518 - 6" PERFORATED CORRUGATED PLASTIC PIPE**

Length = 180 ft  
No. of locations = 2  
**Total = 360 ft**

**ITEM 518 - 6" NON-PERFORATED CORRUGATED PLASTIC PIPE, INCLUDING SPECIALS**

Length = 8 ft  
No. of locations = 4  
**Total = 32 ft**

**ITEM 519 - PATCHING CONCRETE STRUCTURE**

Rear abutment = 35 sf  
Pier 1 = 15 sf  
Pier 2 = 2 sf  
Forward abutment = 50 sf  
Contingency = 23 sf  
**Abutment Total = 97 sf**  
**Pier Total = 28 sf**

**ITEM 523 - DYNAMIC LOAD TESTING**

Abutment dynamic load testing items = 1 each  
Pier dynamic load testing items = 1 each  
**Total = 2 each**

**ITEM 526 - REINFORCED CONCRETE APPROACH SLABS WITH QC/QA (T=15"), AS PER PLAN**

Rear approach slab area = 3,958.33 sf  
Forward approach slab area = 3,958.34 sf  
**Total = 880 sy**

**ITEM 526 - TYPE C INSTALLATION, AS PER PLAN**

Length = 159 ft  
No. of ends = 2  
**Total = 318 ft**



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**STRUCTURAL STEEL WEIGHT CALCULATIONS**

Beams	Qty.	Unit	Weight / Unit	No. per Beam	No. of Beams	Weight (lbs)
New Beams 8-13	157.5	ft	135	1	6	127,575
Less Diaphragm Bar Holes	0.00	ft <sup>3</sup>	-490	6	6	-19
Less Bearing Holes	0.000359065	ft <sup>2</sup>	-490	8	6	-8

Weight of Steel = 490 pcf

**Total Weight = 194,393 Lbs**

Splice Plates	Width (in)	Thickness (in)	Area (in <sup>2</sup> )	Weight (plf)	Length (ft)	Qty.	Weight (lbs)
Top Flange Splice Plate - Top	11	0.75	8.25	28.07	2.50	12	842
Top Flange Splice Plate - Bottom	4	1	4.00	13.61	2.50	24	817
Web Plates	16	0.5	8.00	27.22	2.46	24	1,606
Bottom Flange Plates - Top	4	1	4.00	13.61	2.50	24	817
Bottom Flange Plates - Bottom	11	0.75	8.25	28.07	2.50	12	842
Fill Plates - Top Flange	0	0	0.00	0.00	0.00	0	0
Fill Plate - Bottom Flange	0	0	0.00	0.00	0.00	0	0

Splice Bolts	Qty.	Unit	Weight / Unit	No. per Splice	No. of Splices	Weight (lbs)
1" Dia. Bolts/Washers/Nuts	1	Each	1.234	56	12	829

*Note: Bolt weight is based upon 1.75" long, 1" Dia. High Strength Bolts and 1 washer per AISC Table 7-18. Grip subtracted, since bolt hole areas weren't removed from plates.*

Beam Retrofit Plates - Ends	Width (in)	Thickness (in)	Area (in <sup>2</sup> )	Weight (plf)	Length (ft)	Qty.	Weight (lbs)
Top Flange Splice Plate - Top	10.5	0.75	7.88	26.80	3.08	56	4,627
Top Flange Splice Plate - Bottom	4	1	4.00	13.61	3.08	112	4,700
Web Plates	0	0	0.00	0.00	0.00	0	0
Bottom Flange Plates - Top	4	1	4.00	13.61	3.08	112	4,700
Bottom Flange Plates - Bottom	10.5	0.75	7.88	26.80	3.08	56	4,627
Fill Plates - Top Flange	10.5	0.4375	4.59	15.63	1.48	56	1,295
Fill Plate - Bottom Flange	10.5	0.5	5.25	17.86	1.48	56	1,480

Beam Retrofit Bolts - Ends	Qty.	Unit	Weight / Unit	No. per Beam	No. of Beams	Weight (lbs)
1" Dia. Bolts/Washers/Nuts	1	Each	1.234	80	14	1,382

*Note: Bolt weight is based upon 1.75" long, 1" Dia. High Strength Bolts and 1 washer per AISC Table 7-18. Grip subtracted, since bolt hole areas weren't removed from plates.*



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**STRUCTURAL STEEL WEIGHT CALCULATIONS (CONTINUED)**

Beam Retrofit Plates - Middle	Width (in)	Thickness (in)	Area (in <sup>2</sup> )	Weight (plf)	Length (ft)	Qty.	Weight (lbs)
Top Flange Splice Plate - Top	10.5	0.75	7.88	26.80	4.83	28	3,627
Top Flange Splice Plate - Bottom	4	1	4.00	13.61	4.83	56	3,684
Web Plates	0	0	0.00	0.00	0.00	0	0
Bottom Flange Plates - Top	0	0	0.00	0.00	0.00	0	0
Bottom Flange Plates - Bottom	0	0	0.00	0.00	0.00	0	0
Fill Plates - Top Flange	0	0	0.00	0.00	0.00	0	0
Fill Plate - Bottom Flange	0	0	0.00	0.00	0.00	0	0

Beam Retrofit Bolts - Middle	Qty.	Unit	Weight / Unit	No. per Beam	No. of Beams	Weight (lbs)
1" Dia. Bolts/Washers/Nuts	1	Each	1.234	64	14	1,106

*Note: Bolt weight is based upon 1.75" long, 1" Dia. High Strength Bolts and 1 washer per AISC Table 7-18. Grip subtracted, since bolt hole areas weren't removed from plates.*

Typical Existing Cross Frame Replacement	Qty.	Unit	Weight / Unit	No. per Cross Frame	No. of Cross Frames	Weight (lbs)
L 3X3X5/16" - Horizontal	8.56	ft	6.1	1	28	1,462
L 3X3X5/16" - Diagonal	8.87	ft	6.1	2	28	3,030
Connection Plates	0.00	ft <sup>3</sup>	0	0	0	0
Fill Plate	0.00	ft <sup>3</sup>	0	0	0	0
5/8" Dia. Bolts/Washers/Nuts	0	Each	0	0	0	0

Typical Proposed Cross Frame - SB	Qty.	Unit	Weight / Unit	No. per Cross Frame	No. of Cross Frames	Weight (lbs)
L 4X4X7/16" - Horizontal	7.45	ft	11.3	1	40	3,367
L 4X4X7/16" - Diagonal	7.56	ft	11.3	2	40	6,834
Connection Plates	0.05	ft <sup>3</sup>	490	2	40	1,917
Fill Plate	0.03	ft <sup>3</sup>	490	1	40	509
1" Dia. Bolts/Washers/Nuts	1	Each	0.347	6	40	83

*Note: Bolt weight is based upon 1.25" long, 5/8" Dia. High Strength Bolts and 1 washer per AISC Table 7-18. Grip subtracted, since bolt hole areas weren't removed from plates*

Typical Proposed Cross Frame - NB	Qty.	Unit	Weight / Unit	No. per Cross Frame	No. of Cross Frames	Weight (lbs)
L 4X4X7/16" - Horizontal	7.11	ft	11.3	1	40	3,214
L 4X4X7/16" - Diagonal	7.24	ft	11.3	2	40	6,545
Connection Plates	0.05	ft <sup>3</sup>	490	2	40	1,917
Fill Plate	0.03	ft <sup>3</sup>	490	1	40	491
1" Dia. Bolts/Washers/Nuts	1	Each	0.347	6	40	83

*Note: Bolt weight is based upon 1.25" long, 5/8" Dia. High Strength Bolts and 1 washer per AISC Table 7-18. Grip subtracted, since bolt hole areas weren't removed from plates*

Existing Beam Bearing Angle	Qty.	Unit	Weight / Unit	No. per Beam	No. of Beams	Weight (lbs)
L 6X6X1/2"	0.75	ft	19.6	2	14	412