PID 110151, MOT-BP-FY26: QUANTITY CALCULATION CHECK

Calculated by: *Dan Grilliot, P.E., Date: 10/28/2024*

Checked by: *Lawton Gerlinger, P.E., Date: 12/18/2024*

Revised by: *Dan Grilliot, P.E., Date: 4/16/2025*

Erosion Control

1. Item 659-Seeding and Mulching (SY)
   a. Assumed an area of total = 500 sq. yd.
2. Item 659-Repair Seeding and Mulching (SY)
   a. 5% of permanent per Designer Note
   b. Total = 500 sq. yd x 0.05 = 25 sq. yd.
3. Item 659-Commercial Fertilizer (TON)
   a. Rates per Designer Note
   b. Perm seed total = 500 sq. yd. x (1 ton/7410 sq. yd.) = 0.07 ton
   c. Total = 0.07 ton
4. Item 659-Water (MGAL)
   a. Rates per Designer Note
   b. Perm seed total = 500 sq. yd. x 0.0027 MGAL/sq. yd. x 2 applications = 2.7 MGAL = 3 MGAL
   c. Total = 3 MGAL
5. *Item 832-Erosion Control (EA)*
   a. Considered Maintenance Project: $833.33/bridge x 6 bridges = $5,000

Structure Repair (MOT-35-1607R)

6. Item 513-Structural Steel, Misc.: Access Door Repair (LS)
   a. Includes all hardware (bolts, washers, and nuts), neoprene sheeting, excludes painting
   b. LUMP SUM
7. Item 514-Surface Preparation of Existing Structural Steel, As Per Plan (SF)
   a. Interior Sides
   b. 4.833 ft x 0.90625 ft. x 2 walls x 2 pier cap ends = 17.52 sq. ft.
   c. Interior Top/Bottom
   d. 0.90625 ft. x 2.8958 ft. x 2 walls x 2 pier cap ends = 10.50 sq. ft.
   e. Interior End
   f. 2.8958 ft. x 4.833 ft. 2 walls x 2 pier cap ends = 55.98 sq. ft
   g. Total = 17.52 sq. ft. + 10.50 sq. ft. + 55.98 sq. ft. = 84 sq. ft.
8. Item 514-Field Painting of Existing Structural Steel, Prime Coat, As Per Plan (SF)
   a. Same as Surface Preparation of Existing Structural Steel = 84 sq. ft.

9. Item 514-Field Painting Structural Steel, Intermediate Coat, As Per Plan (SF)
    a. Same as Surface Preparation of Existing Structural Steel = 84 sq. ft.
10. Item 514-Field Painting Structural Steel, Finish Coat, As Per Plan (SF)
    a. Same as Surface Preparation of Existing Structural Steel = 84 sq. ft.
11. Item 514-Grinding Fins, Tears, Slivers on Existing Structural Steel (MNHR)
    a. Total = 1 hr.
12. Item 514-Final Inspection Repair (EA)
    a. 1 each = total

Structure Repair (MOT-35-1654L)

13. Item 514-Surface Preparation of Existing Structural Steel (SF)
    a. Plate Girder #1-#4 for 1 ½" thick bottom plate
    b. ((18" – 3/8") x 2) + (48" x 2) + (1 ½" x 2) + 18" = 35.25" + 96" + 3" + 18" = 152.25" = 12.6875 ft. = perimeter
    c. Girder #1 length for 1 ½" thick bottom plate = 9" + (56'-0 7/8") + (9'-9") + (9'-6") + (13'-3") = 89.32 ft.
    d. Girder #2 length for 1 ½" thick bottom plate = 9" + (58'-3") + (10'-0") + (9'-9") + (13'-6") = 92.25 ft.
    e. Girder #3 length for 1 ½" thick bottom plate = 9" + (60'-2 1/16") + (10'-6") + (10'-0") + (14'-0") = 95.42 ft.
    f. Girder #4 length for 1 ½" thick bottom plate = 9" + (62'-4 3/16") + (10'-9") + (10'-6") + (14'-6") = 98.85 ft.
    g. Girder #1-#4 with 1 ½" thick bottom plate to paint = 12.6875 ft. x (89.32 ft. + 92.25 ft. + 95.42 ft. + 98.85 ft.) = 4768.47 sq. ft.
    h. Plate Girder #1-#4 for 1 ¾" thick bottom plate
    i. ((18" – 3/8") x 2) + (48" x 2) + (1 3/4" x 2) + 18" = 152.75" = 12.73 ft. = perimeter
    j. Girder #1 length for 1 ¾" thick bottom plate = (8'-6") + (13'-3") = 21.75 ft.
    k. Girder #2 length for 1 ¾" thick bottom plate = (8'-9") + (13'-6") = 22.25 ft.
    l. Girder #3 length for 1 ¾" thick bottom plate = (9'-0") + (14'-0") = 23 ft.
    m. Girder #4 length for 1 ¾" thick bottom plate = (9'-3") + (14'-6") = 23.75 ft.
    n. Girder #1-#4 with 1 ¾" thick bottom plate to paint = 12.73 ft. x (21.75 ft. + 22.25 ft. + 23 ft. + 23.75 ft.) = 1155.24 sq. ft.
    o. Plate Girder #1-#4 for 1" thick bottom plate
    p. ((18" – 3/8") x 2) + (48" x 2) + (1" x 2) + 18" = 151.25" = 12.6 ft. = perimeter
    q. Girder #1 length for 1" thick bottom plate = (7'-3") + (45'-7 13/16") + (6'-3") = 59.15 ft.
    r. Girder #2 length for 1" thick bottom plate = (7'-9") + (46'-8") + (6'-9") = 61.17 ft.
    s. Girder #3 length for 1" thick bottom plate = (8'-0") + (48'-4 3/16") + (7'-0") = 63.35 ft.
    t. Girder #4 length for 1" thick bottom plate = (8'-3") + (50'-0 3/8") + (7'-0") = 65.28 ft.
    u. Girder #1-#4 with 1" thick bottom plate to paint = 12.6 ft. x (59.15 ft. + 61.17 ft. + 63.35 ft. + 65.28 ft.) = 3136.77 sq. ft.
    v. Plate Girder #1-#4 for ¾" thick bottom plate
    w. ((18" – 3/8") x 2) + (48" x 2) + (3/4" x 2) + 18" = 150.75" = 12.5625 ft. = perimeter
    x. Girder #1 length for ¾" thick bottom plate = (5'-3") + (34'-10 1/16") + 9" = 40.84 ft.
    y. Girder #2 length for ¾" thick bottom plate = (5'-9") + (36'-0 1/16") + 9" = 42.51 ft.

z. Girder #3 length for ¾" thick bottom plate = (6'-0") + (37'-2 1/8") + 9" = 43.93 ft.
aa. Girder #4 length for ¾" thick bottom plate = (6'-3") + (38'-4 1/8") + 9" = 45.34 ft.
bb. Girder #1-#4 with ¾" thick bottom plate to paint = 12.5625 ft. x (40.84 ft. + 42.51 ft. + 43.93 ft. + 45.34 ft.) = 2168.54 sq. ft.
cc. Total Girder #1-#4 without stiffener plates = 4768.47 sq. ft. + 1155.24 sq. ft. + 3136.77 sq. ft. + 2168.54 sq. ft. = 11229.02 sq. ft.
dd. Intermediate Crossframes
ee. All crossframe angles are 4" x 4" x 1/2".
ff. Perimeter of 4" x 4" x ½" angle for bottom brace and angle braces = 4" x 4 = 16" = 1.333 ft.
gg. Perimeter of 4" x 4" x ½" angle for top brace = 4" x 3 = 12" = 1 ft.
hh. # intermediate crossframes = 51 each
ii. Crossframe unit = bottom angle + 2 diagonal angles = (6.75 ft. + (4.75 ft. x 2 each)) x (1.333 ft.) = 21.67 sq. ft.
jj. Top angle = (6.75 ft. x 1 ft.) = 6.75 sq. ft.
kk. 4 corner plates = 1' x 1' (1 sq. ft. x 4 plates x 2 sides) = 8 sq. ft.
ll. 1 top middle plate = (1.333 ft. x 0.666 ft. x 2 sides x 1 plate) = 1.78 sq. ft.
mm. Total crossframe unit = 21.67 sq. ft. + 6.75 sq. ft. + 8 sq. ft. + 1.78 sq. ft. = 38.2 sq. ft
nn. Total intermediate crossframes = 51 each x 38.2 sq. ft. = 1948.20 sq. ft.
oo. End Crossframes
pp. # end crossframe units = 6 each
qq. Bottom angle + diagonal angles = (7.75 ft. x 1.333 ft. x 1 each) + (3.583 ft. x 1.333 ft. x 4 each) = 29.44 sq. ft.
rr. Plates say 6"x8" each = (5 plates x 2 sides x 6" x 8" x (1 sq. ft./144 sq. in.)) = 3.33 sq. ft.
ss. Per end crossframe total = 32.77 sq. ft.
tt. Total end crossframes = 196.64 sq. ft.
uu. Stiffeners
vv. End of girder #1 = 1 plate = 4" x 48", 2 plate = 8" x 48" plates
ww. Girder #1 = (56'-0 7/8") + (9'-9") + (8'-6") – (10'-0") = 64.32 ft/4 ft. max. spacing = 16.08 spaces = 17 spaces
xx. 17 stiffener locations x 2 plates = 34 plates @ 6" x 48" plate
yy. = 10'-0"/3'-6" spacing max. = 3 spaces = 2 stiffener locations x 2 plates = 4 plates @ 6" x 48" plate
zz. C/L pier 1 = 2 plates @ 8" x 48" = 3 stiffener locations x 2 plates = 6 plates @ 6" x 48" = 69.90 ft/4 ft. max. spacing = 17.47 spaces = 18 spaces = 18 stiffener locations x 2 plates = 36 plates @ 6" x 48" plates
aaa. C/L pier 2 = 2 plates @ 8" x 48" plates
bbb. = 2 plates @ 6" x 48" plate
ccc. = 50.34 ft./4 ft. max. spacing = 12.58 spaces = 13 spaces = 11 stiffener locations x 2 plates = 22 plates @ 6" x 48" plates
ddd. = C/L bridge abut. 2 = 2 plates@ 8" x 48" plates
eee. End of girder #1 = 1 plate = 4" x 48" plate
fff. 4" x 48" plate = 4" x 48" x (1 ft./12 in.) x (1 ft./12 in.) x 2 sides = 2.667 sq. ft.
ggg. 6" x 48" plate = 6" x 48" x (1 ft./12 in.) x (1 ft./12 in.) x 2 sides = 4 sq. ft.
hhh. 8" x 48" plate = 4" x 48" x (1 ft./12 in.) x (1 ft./12 in.) x 2 sides = 5.33 sq. ft.

iii. Girder #1 (1 plate x 2.667 sq. ft.) + (2 plates x 5.333 sq. ft.) + (34 plates x 4 sq. ft.) + (4 plates x 4 sq. ft.) + (2 plates x 5.33 sq. ft.) + (6 plates x 4 sq. ft.) + (36 plates x 4 sq. ft.) + (2 plates x 5.33 sq. ft.) + (2 plates x 4 sq. ft.) + (22 plates x 4 sq. ft.) + (2 plates x 5.33 sq. ft.) + (1 plate x 2.667 sq. ft.) = 463.98 sq. ft.
jjj. Girder #2 Stiffeners
kkk. End of girder #2 = 2 plates @ 4" x 48"
lll. 2 plates @ 8" x 48" plates
mmm. 67 ft./4 ft. max. spacing = 16.75 spacings = 17 spaces = 17 locations x 2 plates = 34 plates @ 6" x 48" plates
nnn. = 10'-0"/3'-6" spacing = 3 spaces = 2 stiffener locations x 2 plates = 4 plates @ 6" x 48" plate
ooo. = C/L pier 1 = 2 plates @ 8" x 48" plates
ppp. = 3 stiffener locations x 2 plates = 6 plates @ 6" x 48" plates
qqq. = 72.42 ft/4 ft. max. spacing = 18.1 spaces = 19 spaces = 19 locations x 2 plates = 38 plates @ 6" x 48" plates
rrr. = C/L pier 2 = 2 plates @ 8" x 48" plates
sss. = 2 plates @ 6" x 48" plates
ttt. 52.26 ft./4 ft. max. spacing = 13.06 spaces = 14 spaces = 12 locations x 2 plates = 24 plates @ 6" x 48" plates
uuu. C/L brg. Abut 2 = 2 plates @ 8" x 48" plates
vvv. End of girder #2 = 2 plates @ 4" x 48" plates
www. (2 plates x 2.667 sq. ft.) + (2 plates x 5.33 sq. ft.) + (34 plates x 4 sq. ft.) + (4 plates x 4 sq. ft.) + (2 plates x 5.33 sq. ft.) + (6 plates x 4 sq. ft.) + (38 plates x 4 sq. ft.) + (2 plates x 5.33 sq. ft.) + (2 plates x 4 sq. ft.) + (24 plates x 4 sq. ft.) + (2 plates x 5.33 sq. ft.) + (2 plates x 2.667 sq. ft) = 485.31 sq. ft.
xxx. Girder #3 Stiffeners
yyy. End of girder #3 = 2 plates @ 4" x 48"
zzz. 2 plates @ 8" x 48" plates
aaaa. 69.67 ft./4 ft. max. spacing = 17.41 spaces = 18 spaces = 18 locations x 2 plates = 36 plates @ 6" x 48" plates
bbbb. = 10'-0"/3'-6" spacing = 3 spaces = 2 stiffener locations x 2 plates = 4 plates @ 6" x 48" plate
cccc. = C/L pier 1 = 2 plates @ 8" x 48" plates
dddd. = 3 stiffener locations x 2 plates = 6 plates @ 6" x 48" plates
eeee. = 75.35 ft/4 ft. max. spacing = 18.84 spaces = 19 spaces = 19 locations x 2 plates = 38 plates @ 6" x 48" plates
ffff. = C/L pier 2 = 2 plates @ 8" x 48" plates
gggg. = 2 plates @ 6" x 48" plates
hhhh. 54.18 ft./4 ft. max. spacing = 13.54 spaces = 14 spaces = 12 locations x 2 plates = 24 plates @ 6" x 48" plates
iiii. C/L brg. Abut 2 = 2 plates @ 8" x 48" plates
jjjj. End of girder #2 = 2 plates @ 4" x 48" plates
kkkk. (2 plates x 2.667 sq. ft.) + (2 plates x 5.33 sq. ft.) + (36 plates x 4 sq. ft.) + (4 plates x 4 sq. ft.) + (2 plates x 5.33 sq. ft.) + (6 plates x 4 sq. ft.) + (38 plates x 4 sq. ft.) + (2 plates x 5.33 sq. ft.) + (2 plates x 4 sq. ft.) + (24 plates x 4 sq. ft.) + (2 plates x 5.33 sq. ft.) + (2 plates x 2.667 sq. ft) = 493.31 sq. ft.

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llll. Girder #4 Stiffeners
mmmm. End of girder #4 = 1 plate @ 4” x 48”
nnnn. 2 plates @ 8” x 48” plates
oooo. 72.35 ft./4 ft. max. spacing = 18.08 spaces = 19 spaces = 19 locations x 2 plates = 38 plates @ 6” x 48” plates
pppp. = 10’-0”/3’-6” spacing = 3 spaces = 2 stiffener locations x 2 plates = 4 plates @ 6” x 48” plate
qqqq. = C/L pier 1 = 2 plates @ 8” x 48” plates
rrrr. = 3 stiffener locations x 2 plates = 6 plates @ 6” x 48” plates
ssss. = 78.30 ft/4 ft. max. spacing = 19.57 spaces = 20 spaces = 20 locations x 2 plates = 40 plates @ 6” x 48” plates
tttt. = C/L pier 2 = 2 plates @ 8” x 48” plates
uuuu. = 2 plates @ 6” x 48” plates
vvvv. 56.09 ft./4 ft. max. spacing = 14.02 spaces = 14 spaces = 12 locations x 2 plates = 24 plates @ 6” x 48” plates
wwww. C/L brg. Abut 2 = 2 plates @ 8” x 48” plates
xxxx. End of girder #2 = 1 plates @ 4” x 48” plates
yyyy. (1 plate x 2.667 sq. ft.) + (2 plates x 5.33 sq. ft.) + (38 plates x 4 sq. ft.) + (4 plates x 4 sq. ft.) + (2 plates x 5.33 sq. ft.) + (6 plates x 4 sq. ft.) + (40 plates x 4 sq. ft.) + (2 plates x 5.33 sq. ft.) + (2 plates x 4 sq. ft.) + (24 plates x 4 sq. ft.) + (2 plates x 5.33 sq. ft.) + (1 plates x 2.667 sq. ft) = 503.97 sq. ft.
zzzz. Stiffener total = Girder #1 stiffeners + Girder #2 stiffeners + Girder #3 stiffeners + Girder # 4 stiffeners = 463.98 sq. ft. + 485.31 sq. ft. + 493.31 sq. ft. + 503.97 sq. ft. = 1946.57 sq. ft.
aaaaa. Scuppers
bbbbb. 4 scuppers Fwd. Lt. side, 6” diameter = 2 x pi x r = 2 x pi x 3” x (1 ft./12 in.) = 1.57 ft.
ccccc. Length = 48” + 8” 56’ = 4.667 ft.
ddddd. 1.57 ft x 4.667 ft x 4 scuppers = 29.31 sq. ft.
eeeee. Scupper Collection System at Rear Abutment Lt. Side
fffff. Length of 6” diameter scupper pipes = ((2’-3”)-9”) + ((2’-6”)-9”) + (7’-0”) + (19’-0”) = 29.25 ft.
ggggg. 6” diameter pipe = 2 x pi x 3” x (1 ft./12 in.) = 1.57 ft.
hhhhh. Scupper Collection System = 1.57 ft. x 29.25 ft. = 45.92 sq. ft.
iiiii. Total Scuppers = 29.31 sq. ft. + 45.92 sq. ft. = 75.23 sq. ft.
jjjjj. Bearings
4 beams x (4 bearings/beam) x (2 sq. ft./bearing) = 32 sq. ft.
kkkkk. Total Girder #1-#4 without stiffener plates = 11229.02 sq. ft.
Total Intermediate Crossframes = 1948.20 sq. ft.
Total End Crossframes = 196.64 sq. ft.
Total Stiffeners = 1946.57 sq. ft.
Total Scuppers = 75.23 sq. ft.
Total Bearings = 32 sq. ft.
Total = 15427.66 sq. ft. = 15428 sq. ft.

14. Item 514-Field Painting of Existing Structural Steel, Prime Coat (SF)
a. Same as Surface Preparation of Existing Structural Steel = 15428 sq. ft.

15. Item 514-Field Painting Structural Steel, Intermediate Coat (SF)
    a. Same as Surface Preparation of Existing Structural Steel = 15428 sq. ft.
16. Item 514-Field Painting Structural Steel, Finish Coat (SF)
    a. Same as Surface Preparation of Existing Structural Steel = 15428 sq. ft.
17. Item 514-Grinding Fins, Tears, Slivers on Existing Structural Steel (MNHR)
    a. Per 2020 BDM section 404.1.11 1 min./ft. beam/girder to be painted;
    b. Length Girder #1 = 211.06 ft.
    c. Length Girder #2 = 217.42 ft.
    d. Length Girder #3 = 225.70 ft.
    e. Length Girder #4 = 233.24 ft.
    f. Total Girder Length = 887.42 ft.
    g. (887.42 ft. x (1 min./ft.) x (1 hr./60 min.) = 14.79 hr. = 15 hr.
18. Item 514-Final Inspection Repair (EA)
    a. Per CMS 514.21: 1 location per 300 ft. of beam length, 2.5% of all crossframe assemblies, (887.42 ft. x (1 each/300 ft.)) + (0.025 x (51 each + 6 each) = 2.96 + 1.425 = 4.38 each = 5 each

<u>Structure Repair (MOT-35-1672N)</u>

19. Item 514-Surface Preparation of Existing Structural Steel (SF)
    a. Beams
    b. W36x230 Perimeter to Paint = (35 7/8" – 1 ¼") x (2) + (16 ½" – ¾") x (2) + 16 ½" = 69.25" + 31.5" + 16.5" = 117.25" = 9.77 ft.
    c. W36x230 Beam Length = 9" + (66'-3 ¾") + (82'-6 ¾") + (64'-7") + 9" = 214.96 ft.
    d. # of beams = 4 each
    e. Total W36x230 Beams to Paint = (9.77 ft.) x (214.96 ft.) x (4 each) = 8401.35 sq. ft = total beams
    f. Intermediate Crossframes
    g. All crossframe angles are 3" x 3" x 5/16".
    h. 3" x 3" x 5/16" perimeter = 3" x 4 = 12" = 1 ft.
    i. Length of angles per crossframe unit = (9.07 ft. x 2) + 8.67 ft. = 26.8 ft.
    j. # crossframe units = 42 each
    k. Intermediate Crossframes to paint = (1 ft. x 42 each x 26.8 ft.) = 1125.60 sq. ft.
    l. End Crossframes
    m. # crossframe units = 6 each
    n. 4" x 4" x 5/16" perimeter = 4" x 4 = 16" = 1.333 ft.
    o. Length of angles per unit = (5.3 ft x 4) + 2.67 ft. + 18.31 ft. = 42.18 ft.
    p. Plate #1 assume 6" x 8" = (2 plates x 6" x 8" x (1 ft./144 sq. in.) = 0.67 sq. ft.
    q. Plate #2 assume 4" x 5" = (1 plate x 4" x 5" x (1 ft./144 sq. in.) = 0.14 sq. ft.
    r. Plate #3 assume 6" x 10" (1 plate x 6" x 10" x (1 ft./144 sq. in.) = 0.42 sq. ft.
    s. Total plates = 0.67 sq. ft. + 0.14 sq. ft. + 0.42 sq. ft. = 1.23 sq. ft.
    t. (6 each x 1.33 ft. x 42.18 ft.) + (1.23 ft. x 6 each) = 343.98 sq. ft. = End Crossframes
    u. Scuppers
    v. # scuppers = 3 each fwd. abut. Lt. side + 4 each rear abut. Rt. side = 7 each
    w. 6" diameter scupper = 2 x pi x r = 2 x pi x 3" x (1 ft./12 in.) = 1.57 ft.
    x. Length = 37 1/8" + 8" = 45 1/8" = 3.76 ft.

y. Total Scuppers = 1.57 ft. x 3.76 ft. x 7 scuppers = 41.34 sq. ft.

z. Bearings

4 beams x (4 bearings/beam) x (2 sq. ft./bearing) = 32 sq. ft.

aa. Total Beams = 8401.35 sq. ft.
Total Intermediate Crossframes = 1125.60 sq. ft.
Total End Crossframes = 343.98 sq. ft.
Total Scuppers = 41.34 sq. ft.
Total Bearings = 32 sq. ft.
Total = 9944.27 sq. ft. = 9944 sq. ft.

20. Item 514-Field Painting of Existing Structural Steel, Prime Coat (SF)
    a. Same as Surface Preparation of Existing Structural Steel = 9944 sq. ft.
21. Item 514-Field Painting Structural Steel, Intermediate Coat (SF)
    a. Same as Surface Preparation of Existing Structural Steel = 9944 sq. ft.
22. Item 514-Field Painting Structural Steel, Finish Coat (SF)
    a. Same as Surface Preparation of Existing Structural Steel = 9944 sq. ft.
23. Item 514-Grinding Fins, Tears, Slivers on Existing Structural Steel (MNHR)
    a. Per 2020 BDM section 404.1.11 1 min./ft. beam/girder to be painted; (214.96 ft. x 4 beams) = 859.84 ft.; (859.84 ft. x (1 min./ft.) X (1 hr./60 min.)) = 14.33 hr. = 15 hr.
24. Item 514-Final Inspection Repair (EA)
    a. Per CMS 514.21: 1 location per 300 ft. of beam length, 2.5% of all crossframe assemblies, (859.84 ft. x (1 each/300 ft.)) + (0.025 x (42 each + 6 each) = 2.87 + 1.2 = 4.07 each = 4 each

<u>Structure Repair (MOT-35-1690)</u>

25. Item 514-Surface Preparation of Existing Structural Steel (SF)

a. Beams

b. W36x170 Perimeter to Paint = (36 1/8" – 1 1/8") x (2) + (12" – 11/16") x (2) + 12" = 70" + 22.625" + 12" = 104.625" = 8.72 ft.

c. Beam #1 Length = 9" + (60'-10 3/8") + (16'-7 7/16") + (16'-7 7/16") + (60'-10 3/8") + 9" – (9" + 1' + 1' + 9") = 152.97 ft.

d. Beam #2 Length = 9" + (60'-6 1/8") + (16'-6 5/16") + (16'-6 5/16") + (60'-6 1/8") + 9" – (9" + 1' + 1' + 9") = 152.07 ft.

e. Beam #3 Length = 9" + (60'-2") + (16'-5 3/16") + (16'-5 3/16") + (60'-2") + 9" – (9" + 1' + 1' + 9") = 151.20 ft.

f. Beam #4 Length = 9" + (59'-9 15/16") + (16'-4 1/16") + (16'-4 1/16") + (59'-9 15/16") + 9" – (9" + 1' + 1' + 9") = 150.33 ft.

g. Beam #5-#19 Length = 9" + (59'-6") + (16'-3") + (16'-3") + (59'-6") + 9" – (9" + 1' + 1' + 9") = 149.5 ft. x 15 beams = 2242.50 ft.

h. Total W36x170 Beam Lengths = 152.97 ft. + 152.07 ft. + 151.20 ft. + 150.33 ft. + 2242.50 ft. = 2849.07 ft.

i. Total W36x170 Beams to paint = 8.72 ft. x 2849.07 ft. = 24843.89 sq. ft.

j. W36x230 Perimeter to Paint = (35 7/8" – 1 ¼") x (2) + (16 ½" – ¾") x (2) + 16 ½" = 69.25" + 31.5" + 16.5" = 117.25" = 9.77 ft.

k. W36x230 Beam #1 Length = 53'-11 9/16" = 53.963 ft.

l. W36x230 Beam #2 Length = 53'-7 ¾" = 53.65 ft.

m. W36x230 Beam #3 Length = 53’-4 1/16” = 53.25 ft.
n. W36x230 Beam #4 Length = 53’-0 9/16” = 53.05 ft.
o. W36x230 Beam #5-#19 Length = 52’-9” x 15 beams = 791.25 ft.
p. Total beam lengths = 1005.16 ft.
q. Total W36x230 Beams to Paint = (9.77 ft.) x (1005.16 ft.) = 9821.25 sq. ft
r. Total beams = W36x170 beams + W36x230 beams = 24843.89 sq. ft. + 9821.25 sq. ft. = 34665.14 sq. ft.

s. Intermediate Crossframes

t. All crossframe angles are 3” x 3” x 5/16”.
u. Crossframes Between Beam 1 to 5
v. Length of angles per crossframe unit = (7.95 ft. x 2) + 7.41 ft. = 23.31 ft.
w. Angle Perimeter = 3” x 4 = 12” = 1 ft.
x. # units between beam #1 through #5 = 59 each
y. Intermediate Crossframes Between Beams #1 to 5 = 23.31 ft. x 1 ft. x 59 each = 1375.52 sq. ft.
z. Crossframes Between Beam 5 to 10
aa. All crossframe angles are 3” x 3” 5/16”.
bb. Length of angles per crossframe unit = (9.06 ft.) x (2) + 8.583 ft. = 26.70 ft.
cc. Angle Perimeter = 3” x 4 = 12” = 1 ft.
dd. # units between beam #5 through 10 = 75 each
ee. Intermediate Crossframes Between Beams #5 to 10 = 26.70 ft. x 1 ft. x 75 ft. = 2002.25 sq. ft.
ff. Crossframes Between Beam 11 to 19
gg. All crossframe angles are 3” x 3” 5/16”.
hh. Length of angles per crossframe unit = (8.98 ft.) x (2) + 8.5 ft. = 26.46 ft.
ii. Angle Perimeter = 3” x 4 = 12” = 1 ft.
jj. # units between beam #11 through 19 = 112 each
kk. Intermediate Crossframes Between Beams #11 to 19 = 26.46 ft. x 1 ft. x 112 ft. = 2963.04 sq. ft.
ll. Total Intermediate Crossframes = Between Beams 1 to 5 = 1375.52 sq. ft.
Between Beams 5 to 10 = 2002.25 sq. ft.
Between Beams 11 to 19 = 2963.04 sq. ft.
Total = 6340.81 sq. ft.

mm. End Crossframes

nn. No end crossframes as the abutments are semi-integral

oo. Scuppers

pp. 20 scuppers Rear Abut. + 8 scuppers fwd. abut. = 28 scuppers
qq. 6” diameter scupper = 2 x pi x r = 2 x pi x 3” x (1 ft./12 in.) = 1.57 ft.
rr. Length = 36 1/8” + 8” = 44 1/8” = 3.68 ft.
ss. Total Scuppers = 1.57 ft. x 3.68 ft. x 28 scuppers = 161.77 sq. ft.

tt. Bearings

19 beams x (2 bearings/beam) x (2 sq. ft./bearing) = 76 sq. ft.

uu. Total W36x170 Beams = 24843.89 sq. ft.
Total W36x230 Beams = 9821.25 sq. ft.
Total Intermediate Crossframes = 6340.81 sq. ft.
Total End Crossframes = 0 sq. ft.

Total Scuppers = 161.77 sq. ft.
Total Bearings = 76 sq. ft.
Total = 41243.72 sq. ft. = 41244 sq. ft.

26. Item 514-Field Painting of Existing Structural Steel, Prime Coat (SF)
    a. Same as Surface Preparation of Existing Structural Steel = 41244 sq. ft.
27. Item 514-Field Painting Structural Steel, Intermediate Coat (SF)
    a. Same as Surface Preparation of Existing Structural Steel = 41244 sq. ft.
28. Item 514-Field Painting Structural Steel, Finish Coat (SF)
    a. Same as Surface Preparation of Existing Structural Steel = 41244 sq. ft.
29. Item 514-Grinding Fins, Tears, Slivers on Existing Structural Steel (MNHR)
    a. Per 2020 BDM section 404.1.11 1 min./ft. beam/girder to be painted.
    b. W36x170 beam length = 2849.07 ft.
    c. W36x230 beam length = 1005.16 ft.
    d. Total beam length = 3854.23 ft.
    e. (3854.23 ft. x (1 min./ft.) X (1 hr./60 min.)) = 64.24 hr. = 65 hr.
30. Item 514-Final Inspection Repair (EA)
    a. Per CMS 514.21: 1 location per 300 ft. of beam length, 2.5% of all crossframe assemblies, (3854.23 ft. x (1 each/300 ft.)) + (0.025 x (59 each + 75 each + 112 each)) = 12.85 + 6.15 = 19 each

Structure Repair (MOT-35-1704)

31. Item 514-Surface Preparation of Existing Structural Steel (SF)
    a. Beams
    b. W30x108 Perimeter to Paint = (29 7/8" – ¾") x (2) + (10 ½" – 9/16") x (2) + 10 ½" = 58.25" + 19.875" + 10.5" = 88.625" = 7.39 ft.
    c. W30x108 Beam #1 to #15 Length = (62.25 ft. – 1 ft.) x (15 beams) = 918.75 ft.
    d. W30x108 Beam #16 Length = (62.22 ft. – 1 ft.) x (1 beam) = 61.22 ft.
    e. W30x108 Beam #17 Length = (62.21 ft. – 1 ft.) x (1 beam) = 61.21 ft.
    f. W30x108 Beam #18 Length = (62.19 ft. – 1 ft.) x (1 beam) = 61.19 ft.
    g. Total W30x108 Beam Length = 1102.37 ft.
    h. Total W30x108 Beams to Paint = (7.39 ft.) x (1102.37 ft.) = 8146.51 sq. ft.
    i. W30x172 Perimeter to Paint = (30 1/2" – 1 1/16") x (2) + (15" – 5/8") x (2) + 15" = 58.875" + 28.75" + 15" = 102.625" = 8.55 ft.
    j. W30x172 Beam #1 to #15 Length = (78 ft.) x (15 beams) = 1170 ft.
    k. W30x172 Beam #16 Length = (77.97 ft.) x (1 beam) = 77.97 ft.
    l. W30x172 Beam #17 Length = (77.94 ft.) x (1 beam) = 77.94 ft.
    m. W30x172 Beam #18 Length = (77.92 ft.) x (1 beam) = 77.92 ft.
    n. Total W30x172 Beam Length = 1403.83 ft.
    o. Total W30x172 Beams to Paint = (8.55 ft.) x (1403.83 ft.) = 12002.75 sq. ft.
    p. W30x124 Perimeter to Paint = (30 1/8" – 15/16") x (2) + (10 ½" – 9/16") x (2) + 10 1/2" = 58.375" + 19.875" + 10.5" = 88.75" = 7.40 ft.
    q. W30x124 Beam #1 to #15 Length = (30 ft. – 1 ft.) x (15 beams) = 435 ft.
    r. W30x124 Beam #16 Length = (29.99 ft. – 1 ft.) x (1 beam) = 28.99 ft.
    s. W30x124 Beam #17 Length = (29.98 ft. – 1 ft.) x (1 beam) = 28.98 ft.
    t. W30x124 Beam #18 Length = (29.97 ft. – 1 ft.) x (1 beam) = 28.97 ft.

u. Total W30x124 Beam Length = 521.94 ft.
v. Total W30x124 Beams to Paint = (7.40 ft.) x (521.94 ft.) = 3862.36 sq. ft.
w. Total Beams = W30x108 beams + W30x172 beams + W30x124 beams = 8146.51 sq. ft. + 12002.75 sq. ft. + 3862.36 sq. ft. = 24011.62 sq. ft.
x. Intermediate Crossframes
y. All crossframe angles are 3" x 3" x 5/16".
z. Crossframes Between Beam 1 to 8
aa. Length of angles per crossframe unit = (9.95 ft. x 2) + 9.67 ft. = 29.57 ft.
bb. Angle Perimeter = 3" x 4 = 12" = 1 ft.
cc. # units between beam #1 through #8 = 77 each
dd. Intermediate Crossframes Between Beams #1 to 8 = 29.57 ft. x 1 ft. x 77 each = 2277.02 sq. ft.
ee. Crossframes Between Beam 9 to 15
ff. Length of angles per crossframe unit = (10.03 ft.) x (2) + 9.75 ft. = 29.81 ft.
gg. Angle Perimeter = 3" x 4 = 12" = 1 ft.
hh. # units between beam #9 through 15 = 66 each
ii. Intermediate Crossframes Between Beams #9 to 15 = 29.81 ft. x 1 ft. x 66 ft. = 1967.46 sq. ft.
jj. Crossframes Between Beam 15 to 18
kk. Length of angles per crossframe unit = (8.5 ft.) x (2) + 8.17 ft. = 25.17 ft.
ll. Angle Perimeter = 3" x 4 = 12" = 1 ft.
mm. # units between beam #15 through 18 = 33 each
nn. Intermediate Crossframes Between Beams #15 to 18 = 25.17 ft. x 1 ft. x 33 ft. = 830.61 sq. ft.

Total Intermediate Crossframes = Between Beams 1 to 8 = 2277.02 sq. ft.
Between Beams 9 to 15 = 1967.46 sq. ft.
Between Beams 15 to 18 = 830.61 sq. ft.
Total = 5075.09 sq. ft.

oo. End Crossframes
pp. No end crossframes as the abutments are semi-integral
qq. Scuppers
rr. 21 scuppers Rear Abut. + 7 scuppers fwd. abut. = 28 scuppers
ss. 6" diameter scupper = 2 x pi x r = 2 x pi x 3" x (1 ft./12 in.) = 1.57 ft.
tt. Length = 30" + 8" = 38" = 3.17 ft.
uu. Total Scuppers = 1.57 ft. x 3.17 ft. x 28 scuppers = 139.35 sq. ft.
vv. Bearings
18 beams x (3 bearings/beam) x (2 sq. ft./bearing) = 108 sq. ft.
ww. Total Beams = 24011.62 sq. ft.
Total Intermediate Crossframes = 5075.09 sq. ft.
Total End Crossframes = 0 sq. ft.
Total Scuppers = 139.35 sq. ft.
Total Bearings = 108 sq. ft.
Total = 29334.06 sq. ft. = 29334 sq. ft.

32. Item 514-Field Painting of Existing Structural Steel, Prime Coat (SF)
a. Same as Surface Preparation of Existing Structural Steel = 29334 sq. ft.
33. Item 514-Field Painting Structural Steel, Intermediate Coat (SF)

a. Same as Surface Preparation of Existing Structural Steel = 29334 sq. ft.

34. Item 514-Field Painting Structural Steel, Finish Coat (SF)
    a. Same as Surface Preparation of Existing Structural Steel = 29334 sq. ft.
35. Item 514-Grinding Fins, Tears, Slivers on Existing Structural Steel (MNHR)
    a. Per 2020 BDM section 404.1.11 1 min./ft. beam/girder to be painted
    b. W30x108 beam length = 1102.37 ft.
    c. W30x172 beam length = 1403.83 ft.
    d. W30x124 beam length = 521.94 ft.
    e. (3028.14 ft.) x (1 min./ft.) X (1 hr./60 min.) = 50.5 hr. = 51 hr.
36. Item 514-Final Inspection Repair (EA)
    a. Per CMS 514.21: 1 location per 300 ft. of beam length, 2.5% of all crossframe assemblies, (3028.14 ft. x (1 each/300 ft.)) + (0.025 x (77 each + 66 each + 33 each) = 10.09 + 4.4 = 14.49 each = 15 each

Structure Repair (MOT-35-1827)

37. Item 514-Surface Preparation of Existing Structural Steel (SF)
    a. Beams
    b. W36x230 Perimeter to Paint = (35 7/8" – 1 ¼") x (2) + (16 ½" – ¾") x (2) + 16 ½" = 69.25" + 31.5" + 16.5" = 117.25" = 9.77 ft.
    c. W36x230 Beam Length Beam #1 to #15 = (221' – 1' – 1') x (15 beams) = 3285 ft.
    d. Total W36x230 Beams to Paint = (9.77 ft.) x (3285 ft.) = 32097 sq. ft. = total beams
    e. Intermediate Crossframes
    f. All crossframe angles are 3" x 3" x 5/16".
    g. Crossframes Between Beam 1 to 7
    h. Length of angles per crossframe unit = (9.12 ft. x 2) + 8.67 ft. =26.90 ft.
    i. Angle Perimeter = 3" x 4 = 12" = 1 ft.
    j. # units between beam #1 through #7 = 82 each
    k. Intermediate Crossframes Between Beams #1 to 7 = 26.90 ft. x 1 ft. x 82 each = 2205.77 sq. ft.
    l. Crossframes Between Beam 8 to 15
    m. Length of angles per crossframe unit = (9.03 ft.) x (2) + 8.583 ft. = 26.65 ft.
    n. Angle Perimeter = 3" x 4 = 12" = 1 ft.
    o. # units between beam #8 through 15 = 98 each
    p. Intermediate Crossframes Between Beams #8 to 15 = 26.65 ft. x 1 ft. x 98 ft. = 2611.88 sq. ft.

    Total Intermediate Crossframes = Between Beams 1 to 7 = 2205.77 sq. ft.
    Between Beams 8 to 15 = 2611.88 sq. ft.
    Total = 4817.65 sq. ft.

    q. End Crossframes
    r. No end crossframes as the abutments are semi-integral
    s. Scuppers
    t. 12 scuppers Rear Abut. = 2 scuppers Fwd. Abut. = 14 scuppers
    u. 6" diameter scupper = 2 x pi x r = 2 x pi x 3" x (1 ft./12 in.) = 1.57 ft.
    v. Length = 37 1/8" + 8" = 45 1/8" = 3.76 ft.
    w. Total Scuppers = 1.57 ft. x 3.76 ft. x 14 scuppers = 82.64 sq. ft.

x. **Bearings**
15 beams x (2 bearings/beam) x (2 sq. ft./bearing) = 60 sq. ft.

y. Total Beams = 32097 sq. ft.
Total Intermediate Crossframes = 4817.65 sq. ft.
Total End Crossframes = 0 sq. ft.
Total Scuppers = 82.64 sq. ft.
Total Bearings = 60 sq. ft.
Total = 37057.29 sq. ft. = 37057 sq. ft.

38. Item 514-Field Painting of Existing Structural Steel, Prime Coat (SF)
    a. Same as Surface Preparation of Existing Structural Steel = 37057 sq. ft.
39. Item 514-Field Painting Structural Steel, Intermediate Coat (SF)
    a. Same as Surface Preparation of Existing Structural Steel = 37057 sq. ft.
40. Item 514-Field Painting Structural Steel, Finish Coat (SF)
    a. Same as Surface Preparation of Existing Structural Steel = 37057 sq. ft.
41. Item 514-Grinding Fins, Tears, Slivers on Existing Structural Steel (MNHR)
    a. Per 2020 BDM section 404.1.11 1 min./ft. beam/girder to be painted; (3285 ft.) x (1 min./ft.) X (1 hr./60 min.)) = 54.75 hr. = 55 hr.
42. Item 514-Final Inspection Repair (EA)
    a. Per CMS 514.21: 1 location per 300 ft. of beam length, 2.5% of all crossframe assemblies, (3285 ft. x (1 each/300 ft.)) + (0.025 x (82 + 98 crossframes)) = 10.95 + 4.5 = 15.45 each = 16 each

Maintenance of Traffic

43. Item 614-Law Enforcement Officer with Patrol Car for Assistance
    a. MOT-35-1607R = 0 hr.
    b. MOT-35-1654L = 40 hr.
    c. MOT-35-1672N = 20 hr.
    d. MOT-35-1690 = 20 hr.
    e. MOT-35-1704 = 20 hr.
    f. MOT-35-1827 = 0 hr.
    g. Total = 100 hr.
44. Item 614-Work Zone Impact Attenuator, 24” Wide Hazards, (Unidirectional) (EA)
    a. MOT-35-1654L = 1 each
    b. MOT-35-1672N = 1 each
    c. Total = 2 each
45. Item 614-Detour Signing (LS)
    a. Lump Sum (LS)
46. Item 614-Barrier Reflector, Type 1 (One Way) (EA)
    a. MOT-35-1654L = 250 ft/50 ft. = 5 spaces = 6 each
    b. MOT-35-1672N = 250 ft./50 ft. = 5 spaces = 6 each
    c. Total = 12 each
47. Item 614-Object Marker, Two Way (EA)
    a. Same as Item 614 Barrier Reflector, Type 1 (One Way) = 12 each = total

48. Item 614-Portable Changeable Message Sign, As Per Plan
    a. MOT-35-1654L = 1 sign for 2 months = 2 sign months
49. Item 622-Portable Barrier, Unanchored (FT)
    a. MOT-35-1654L = 250 ft.
    b. MOT-35-1672N = 250 ft.
    c. Total = 500 ft.

Incidentals

50. Item 614-Maintaining Traffic (LS)
    a. Lump Sum (LS)
51. Item 624-Mobilization (LS)
    a. Lump Sum (LS)

END OF CALCULATIONS