

# STRUCTURE ESTIMATED QUANTITIES

**Bridge No. FRA-70-1390C**

**RAMP C5 OVER I70/71**

**FRA-70/71-12.68/14.86**

**PID No. 105523**

**Franklin County, Ohio**

**Prepared For:**

**The Ohio Department of Transportation  
District 6**



**1801 Watermark Drive, Suite 210  
Columbus, Ohio 43215  
(614) 210-0751  
[www.gpdgroup.com](http://www.gpdgroup.com)**

**May 31, 2019**



Job FRA-70-1390C RAMP CS BRIDGE  
Sheet No. 1 of 16  
Calculated by MLS Date 5/23/2019  
Checked by RHC Date 5/30/2019

ESTIMATED QUANTITIES

ITEM 503 - COFFERDAMS AND EXCAVATION BRACING, AS PER PLAN

LUMP SUM

ITEM 503 - UNCLASSIFIED EXCAVATION

PLAN AREA  
MICROSTATION      AVG. DEPTH  
REAR ABUTMENT - (9747 SF)(13.8 FT)( $\frac{1}{27}$ ) = 4,981.8 CY

PIER - (4492 SF)(11.0 FT)( $\frac{1}{27}$ ) = 1,830.1 CY

FRWD ABUT - (2600 SF)(9.3 FT)( $\frac{1}{27}$ ) = 895.6 CY

TOTAL = 7,707.5 CY

∴ USE 7,708 CY

ITEM 509 - EPOXY COATED REINFORCING STEEL

1,594,396 LBS



ITEM 511 - CLASS QC2 CONCRETE WITH QC/QA, SUPERSTRUCTURE

DIAPHRAGMS

- REAR ABUTMENT

B22-B13 - 
$$\left[ \begin{array}{l} \text{ELEVATION AREA} \\ \text{MICROSTATION} \end{array} (907.7 \text{ SF}) \begin{array}{l} \text{THICKNESS} \\ (3.3 \text{ FT}) \end{array} - \begin{array}{l} \# \text{ OF} \\ \text{BEAMS} \end{array} (10) \begin{array}{l} \text{X-SEC} \\ \text{AREA OF} \\ \text{BEAM} \end{array} (7.6 \text{ SF}) \begin{array}{l} \text{BEAM} \\ \text{EMBEDMENT} \\ (2.3 \text{ FT}) \end{array} + \right. \\ \left. \begin{array}{l} \text{SLOPED} \\ \text{TOP AREA} \end{array} (0.13 \text{ SF}) \begin{array}{l} \text{LENGTH} \\ (142.5 \text{ FT}) \end{array} - \begin{array}{l} \text{TOP LOAD} \\ \text{R VOLUME} \end{array} (10) (0.59 \text{ CF} + 0.40 \text{ CF} + 0.05 \text{ CF}) \right] (1/27) \\ = 104.8 \text{ CY}$$

B12-B1 - 
$$\left[ \begin{array}{l} \text{PLAN AREA @} \\ \text{TRANSITION BIT} \\ \text{B11-B12} \end{array} (53.0 \text{ SF}) \begin{array}{l} \text{AVG} \\ \text{HEIGHT} \end{array} (6.45 \text{ FT}) + \begin{array}{l} \text{SLOPED TOP} \\ \text{AREA} \end{array} (0.13 \text{ SF}) \begin{array}{l} \text{LENGTH} \\ (19.0 \text{ FT}) \end{array} + \begin{array}{l} \text{ELEVATION} \\ \text{AREA B11-B1} \end{array} (908.8 \text{ SF}) \begin{array}{l} \text{AVG WEIGHTED} \\ \text{THICKNESS} \\ (3.43 \text{ FT}) \end{array} \right. \\ \left. - \begin{array}{l} \# \text{ OF} \\ \text{X-SEC AREA BEAM} \\ \text{EMBEDMENT} \end{array} (3) \begin{array}{l} \text{X-SEC} \\ \text{BEAM AREA} \end{array} (7.6 \text{ SF}) \begin{array}{l} \text{EMBED.} \\ (2.3 \text{ FT}) \end{array} - \begin{array}{l} \# \\ \text{TOP LOAD R} \\ \text{VOLUME} \end{array} (12) (0.59 \text{ CF} + 0.40 \text{ CF} + 0.05 \text{ CF}) \right] (1/27) = 120.0 \text{ CY}$$

- PIER

B1-B12 - 
$$\left[ \begin{array}{l} \text{ELEV. AREA} \\ \text{MICROSTATION} \end{array} (1063.2 \text{ SF}) \begin{array}{l} \text{THICKNESS} \\ (3.0 \text{ FT}) \end{array} - \begin{array}{l} \# \text{ OF} \\ \text{BEAMS} \end{array} (12) \begin{array}{l} \text{X-SEC} \\ \text{AREA OF} \\ \text{BEAM} \end{array} (7.6 \text{ SF}) \begin{array}{l} \text{EMBEDMENT} \\ (2.33 \text{ FT}) \end{array} + \right. \\ \left. \begin{array}{l} \text{SLOPED TOP} \\ \text{AREA} \end{array} (0.11 \text{ SF}) \begin{array}{l} \text{LENGTH} \\ (165.1 \text{ FT}) \end{array} - \begin{array}{l} \text{TOP LOAD R} \\ \text{VOLUME} \end{array} (12) (0.59 \text{ CF}) \begin{array}{l} \text{BOT LOAD} \\ \text{R VOLUME} \end{array} (0.40 \text{ CF}) \begin{array}{l} \text{HP SHAPE} \\ \text{VOLUME} \end{array} (0.05 \text{ CF}) \right] (1/27) \\ = 110.5 \text{ CY}$$

B13-B33 - 
$$\left[ \begin{array}{l} \text{PLAN AREA @} \\ \text{TRANSITION BIT} \\ \text{B13-B14} \end{array} (55.9 \text{ SF}) \begin{array}{l} \text{AVG} \\ \text{HEIGHT} \end{array} (6.48 \text{ FT}) + \begin{array}{l} \text{PLAN AREA} \\ \text{UNDER DECK} \\ \text{B14-B32} \end{array} (615.7 \text{ SF}) \begin{array}{l} \text{AVG} \\ \text{HEIGHT} \end{array} (6.47 \text{ FT}) + \right. \\ \left. \begin{array}{l} \text{PLAN AREA} \\ \text{BIT B32-B33} \end{array} (68.9 \text{ SF}) \begin{array}{l} \text{AVG} \\ \text{HEIGHT} \end{array} (6.52 \text{ FT}) + \begin{array}{l} \text{SLOPED} \\ \text{TOP AREA} \end{array} (0.17 \text{ SF}) \begin{array}{l} \text{LENGTH} \\ (12.2 \text{ FT} + 13.3 \text{ FT}) \end{array} - \right. \\ \left. \begin{array}{l} \# \text{ OF} \\ \text{X-SEC} \\ \text{AREA OF} \\ \text{BEAM} \end{array} (2) \begin{array}{l} \text{X-SEC} \\ \text{BEAM AREA} \end{array} (7.6 \text{ SF}) \begin{array}{l} \text{EMBEDMENT} \\ (2.83 \text{ FT}) \end{array} - \begin{array}{l} \# \\ \text{TOP LOAD R} \\ \text{VOLUME} \end{array} (3) \begin{array}{l} \text{X-SEC} \\ \text{BEAM AREA} \end{array} (7.43 \text{ SF}) \begin{array}{l} \text{EMBED.} \\ (2.83 \text{ FT}) \end{array} - \right. \\ \left. \begin{array}{l} \# \\ \text{TOP LOAD R} \\ \text{VOLUME} \end{array} (8) \begin{array}{l} \text{X-SEC} \\ \text{BEAM AREA} \end{array} (7.43 \text{ SF}) \begin{array}{l} \text{EMBED.} \\ (1.75 \text{ FT}) \end{array} (2) - \begin{array}{l} \# \\ \text{TOP LOAD R} \\ \text{VOLUME} \end{array} (13) (0.59 \text{ CF} + 0.40 \text{ CF} + 0.05 \text{ CF}) \right] (1/27) \\ = 165.6 \text{ CY}$$

B34-B45 - 
$$\left[ \begin{array}{l} \text{ELEVATION} \\ \text{AREA MICR.} \end{array} (440.0 \text{ SF}) \begin{array}{l} \text{THICKNESS} \\ (3.0 \text{ FT}) \end{array} + \begin{array}{l} \text{PLAN AREA} \\ \text{BIT B32-B33} \end{array} (651.1 \text{ SF}) \begin{array}{l} \text{AVG} \\ \text{HEIGHT} \end{array} (3.5 \text{ FT}) + \begin{array}{l} \text{SLOPED} \\ \text{TOP AREA} \end{array} (0.13 \text{ SF}) \begin{array}{l} \text{LENGTH} \\ (68.9 \text{ FT}) \end{array} + \right. \\ \left. \begin{array}{l} \text{SLOPED} \\ \text{TOP AREA} \end{array} (0.15 \text{ SF}) \begin{array}{l} \text{LENGTH} \\ (101.1 \text{ FT}) \end{array} - \begin{array}{l} \# \text{ OF} \\ \text{X-SEC AREA BEAM} \\ \text{EMBEDMENT} \end{array} (5) \begin{array}{l} \text{X-SEC} \\ \text{BEAM AREA} \end{array} (7.6 \text{ SF}) \begin{array}{l} \text{EMBED.} \\ (2.33 \text{ FT}) \end{array} - \begin{array}{l} \# \\ \text{TOP LOAD R} \\ \text{VOLUME} \end{array} (7) \begin{array}{l} \text{X-SEC} \\ \text{BEAM AREA} \end{array} (7.6 \text{ SF}) \begin{array}{l} \text{EMBED.} \\ (2.33 \text{ FT}) \end{array} - \right. \\ \left. \begin{array}{l} \# \\ \text{TOP LOAD R} \\ \text{VOLUME} \end{array} (12) (0.59 \text{ CF} + 0.40 \text{ CF} + 0.05 \text{ CF}) \right] (1/27) = 125.8 \text{ CY}$$



ITEM S11 - CLASS QC2 CONCRETE WITH QC/QA, SUPERSTRUCTURE

DIAPHRAGMS CONT.

- FRWD ABUTMENT

$$\begin{aligned}
 & \text{ELEVATION AREA MICRO} \\
 & \text{B23-B38} - [(702.3 \text{ SF})(3.33 \text{ FT}) + (458.5 \text{ SF})(3.33 \text{ FT}) + \\
 & \quad \text{SLOPED TOP AREA LENGTH} \\
 & \quad (229.8 \text{ SF})(3.33 \text{ FT}) + (0.14 \text{ SF})(217.2 \text{ FT}) - \\
 & \quad \text{X-SEC AREA BEAM EMBEDMENT TOP LOAD BUT LOAD HP SHARES} \\
 & \quad (16)(7.6 \text{ SF})(2.33 \text{ FT}) - (16)(0.59 \text{ CF} + 0.4 \text{ CF} + 0.05 \text{ CF})](127)
 \end{aligned}$$

= 161.7 CY

$$\begin{aligned}
 & \text{ELEVATION AREA MICROSTATION THICKNESS # X-SEC AREA AUG EMB EMBEDMENT} \\
 & \text{B39-B45} - [(469.8 \text{ SF})(5.1 \text{ FT}) - (7)(7.6 \text{ SF})(3.44 \text{ FT}) - \\
 & \quad (7)(0.59 \text{ CF} + 0.4 \text{ CF} + 0.05 \text{ CF})](127) = 81.7 \text{ CY}
 \end{aligned}$$

- TOTAL

- REAR ABUT = 224.8 CY
- PIER = 401.9 CY
- FRWD ABUT = 243.4 CY

∴ USE 870.1 CY

870.1 CY

ITEM S11 - SEMI-INTEGRAL DIAPHRAGM GUIDE

- REAR ABUTMENT - 3 EACH
- PIER - 0 EACH
- FRWD ABUTMENT - 4 EACH

7 EACH



Job FRA-70-1390C RAMP C5 BRIDGE  
Sheet No. 4 of 16  
Calculated by MLS Date 5/23/2019  
Checked by RHC Date 5/30/2019

ITEM 511 - CLASS Q22 CONCRETE WITH Q2/QA, BRIDGE DECK

AVERAGE HAUNCH THICKNESS = 5.95 IN (FROM DECK ELEVATIONS  
DECK THICKNESS = 10 IN SPREADSHEET)

AVERAGE HAUNCH LENGTH = 59.0 FT

HAUNCH WIDTH = 4.08 FT

DECK PLAN AREA = 30,219.74 SF

$$\text{DECK} = (10 \text{ IN} / 12 \text{ IN} / \text{FT}) (30,219.74 \text{ SF}) (1/27) = 932.7 \text{ CY}$$

$$\text{HAUNCHES} = (5.95 \text{ IN} / 12 \text{ IN} / \text{FT}) (59.0 \text{ FT}) (4.08 \text{ FT}) (\overset{\# \text{ OF HAUNCHES}}{37}) (1/27) = 163.7 \text{ CY}$$

$$\text{TOTAL} = 1096.4 \text{ CY}$$

$$\therefore \underline{\underline{\text{USE } 1097 \text{ CY}}}$$

ITEM 511 - CLASS Q22 CONCRETE WITH Q2/QA, BRIDGE DECK (PARAPET)

$$\text{LEFT PARAPET} - \overset{\text{LENGTH}}{(460.1 \text{ FT})} \overset{\text{PLAN AREA}}{(4.08 \text{ SF})} (1/27) = 69.5 \text{ CY}$$

$$\text{LEFT SIGN SUPPORT PILASTER} - \overset{\text{PLAN AREA}}{(13.5 \text{ SF})} \overset{\text{HEIGHT}}{(3.5 \text{ FT})} (1/27) = 1.75 \text{ CY}$$

$$\text{LIGHT POLE PILASTER} - \overset{\# \text{ PLAN AREA}}{(3)} (4.9 \text{ SF}) (3.5 \text{ FT}) (1/27) = 1.9 \text{ CY}$$

$$\text{RIGHT PARAPET} - (418.2 \text{ FT}) (4.08 \text{ SF}) (1/27) = 63.2 \text{ CY}$$

$$\text{RIGHT SIGN SUPPORT PILASTER} - (13.4 \text{ SF}) (3.5 \text{ FT}) (1/27) = 1.74 \text{ CY}$$

$$\text{TOTAL} = 138.09$$

$$\therefore \underline{\underline{\text{USE } 139 \text{ CY}}}$$



Job FRA-70-1390C RAMP CS BRIDGE  
 Sheet No. 5 of 16  
 Calculated by MLS Date 5/23/2019  
 Checked by RHC Date 5/30/2019

ITEM 511 - CLASS QCI CONCRETE WITH QC/QA, PIER ABOVE FOOTING

SEGMENT 1 - 
$$\left[ \frac{\text{ELEVATION AREA}}{\text{WIDTH}} (3\text{FT}) + \frac{\text{AVG AREA OF RECESS}}{\text{WIDTH}} (9)(83.9\text{SF})(2\text{FT}) \right] \left( \frac{1}{27} \right) = 423.9\text{CY}$$

SEGMENT 2 - 
$$\left[ (2163.8\text{SF})(3\text{FT}) + (8)(56.8\text{SF})(2\text{FT}) + (422.3\text{SF})(4\text{FT}) \right] \left( \frac{1}{27} \right)$$
  

$$= 336.6\text{CY}$$

SEGMENT 3 - 
$$\left[ (2083.8\text{SF})(3\text{FT}) + (6)(52.9\text{SF})(2\text{FT}) \right] \left( \frac{1}{27} \right) = 255.0\text{CY}$$

SEGMENT 4 - 
$$\left[ (1444.2\text{SF})(3\text{FT}) + (5)(59.7\text{SF})(2\text{FT}) + (303.3\text{SF})(3.5\text{FT}) \right] \left( \frac{1}{27} \right)$$
  

$$= 221.9\text{CY}$$

∴ USE 1238 CY

TOTAL = 1237.4 CY

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

REAR ABUTMENT

ELEVATION AREA

WIDTH



① 
$$\left[ (4132.3\text{SF} + 474.6\text{SF})(3.3\text{FT}) + (4.7\text{SF})(1.33\text{FT}) \right] \left( \frac{1}{27} \right) = 563.3\text{CY}$$

② BACKWALL - 
$$\left[ (140.8\text{SF})(1.417\text{FT}) + (195.3\text{SF})(6.13\text{FT}) \right] \left( \frac{1}{27} \right) = 51.7\text{CY}$$

② STEM - 
$$\left[ (753.3\text{SF})(1.083\text{FT}) + \left( \frac{1}{2} \right) (1.083\text{FT})(1.083\text{FT})(191.4\text{FT}) \right]$$

$$\left[ (948.5\text{SF})(26.7\text{FT}) \right] \left( \frac{1}{27} \right) = 972.3\text{CY}$$

③ 
$$\left[ (137.1\text{SF})(0.5\text{FT}) + (786.2\text{SF})(3\text{FT}) + (14.7\text{SF})(1.0\text{FT}) + (4.08\text{SF})(88.4\text{FT}) \right] \left( \frac{1}{27} \right)$$
  

$$= 103.8\text{CY}$$

④ 
$$\left[ (4.08\text{SF})(105.3\text{FT}) + (3071.7\text{SF})(1.5\text{FT}) + \left( \frac{1}{2} \right) (3093.2\text{SF})(2.5\text{FT}) + (1.2\text{SF})(32.6\text{FT}) + (0.83\text{SF})(95\text{FT}) \right] \left( \frac{1}{27} \right) = 334.1\text{CY}$$



Job FRA-70-1390C RAMP CS BRIDGE

Sheet No. 6 of 16

Calculated by MLS Date 5/23/2019

Checked by RHC Date 5/30/2019

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

FORWARD ABUTMENT

$$\begin{aligned}
 & \left[ \begin{array}{l} \text{ELEVATION AREA} \\ (2205.4 \text{ SF} + 1456.0 \text{ SF} + 806.6 \text{ SF}) \end{array} \right] (3.3 \text{ FT}) + \begin{array}{l} \text{PLAN AREA} \\ (12.2 \text{ SF}) \end{array} (6.67 \text{ FT}) + \\
 & \begin{array}{l} \text{BACKWALL} \\ \text{PLAN AREA} \end{array} (132.7 \text{ SF}) \begin{array}{l} \text{AVG} \\ \text{HEIGHT} \end{array} (7.4 \text{ FT}) - \begin{array}{l} \text{APP. SLAB} \\ \text{SEAT PLAN AREA} \end{array} (28.9 \text{ SF}) \begin{array}{l} \text{TRANSITION} \\ \text{ELEV. AREA} \end{array} (1.4167 \text{ FT}) + \begin{array}{l} \text{BEAM SEAT} \\ \text{ELEV. AREA} \end{array} (336.8 \text{ SF}) \begin{array}{l} \text{PARAPET} \\ \text{PLAN AREA} \end{array} (6.0 \text{ FT}) + \\
 & \begin{array}{l} \text{ELEV. AREA} \\ \text{ABOVE PANELS} \end{array} (260.1 \text{ SF}) \begin{array}{l} \text{SLOPED PARAPET} \\ \text{PLAN AREA} \end{array} (1.25 \text{ FT}) + \begin{array}{l} \text{TRANSITION} \\ \text{ELEV. AREA} \end{array} (30.3 \text{ SF}) \begin{array}{l} \text{PARAPET} \\ \text{PLAN AREA} \end{array} (6.67 \text{ FT}) + \begin{array}{l} \text{PARAPET} \\ \text{PLAN AREA} \end{array} (26.3 \text{ SF}) (3.5 \text{ FT}) + \\
 & \begin{array}{l} \text{SLOPED PARAPET} \\ \text{PLAN AREA} \end{array} (1/2)(4.35 \text{ SF})(3.5 \text{ FT}) \left] (1/27) = 687.5 \text{ CY}
 \end{aligned}$$

ABUTMENT TOTAL = 2712.7 CY

∴ USE 2713 CY

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

REAR ABUTMENT

$$\begin{aligned}
 & \left[ \begin{array}{l} \text{ELEV. AREA} \\ (680.6 \text{ SF}) \end{array} \right] (6 \text{ FT}) + \begin{array}{l} \text{ABUT. PLAN} \\ \text{AREA} \end{array} (3365.9 \text{ SF} + 931.3 \text{ SF}) (4.0 \text{ FT}) + \begin{array}{l} \text{WINGWALL} \\ \text{PLAN AREA} \end{array} (3483.2 \text{ SF}) (3.75 \text{ FT}) \left] (1/27) \right. \\
 & \left. = 1271.6 \text{ CY} \right.
 \end{aligned}$$

PIER

$$\left[ \begin{array}{l} \text{SEG. 1} \\ \text{PLAN AREA} \end{array} (825.4 \text{ SF}) + \begin{array}{l} \text{SEG. 2} \\ \text{PLAN AREA} \end{array} (703.8 \text{ SF}) + \begin{array}{l} \text{SEG. 3} \\ \text{PLAN AREA} \end{array} (1161.5 \text{ SF}) + \begin{array}{l} \text{SEG. 4} \\ \text{PLAN AREA} \end{array} (505.2 \text{ SF}) \right] (3 \text{ FT}) \left] (1/27) = 355.1 \text{ CY}$$

FORWARD ABUTMENT

$$\begin{aligned}
 & \left[ \begin{array}{l} \text{SEG. 1} \\ \text{PLAN AREA} \end{array} (654.7 \text{ SF}) + \begin{array}{l} \text{SEG. 2} \\ \text{PLAN AREA} \end{array} (429.8 \text{ SF}) \right] (4 \text{ FT}) + \begin{array}{l} \text{SEG. 3 TOE} \\ \text{PLAN AREA} \end{array} (446.8 \text{ SF}) (4 \text{ FT}) + \begin{array}{l} \text{SEG. 3 HEEL} \\ \text{PLAN AREA} \end{array} (338.5 \text{ SF}) (3.75 \text{ FT}) + \\
 & \begin{array}{l} \text{SEG. 4} \\ \text{X-SEC AREA} \end{array} (7.34 \text{ SF}) \begin{array}{l} \text{LENGTH} \\ (76.0 \text{ FT}) \end{array} \left] (1/27) = 294.5 \text{ CY}
 \end{aligned}$$

TOTAL = 1921.2 CY

∴ USE 1922 CY



ITEM 512 - SEALING OF CONCRETE SURFACES (EPOXY-URETHANE),  
LIGHT NEUTRAL

REAR ABUTMENT

SEG 1 FRONT ELEV AREA	SEG 1 BACK ELEV AREA	SEG 2 FRONT ELEV AREA	SEG 2 BACK ELEV AREA	SEG 2 BEAM SEAT AREA	SEG 3 FRONT AREA
--------------------------	-------------------------	--------------------------	-------------------------	-------------------------	---------------------

$$[(2970.4 \text{ SF} + 1883.7 \text{ SF} + 3036.4 \text{ SF} + 293.1 \text{ SF} + 452.4 \text{ SF} + 1558.6 \text{ SF} +$$

SEG 1 FRONT DIAPHRAGM AREA	FRONT BACK	DIAPHRAGM TOP WIDTH	LENGTH	SEG 2 FRONT DIAPH. AREA	SEG 2 BACK DIAPH. AREA	SEG 2 TOP WIDTH	LENGTH
-------------------------------	---------------	------------------------	--------	----------------------------	---------------------------	--------------------	--------

$$907.7 \text{ SF} (2) + 3.34 \text{ FT} (142.5 \text{ FT}) + 1031.5 \text{ SF} + 332.2 \text{ SF} + (3.34 \text{ FT}) (12.7 \text{ FT})$$

SEG 2 TOP WIDTH OVERSILL	#	BEAM X-SEC AREA	# OF ENDS	X-SEC AREA
-----------------------------	---	--------------------	--------------	---------------

$$+ (3.5 \text{ FT}) (30.0 \text{ FT}) - (13) (7.6 \text{ SF}) - (9) (7.43 \text{ SF}) + (4) (21.6 \text{ SF}) \left( \frac{1}{9} \right) = 1546.4 \text{ SY}$$

PIER

FRONT AREA	AREA OF RECESSES	FRONT & BACK	TOTAL LENGTH OF RECESSES	RECESS DEPTH	FRONT & BACK
---------------	---------------------	-----------------	-----------------------------	-----------------	-----------------

SEGMENT 1 -  $[(1763.3 \text{ SF} + 755.4 \text{ SF} (2) + 279.9 \text{ FT} (0.5 \text{ FT}) (2) +$

LENGTH OF TOP ARCH OPENINGS	WIDTH	LENGTH OF BOT. ARCH OPENINGS	WIDTH	END HEIGHT	ASSUMED REAR AREA
--------------------------------	-------	---------------------------------	-------	---------------	----------------------

$$(34.0 \text{ FT}) (3 \text{ FT}) + (18.2 \text{ FT}) (2 \text{ FT}) + (14.4 \text{ FT}) (3 \text{ FT}) + 2,000 \text{ SF} \left( \frac{1}{9} \right)$$

$$= 637.3 \text{ SY}$$

FRONT AREA	ASSUMED REAR AREA	AREA OF RECESSES	FRONT & BACK	TOP CAP RECESS LENGTH	FRONT & BACK
------------	----------------------	---------------------	-----------------	--------------------------	-----------------

SEGMENT 2 -  $[(1563.2 \text{ SF} + 1800 \text{ SF} + 453.9 \text{ SF} (2) + (140.8 \text{ FT}) (0.5 \text{ FT}) (2) +$

TOTAL LOWER RECESS LENGTH	RECESS DEPTH	FRONT BACK	BOT. OF ARCH OPENING LENGTH	# OF ARCHES	WIDTH
------------------------------	-----------------	---------------	--------------------------------	----------------	-------

$$(172.6 \text{ FT}) (0.5 \text{ FT}) (2) + (9.087 \text{ FT}) (8) (2 \text{ FT}) +$$

TOTAL ARCH LENGTH	WIDTH
----------------------	-------

$$(161.4 \text{ FT}) (3 \text{ FT}) \left( \frac{1}{9} \right) = 579.3 \text{ SY}$$

FRONT AREA	ASSUMED REAR AREA	AREA OF RECESSES	FRONT & BACK	TOTAL LENGTH OF RECESSES	RECESS DEPTH	FRONT & BACK
------------	----------------------	---------------------	-----------------	-----------------------------	-----------------	-----------------

SEGMENT 3 -  $[(1326.4 \text{ SF} + 1300 \text{ SF} + 317.6 \text{ SF} (2) + (124.4 \text{ SF}) (0.5 \text{ FT}) (2)$

BOT ARCH OPENING LENGTH	# OF ARCHES	WIDTH	TOTAL TOP ARCH LENGTH	WIDTH
----------------------------	----------------	-------	--------------------------	-------

$$+ (9.087 \text{ FT}) (6) (2 \text{ FT}) + (132.4 \text{ FT}) (3 \text{ FT}) \left( \frac{1}{9} \right) = 432.5 \text{ SY}$$

FRONT AREA	ASSUMED REAR AREA	LENGTH OF TOP CAP RECESS	RECESS DEPTH	AREA OF FRONT RECESSES & BACK
---------------	----------------------	-----------------------------	-----------------	----------------------------------

SEGMENT 4 -  $[(1132.3 \text{ SF} + 1100 \text{ SF} + (101.1 \text{ FT}) (0.5 \text{ FT}) + (298.5 \text{ SF}) (2) +$

TOTAL LOWER RECESS LENGTH	RECESS DEPTH	FRONT & BACK	BOT ARCH OPENING LEN.	# OF ARCHES	WIDTH	TOTAL TOP ARCH LENGTH	WIDTH
------------------------------	-----------------	-----------------	--------------------------	----------------	-------	--------------------------	-------

$$(109.5 \text{ FT}) (0.5 \text{ FT}) (2) + (10.25 \text{ FT}) (5) (2 \text{ FT}) + (109.2 \text{ FT}) (3 \text{ FT})$$

END LENGTH	WIDTH	CAP LENGTH	WIDTH
---------------	-------	---------------	-------

$$+ (14.7 \text{ FT}) (3 \text{ FT}) + (3 \text{ FT}) (3.5 \text{ FT}) \left( \frac{1}{9} \right) = 386.0 \text{ SY}$$





ITEM 512 - SEALING OF CONCRETE SURFACES (EPOXY-URETHANE),  
LIGHT NEUTRAL

PIER DIAPHRAGMS

AREA	FRONT & BACK	# OF BEAMS	BEAM AREA	TOP WIDTH	DIAPHRAGM LENGTH	
SEGMENT 1 -	$[(1063.1 SF)(2) - (12)(7.6 SF) + (3.5 FT)(165.0 FT)]$				$(19) = 290.3 SY$	
SEGMENT 2 -	$[(1198.7 SF)(2) - (2)(7.6 SF) - (19)(7.43 SF) + (4 FT)(31 FT)]$				$(19) = 262.8 SY$	
SEGMENT 3 -	$[(444.0 SF)(2) - (5)(7.6 SF) + (3 FT)(68.9 FT)]$				$(19) = 117.4 SY$	
SEGMENT 4 -	$[(651.1 SF)(2) - (7)(7.6 SF) + (3.5 FT)(101.1 FT) + (19.5 SF) + (22.7 SF)]$				$(19) = 182.8 SY$	

FORWARD ABUTMENT

AREA BACK OF ABUT	AREA FRONT OF ABUT.	END OF ABUT. HEIGHT	WIDTH	
SEGMENT 1 -	$[(1111.9 SF) + (1519.0 SF) + (11.9 FT)(3.33 FT)]$			$(19) = 296.7 SY$
SEGMENT 2 -	$[(440.3 SF) + (1053.2 SF)]$			$(19) = 165.9 SY$
SEGMENT 3 -	$[(51.7 SF) + (578.0 SF) + (3.33 FT)(14.9 FT) + (1.5 FT)(14.9 FT) + (6.2 SF) + (12.2 SF) + (7.5 FT)(6.7 FT)]$			$(19) = 85.6 SY$
SEGMENT 4 -	$[(1108.3 SF) + (418.0 SF) + (561.6 SF) + (26.3 SF) + (6.7 SF) + (69.5 SF) + (4.1 SF) + (56.4 SF) + (12.5 SF)]$			$(19) = 257.5 SY$

FORWARD ABUTMENT DIAPHRAGMS

AREA	FRONT & BACK	# OF BEAMS	BEAM AREA	TOP WIDTH	DIAPHRAGM LENGTH	
SEGMENT 1 -	$[(702.3 SF)(2) - (8)(7.6 SF) + (3.33 FT)(109.1 FT)]$				$(19) = 189.7 SY$	
SEGMENT 2 -	$[(458.5 SF)(2) - (5)(7.6 SF) + (3.33 FT)(71.7 FT)]$				$(19) = 124.2 SY$	
SEGMENT 3 -	$[(229.8 SF)(2) - (3)(7.6 SF) + (3.33 FT)(36.4 FT)]$				$(19) = 62.0 SY$	



Job FRA-70-1390C RAMP CS BRIDGE  
 Sheet No. 9 of 16  
 Calculated by MLS Date 5/23/2019  
 Checked by RHC Date 5/30/2019

ITEM 512 - SEALING OF CONCRETE SURFACES (EPOXY-URETHANE,  
 LIGHT NEUTRAL

FORWARD ABUTMENT DIAPHRAGMS CONTINUED

FRONT AREA      # OF BEAMS      BEAM AREA

$$\text{SEGMENT 4} - [(460.8 \text{ SF}) - (7)(7.43 \text{ SF})] (1/9) = 45.4 \text{ SY}$$

DECK + PARAPETS

AREA UNDER DECK - LEFT	AREA UNDER DECK - RIGHT	# OF BEAMS INTERSECTING	SKEWED WIDTH	SEALING LIMIT	DECK THICKNESS	OFFSET TO EDGE DECK	LEFT SIDE
$[(225.1 \text{ SF}) + (187.4 \text{ SF}) - (53)(4.5 \text{ FT})(0.5 \text{ FT}) + (10/12 \text{ FT} + 2/12 \text{ FT})(459.8 \text{ FT}$							
RIGHT SIDE	PARAPET PERIMETER	LEFT SIDE	RIGHT SIDE	SIGN PILASTER PERIMETER	LENGTH #		
$+ 392.8 \text{ FT}) + (7.8 \text{ FT})(417.5 \text{ FT} + 403.9 \text{ FT}) + (9.7 \text{ FT})(7.3 \text{ FT})(2) +$							
LIGHT POLE PILASTER PERIMETER	LENGTH #	SIDE AREA SIGN PILASTER #	SIDE AREA LIGHT PILASTER #				
$(9.5 \text{ FT})(2.92 \text{ FT})(3) + (16 \text{ SF})(2) + (15.3 \text{ SF})(3)] (1/9) = 890.2 \text{ SY}$							

REAR ABUTMENT CONTINUED

AREA UNDER OVERHANG	PERIMETER FACE OF OVERHANG	LENGTH	TOP OF OVERHANG AREA	PARAPET PERIMETER	LENGTH
$[(342.3 \text{ SF}) + (3.16 \text{ FT})(88.4 \text{ FT}) + (20.2 \text{ SF}) + (7.83 \text{ FT})(88.4 \text{ FT})] (1/9) = 148.2 \text{ SY}$					

WINGWALL

LENGTH	AVG HEIGHT ABOVE GRADE	PARAPET PERIMETER	LENGTH
$[(95.3 \text{ FT})(22.0 \text{ FT}) + (7.83 \text{ FT})(94.9 \text{ FT})] (1/9) = 315.5 \text{ SY}$			

TOTAL = 7,009.7 SY

∴ USE 7,010 SY



Job FRA-70-1390C RAMP CS BRIDGE

Sheet No. 10 of 16

Calculated by MLS Date 5/23/2019

Checked by RHC Date 5/30/2019

ITEM 512 - SEALING OF CONCRETE SURFACES (EPOXY-URETHANE), BLACK

$$\begin{array}{cccc} \text{BEAM} & \text{LENGTH OF} & \text{BEAM PER.} & \text{LENGTH OF} \\ \text{PERIMETER} & \text{COMP. SEALING} & & \text{PARTIAL SEALING} \\ [(21.59 \text{ FT}) & (1998.1 \text{ FT}) & + (17.51 \text{ FT}) & (2091.7 \text{ FT}) = 8,862.7 \text{ SY} \end{array}$$

$$\therefore \text{USE } \underline{8,863 \text{ SY}}$$

ITEM 512 - TYPE 2 WATERPROOFING

REAR ABUTMENT

$$\begin{array}{cc} \text{WIDTH} & \text{LENGTH} \\ [(3 \text{ FT}) & (11.7 \text{ FT})] (1/9) = 3.9 \text{ SY} \end{array}$$

FORWARD ABUTMENT

$$\begin{array}{cc} \text{WIDTH} & \text{LENGTH} \\ [(3 \text{ FT}) & (12.7 \text{ FT} + 16.8 \text{ FT} + 24.4 \text{ FT})] (1/9) = 18.0 \text{ SY} \end{array}$$

$$\therefore \text{USE } \underline{22 \text{ SY}} \quad \text{TOTAL} = 21.9 \text{ SY}$$

ITEM 513 - STRUCTURAL STEEL MEMBERS, LEVEL UF

$$L4 \times 3\frac{1}{2} \times 3\frac{3}{8} \quad \text{UNIT WEIGHT} = 9.10 \text{ PLF}$$

$$(9.10 \text{ PLF}) (62.8 \text{ FT} + 61.3 \text{ FT} + 59.5 \text{ FT} + 57.8 \text{ FT} + 56.0 \text{ FT} + 27.2 \text{ FT})$$

$$= 2953.9 \text{ LBS} (1.10) = 3249.2 \text{ LBS}$$

$$\therefore \text{USE } \underline{3250 \text{ LBS}}$$

ITEM 515 - DRAPED STRAND PRESTRESSED CONCRETE BRIDGE I-BEAM MEMBERS, LEVEL 3, WFL0-49

$$\underline{45 \text{ EACH}}$$



Job FRA-70-1390C RAMP C5 BRIDGE

Sheet No. 11 of 16

Calculated by MLS Date 5/23/2019

Checked by RHC Date 5/30/2019

ITEM 515 - INTERMEDIATE DIAPHRAGMS

SPAN 1

$$(3/BAY)(21 BAYS) = 63 \text{ EACH}$$

SPAN 2

$$(3/BAY)(22 BAYS) = 66 \text{ EACH}$$

$$\text{TOTAL} = \underline{\underline{129 \text{ EACH}}}$$

ITEM 516 - STRUCTURAL EXPANSION JOINT INCLUDING ELASTOMERIC STRIP SEAL

$$\text{REAR ABUTMENT} = 129.2 \text{ FT}$$

$$\text{FORWARD ABUTMENT} = 123.3 \text{ FT}$$

$$\therefore \text{USE } \underline{\underline{253 \text{ FT}}}$$

$$\text{TOTAL} = 252.5 \text{ FT}$$

ITEM 516 - 1" PREFORMED EXPANSION JOINT FILLER

REAR ABUTMENT WINGWALL

PARAPET X-SEC AREA	STRAIGHT WIDTH	HEIGHT	TAPERED WIDTH	HEIGHT	
4.08 SF	(1.5 FT)	(32.6 FT)	(1/2)	(2.5 FT)	(32.6 FT) = 93.6 SF

REAR ABUTMENT APPROACH SLAB

APP. SLAB THICKNESS	LENGTH	
(1.417 FT)	(98.9 FT)	= 140.1 SF

ABOVE PRECAST PANELS

WIDTH	
(1 1/2 FT)	(76.0 FT) = 69.7 SF

PIER

MEASURED IN  
MICROSTATION  
1823 SF

$$\text{TOTAL} = 2126.4 \text{ SF} \quad \therefore \text{USE } \underline{\underline{2,127 \text{ SF}}}$$



Job FRA-70-1390C RAMP CS BRIDGE

Sheet No. 12 of 16

Calculated by MLS Date 5/23/2019

Checked by RHC Date 5/30/2019

ITEM 516 - 2" PREFORMED EXPANSION JOINT FILLER

REAR ABUTMENT

WIDTH	HEIGHT	WIDTH	HEIGHT	WIDTH	HEIGHT	WIDTH	HEIGHT
(3.33 FT)	(15.8 FT)	(4.67 FT)	(4 FT)	(3.33 FT)	(25 FT)	(6 FT)	(4 FT)
PARADET X-SEC AREA		SLEEPER SLAB AREA AGAINST OVERHANG		WALL W/W/O OVERLAP		WIDTH	HEIGHT
(4.08 SF)	(7.4 SF)	(0.7253 SF)	(0.375 SF)	(22.5 FT)	(4.08 SF)	PARADET X-SEC AREA	
OVERLAP W/W + WALL W/W/O	FOOTING OVERLAP						
(3.9 SF)	(5.0 SF)						

$= 212.3 \text{ SF}$

FORWARD ABUTMENT

WIDTH	HEIGHT	WIDTH	HEIGHT	WIDTH	HEIGHT	WIDTH	HEIGHT
(3.33 FT)	(20.9 FT)	(6 FT)	(2 FT)	(3.33 FT)	(20.8 FT)	(6 FT)	(2.42 FT)
		FACADE PANEL WIDTH	HEIGHT	SEGMENT 4 FOOTING AREA			
(6.67 FT)	(12.3 FT)	(0.92 FT)	(14.4 FT)	(7.34 SF)			

$= 268.1 \text{ SF}$

PIER

WIDTH	HEIGHT	WIDTH	HEIGHT	WIDTH	HEIGHT	WIDTH	HEIGHT
(3.0 FT)	(16.6 FT)	(3.0 FT)	(26.0 FT)	(5.0 FT)	(2.0 FT)	(3.0 FT)	(25.9 FT)
WIDTH	HEIGHT	WIDTH	HEIGHT	WIDTH	HEIGHT		
(3.0 FT)	(24.6 FT)	(3.0 FT)	(24.4 FT)	(5.0 FT)	(0.8 FT)		

$= 366.5 \text{ SF}$

DIAPHRAGM GUIDES

WIDTH	AVG LENGTH	#	WIDTH	LENGTH	WIDTH	AVG LEN.	#
(3.33 FT)	(7.43 FT)	(3)	(5.5 FT)	(7.46 FT)	(3.33 FT)	(7.38 FT)	(2)
WIDTH	LENGTH						
(3.83 FT)	(7.34 FT)						

$= 192.6 \text{ SF}$

TOTAL = 1,039.5 SF

∴ USE 1,040 SF



Job FRA-70-1390C RAMP C5 BRIDGE

Sheet No. 13 of 16

Calculated by MLS Date 5/23/2019

Checked by RHC Date 5/30/2019

ITEM 516 - SEMI-INTEGRAL ABUTMENT EXPANSION JOINT SEAL

FORWARD ABUTMENT

HORIZONTAL LENGTH      VERTICAL LENGTH

$17.42 \text{ FT} + 5.0 \text{ FT} = 22.42 \text{ FT} \quad \therefore \underline{\underline{\text{USE } 23 \text{ FT}}}$

ITEM 516 - ELASTOMERIC BEARING WITH INTERNAL LAMINATES AND LOAD PLATE (NEOPRENE) (1'-1" x 1'-11" x 2.70"), AS PER PLAN

REAR ABUTMENT

22 EACH

PIER

45 EACH

FORWARD ABUTMENT

23 EACH

90 EACH

ITEM 518 - SLIPPERS, INCLUDING SUPPORTS

4 EACH



Job FRA-70-1390C RAMP C5 BRIDGE

Sheet No. 14 of 16

Calculated by MLS Date 5/23/2019

Checked by RHC Date 5/30/2019

ITEM 518 - POROUS BACKFILL WITH GEOTEXTILE FABRIC

REAR ABUTMENT

SEG 1 & 2 MEASURED IN MICROSTATION      SEG 2 FROM WINGWALL AREA MICROSTATION      MICROSTATION      WIDTH

$$[(2015.2 \text{ SF} + 4880.4 \text{ SF} + 2475.6 \text{ SF})(2 \text{ FT})] (\frac{1}{27}) = 694.2 \text{ CY}$$

FORWARD ABUTMENT

BEHIND ABUT. FROM MICROSTATION      WIDTH      X-SEC AREA IN FRONT OF SHAFTS      LENGTH

$$[(2862.4 \text{ SF})(2 \text{ FT}) + (5.3 \text{ SF})(76.0 \text{ FT})] (\frac{1}{27}) = 227.0 \text{ CY}$$

∴ USE 922 CY      TOTAL = 921.2 CY

ITEM 518 - 6" PERFORATED CORRUGATED PLASTIC PIPE

REAR ABUTMENT

SEG 1 + 2      SEG 2 + WINGWALL

$$188.8 \text{ FT} + 273.9 \text{ FT} = 462.7 \text{ FT}$$

FORWARD ABUTMENT

SEG 1 + 2      SEG 3 BEHIND ABUT.      SEG 3 IN FRONT OF SHAFTS

$$220.9 \text{ FT} + 75.6 \text{ FT} + 75.6 \text{ FT} = 372.1 \text{ FT}$$

∴ USE 835 FT      TOTAL = 834.8 FT

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

REAR ABUTMENT

$$6 \text{ FT} + 6 \text{ FT} = 12 \text{ FT}$$

∴ USE 44 FT

FORWARD ABUTMENT

$$19.5 \text{ FT} + 12 \text{ FT} = 31.5 \text{ FT}$$

TOTAL = 43.5 FT



Job FRA-70-1390C RAMP CS BRIDGE

Sheet No. 15 of 16

Calculated by MLS Date 5/23/2019

Checked by RHC Date 5/30/2019

ITEM 518 - 8" PIPE DOWNSPOUT, INCLUDING SPECIALS

PORTION CAST IN PIER	PORTION TO MANHOLE	CLEANOUT	COMBO LATERAL	
23.5 FT	+ 7.25 FT	+ 2 FT	+ 2.25 FT	= 35 FT     ∴ <u>USE 35 FT</u>

ITEM 518 - PIPE HORIZONTAL CONDUCTOR

DOWNSPOUT 1	DOWNSPOUT 2	DOWNSPOUT 3	DOWNSPOUT 4	#	ELBOW FROM	ELBOW + PIPE
38.5 FT	+ 42.0 FT	+ 46.0 FT	+ 49.5 FT	(4)	(1.9 FT + 2 FT + 4 FT +	TO REDUCER
PIPE ELBOW TO MAIN CONDUCTOR	MAIN CONDUCTOR ON PIER					
4 FT	+ 47.5 FT					= 271.1 FT     ∴ <u>USE 272 FT</u>

ITEM 524 - DRILLED SHAFTS, 42" DIAMETER, ABOVE BEDROCK WITH QC/QA

#	SHAFT LENGTH	
(7)	(33.42 FT)	= 233.94 FT     ∴ <u>USE 234 FT</u>

ITEM 524 - DRILLED SHAFTS, 48" DIAMETER, ABOVE BEDROCK WITH QC/QA

#	SHAFT LENGTH	
(8)	(40.0 FT)	= 320 FT
(12)	(40.0 FT)	= 480 FT
(13)	(52.0 FT)	= 676 FT
(6)	(35.0 FT)	= 210 FT
		∴ <u>USE 1,686 FT</u>

TOTAL = 1,686 FT

ITEM 524 - DRILLED SHAFTS, 60" DIAMETER, ABOVE BEDROCK WITH QC/QA

#	SHAFT LENGTH	
(22)	(50.6 FT)	= 1113.2 FT
(9)	(58.6 FT)	= 527.4 FT
(12)	(55.6 FT)	= 667.2 FT
(7)	(50.0 FT)	= 350.0 FT
(5)	(48.0 FT)	= 240.0 FT
(15)	(56.86 FT)	= 852.9 FT
		∴ <u>USE 3,751 FT</u>

TOTAL = 3,750.7 FT





Job FRA-70-1390C RAMP C5 BRIDGE

Sheet No. 16 of 16

Calculated by MLS Date 5/23/2019

Checked by RHC Date 5/30/2019

ITEM 526 - REINFORCED CONCRETE APPROACH SLABS WITH QC/QA (T=17"),  
AS PER PLAN

REAR APPROACH SLAB

$$5,947.6 \text{ SF} \left(\frac{1}{9}\right) = 660.8 \text{ SY} \quad \therefore \text{USE } \underline{\underline{661 \text{ SY}}}$$

ITEM SPECIAL - STRUCTURE, MISC.: PRECAST FACADE PANELS

FORWARD ABUTMENT

MICROSTATION  
AREA

1199.4 SF

$$\therefore \text{USE } \underline{\underline{1,200 \text{ SF}}}$$

ITEM SPECIAL - SPECIAL - FORM LINER

(ALL AREAS MEASURED IN MICROSTATION)

REAR RIGHT WING WALL = 2,484 SF

REAR BREAST WALL = 2,346 SF

DIAPHRAGMS & SUPERSTRUCTURE = 1,230 SF

TOTAL = 6,060 SF

$$\therefore \text{USE } \underline{\underline{6,060 \text{ SF}}}$$