



PID 105400, MIA-55-4.89: QUANTITY CALCULATION CHECK

Calculated by: *Dan Grilliot, P.E., Date: 11/21/2023*

Checked by: *Lawton Gerlinger, P.E., Date: 12/1/2023*

Revised by: *Dan Grilliot, P.E., Date: 4/30/2024*

Erosion Control

1. Item 659-Seeding and Mulching (SY)
 - a. Assumed an area of total = 50 sq. yd.
2. Item 659-Repair Seeding and Mulching (SY)
 - a. 5% of permanent per Designer Note
 - b. Total = 50 sq. yd x 0.05 = 2.5 sq. yd. = 3 sq. yd.
3. Item 659-Commercial Fertilizer (TON)
 - a. Rates per Designer Note
 - b. Perm seed total = 50 sq. yd. x (1 ton/7410 sq. yd.) = 0.01 ton
 - c. Total = 0.01 ton
4. Item 659-Water (MGAL)
 - a. Rates per Designer Note
 - b. Perm seed total = 50 sq. yd. x 0.0027 MGAL/sq. yd. x 2 applications = 0.27 MGAL = 1 MGAL
 - c. Total = 1 MGAL
5. Item 832-Erosion Control (EA)
 - a. Considered Maintenance Project: \$1,000/bridge x 1 bridges = \$1,000

Traffic Control

6. Item 642, Center Line, Type 1 (MILE)
 - a. STA. 236+90 to STA. 241+86 = 496 ft. = 0.10 mile
 - b. Total = 0.10 mile

Structure Repair (MIA-55-0489)

7. Item 202-Portions of Structures Removed, Over 20 Foot Span, As Per Plan (LS)
 - a. LUMP SUM
8. Item 513-Structural Steel for Rehabilitation (LBS)
 - a. End frame 4"x4"x5/16" bottom angle between beam 3 and 4 rear and fwd. abut. = 8.76 ft. long x (8.2 lb./ft.) x 2 each = 143.66 lbs
 - b. End frame 4"x4"x5/16" left diagonal between beam 3 and 4 rear abut. = 4.417 ft. long x (8.2 lb./ft.) = 36.22 lbs
 - c. Total = 180 lbs
9. Item 514-Surface Preparation of Existing Structural Steel (SF)

- a. Beams 2 and 3 (assumed 6" additional from centerline abut. bearings for beam length) for lengths mentioned below.
- # beams = 2 each
 - 0 ft. to 57.25 ft. = 57.25 ft.
 - 95.75 ft. to 165.25 ft. = 69.5 ft.
 - 208.25 ft. to 277.75 ft. = 69.5 ft.
 - 316.25 ft. to 373.5 ft. = 57.25 ft.
 - Length = 57.25 ft. + 69.5 ft. + 69.5 ft. + 57.25 ft. = 253.5 ft.
 - Perimeter = $(12'' - 1/2'') * (2 \text{ sides}) + (48'' \times 2) + (1'' \times 2) + 12'' = 133'' = 11.083 \text{ ft.}$
 - Beam 2 and 3 for lengths mentioned above = $(11.083 \text{ ft.} \times 253.5 \text{ ft.} \times 2 \text{ beams}) = 5619.08 \text{ sq. ft.}$
- b. Beams 2 and 3 for lengths mentioned below
- # beams = 2 each
 - 57.25 ft. to 95.75 ft. = 38.5 ft.
 - 165.25 ft. to 208.25 ft. = 43 ft.
 - 277.75 ft. to 316.25 ft. = 38.5 ft.
 - Length = 38.5 ft. + 43 ft. + 38.5 ft. = 120 ft.
 - Perimeter = $(14'' - 1/2'') * (2 \text{ sides}) + (48'' \times 2) + (1 \ 1/2'' \times 2) + 14'' = 140'' = 11.67 \text{ ft.}$
 - Beam 2 and 3 for lengths mentioned above = $(11.67 \text{ ft.} \times 120 \text{ ft.} \times 2 \text{ beams}) = 2800.8 \text{ sq. ft.}$
- c. Beams 1 and 4
- # beams = 2 each
 - Length = same length as Beam 2 and 3 with $3/4'' \times 12''$ top plate and $1'' \times 12''$ bottom plate = 253.5 ft.
 - Perimeter = $(48'' - 4 \ 3/4'') + (12'' - 1/2'') * (1.5) + (1'' \times 2) + 12'' + 48'' = 122.5'' = 10.21 \text{ ft.}$
 - Beam 1 and 4 = $(10.21 \text{ ft.} \times 253.5 \text{ ft.} \times 2 \text{ beams}) = 5176.47 \text{ sq. ft.}$
- d. Beams 1 and 4
- # beams = 2 each
 - Length = same length as Beam 2 and 3 with $1 \ 1/2'' \times 14''$ top plate and bottom plate = 120 ft.
 - Perimeter = $(48'' - 4'') + (14'' - 1/2'') * (1.5) + (1 \ 1/2'' \times 2) + 14'' + 48'' = 129.25'' = 10.77 \text{ ft.}$
- e. Beam 1 and 4 = $(10.77 \text{ ft.} \times 120 \text{ ft.} \times 2 \text{ beams}) = 2584.8 \text{ sq. ft.}$
- Beam 2 and 3 ($3/4'' \times 12''$ top plate and $1'' \times 12''$ bottom plate) = 5619.08 sq. ft.
 - Beam 2 and 3 ($1 \ 1/2'' \times 14''$ top and bottom plate) = 2800.8 sq. ft.
 - Beam 1 and 4 ($3/4'' \times 12''$ top plate and $1'' \times 12''$ bottom plate deck edge around beam portion) = 5176.47 sq. ft.
 - Beam 1 and 4 ($1 \ 1/2'' \times 14''$ top and bottom plate, deck edge around beam portion) = 2584.8 sq. ft.
 - Beam Total = 16181.15 sq. ft.
- f. Bearing Stiffeners
- $5/8'' \times 5''$ Plates = $(4 \text{ beams}) * (48 \text{ in.}) * (5 \text{ in.}) * (2 \text{ sides}) * (2 \text{ plates/beam/abut.}) * (2 \text{ abut.}) * (1 \text{ sq. ft./144 sq. in.}) = 53.33 \text{ sq. ft.}$
 - $3/4'' \times 6''$ Plates at Pier 1, 2, and 3 = $(4 \text{ beams}) * (48 \text{ in.}) * (6 \text{ in.}) * (2 \text{ sides}) * (2 \text{ plates/beam/pier}) * (3 \text{ piers}) * (1 \text{ sq. ft./144 sq. in.}) = 96 \text{ sq. ft.}$
 - Bearing stiffeners total = 149.33 sq. ft.
- g. Intermediate Crossframes
- Cross frame unit all $3'' \times 3'' \times 5/16''$ angles = $(1 \text{ ft.}) * (8.5 \text{ ft.} + (9.32 \text{ ft.} \times 2)) + (6 \text{ in.}) * (5.5 \text{ in.}) * (2 \text{ each}) * (2 \text{ sides}) * (1 \text{ sq. ft./144 sq. in.}) = 27.14 \text{ sq. ft.} + 0.92 \text{ sq. ft.} + 1.53 \text{ sq. ft.} = 29.59 \text{ sq. ft.}; (29.59 \text{ sq. ft./unit}) * (25 \text{ each bay 1} + 25 \text{ each bay 2}) = 1479.5 \text{ sq. ft. total intermediate crossframe bay 1 and 2; Bay 3 crossframe unit diagonals } 3'' \times 3'' \times 5/16'' \text{ angles, bottom angle } 4'' \times 4'' \ 3/8'' \text{ under conduits} = (1 \text{ ft.}) * (9.32 \text{ ft.} \times 2) + (1.33 \text{ ft.}) * (8.5 \text{ ft.}) + (6 \text{ in.}) * (5.5 \text{ in.}) * (2 \text{ each}) * (2 \text{ sides}) * (1 \text{ sq. ft./144 sq. in.}) + (5.5 \text{ in.}) * (10 \text{ in.}) * (2 \text{ each}) * (2 \text{ sides}) * (1 \text{ sq. ft./144 sq. in.}) = 18.64 \text{ sq. ft.} + 11.31 \text{ sq. ft.} + 0.92 \text{ sq. ft.} + 1.53 \text{ sq. ft.} = 32.4 \text{ sq. ft.}; (32.4 \text{ sq. ft./unit}) * (25 \text{ each bay 3}) = 810 \text{ sq. ft. total intermediate crossframe bay 3}$
 - Total intermediate crossframes = Bay 1 and 2 = 1479.5 sq. ft.
 - Bay 3 = 810 sq. ft.
 - Total = 2289.5 sq. ft.
- h. End Crossframes

$(1.33 \text{ ft.}) * (4.82 \text{ ft.} + 4.1 \text{ ft.} + 4.1 \text{ ft.} + 4.82 \text{ ft.} + 8.75 \text{ ft.}) + (6 \text{ in.}) * (10 \text{ in.}) * (3 \text{ plates}) * (2 \text{ sides}) * (1 \text{ sq. ft./144 sq. in.}) = 35.36 \text{ sq. ft.} + 2.5 \text{ sq. ft.} = 37.86 \text{ sq. ft./end crossframe unit}; (37.86 \text{ sq. ft./unit}) * (3 \text{ unit/abut.}) * (2 \text{ abut.}) = 227.16 \text{ sq. ft.} = \text{total end crossframes}$

- i. Bearings
 $(2 \text{ sq. ft./bearing}) * (5 \text{ bearings/beam}) * (4 \text{ beams}) = 40 \text{ sq. ft.}$
- j. Total Beams = 16181.15 sq. ft.
 Total Bearing Stiffeners = 149.33 sq. ft.
 Total Intermediate Crossframes = 2289.5 sq. ft.
 Total End Crossframes = 227.16 sq. ft.
 Total Bearings = 40 sq. ft.
 Total = 18887.14 sq. ft. = 18887 sq. ft.
- 10. Item 514-Field Painting of Existing Structural Steel, Prime Coat (SF)
 - a. Same as Surface Preparation of Existing Structural Steel = 18887 sq. ft.
- 11. Item 514-Field Painting Structural Steel, Intermediate Coat (SF)
 - a. Same as Surface Preparation of Existing Structural Steel = 18887 sq. ft.
- 12. Item 514-Field Painting Structural Steel, Finish Coat (SF)
 - a. Same as Surface Preparation of Existing Structural Steel = 18887 sq. ft.
- 13. 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; Assume 6" longer on each end of beam from centerline bearing = $(373.5 \text{ ft.} * 4 \text{ beams}) = 1494 \text{ ft.}; (1494 \text{ ft.} * (1 \text{ min./ft.}) * (1 \text{ hr./60 min.})) = 24.9 \text{ hr.} = 25 \text{ hr.}$
- 14. 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, $(1494 \text{ ft.} * (1 \text{ each/300 ft.})) + (0.025 * (25 \text{ each bay 1} + 25 \text{ each bay 2} + 25 \text{ each bay 3 intermediate crossframes}) + (0.025 * (6 \text{ end crossframes}))) = 4.98 + 1.875 + 0.15 = 7 \text{ each}$
- 15. Item 516-Armorless Preformed Joint Seal
 - a. $\cos 14 = 30/x; x = 30.92 \text{ ft.}; (30.92 \text{ ft.} * 2 \text{ abut. ends}) = 61.84 \text{ ft.} = 62 \text{ ft.} = \text{total}$

Maintenance of Traffic

- 16. Item 614-Work Zone Impact Attenuator, 24" Wide Hazards, (Bidirectional) (EA)
 - a. 2 each = total
- 17. Item 614-Detour Signing (LS)
 - a. Lump Sum (LS)
- 18. Item 614-Work Zone Lighting System (EA)
 - a. 2 each = total
- 19. Item 614-Barrier Reflector, Type 1 (Bidirectional) (EA)
 - a. $(390 \text{ ft.}) * (\text{space}/50 \text{ ft.}) = 7.8 \text{ spaces} = 8 \text{ spaces} = 9 \text{ each} = \text{total}$
- 20. Item 614-Object Marker, Two Way (EA)
 - a. Same as Item 614 Barrier Reflector, Type 1 (Bidirectional) = 9 each = total
- 21. Item 614-Work Zone Center Line, Class I, 740.06, Type 1
 - a. STA. 236+07 to STA. 236+32 = use 0.01 mile
 - b. STA. 242+65 to STA. 242+77 = use 0.01 mile
 - c. Total = 0.02 mile
- 22. Item 614-Work Zone Edge Line, Class I, 4", 740.06, Type I
 - a. STA. 236+05 to STA. 242+77 = 0.13 mile = total
- 23. Item 614-Work Zone Stop Line, Class I, 740.06, Type I
 - a. STA. 236+32 = 12 ft.
 - b. STA. 242+41 = 12 ft.
 - c. Total = 24 ft.
- 24. Item 622-Portable Barrier, Unanchored (FT)
 - a. STA. 237+43 to STA. 241+31 = 390 ft. = total

Incidentals

- 25. Item 614-Maintaining Traffic (LS)
 - a. Lump Sum (LS)
- 26. Item 623 Construction Layout Stakes and Surveying (LS)
 - a. Lump Sum (LS)
- 27. Item 624-Mobilization (LS)
 - a. Lump Sum (LS)

END OF CALCULATIONS