

APPENDIX A

Culvert Locations and Sensor Instrumentation Details

Culvert #1

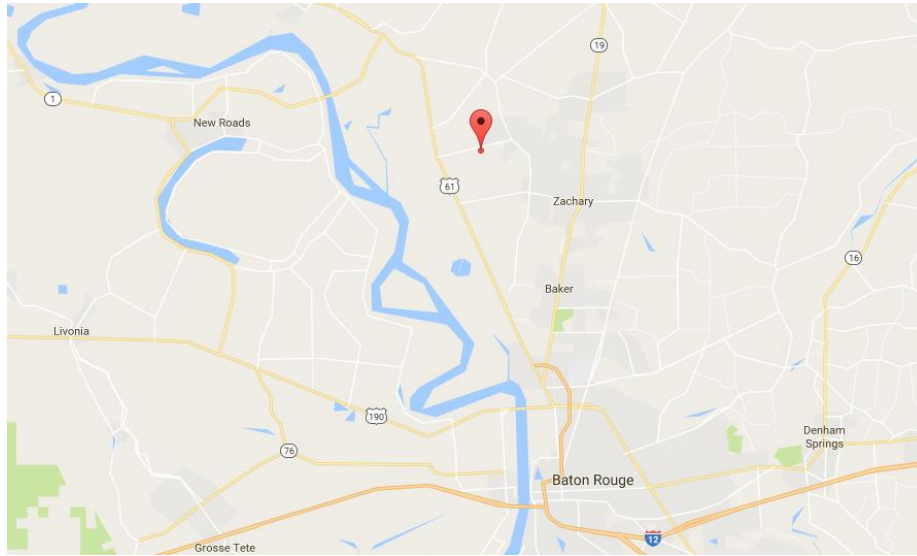


Figure A-1
Map location of Culvert #1 – Zachary, LA



Figure A-2
Aerial view of Culvert #1 – Zachary, LA

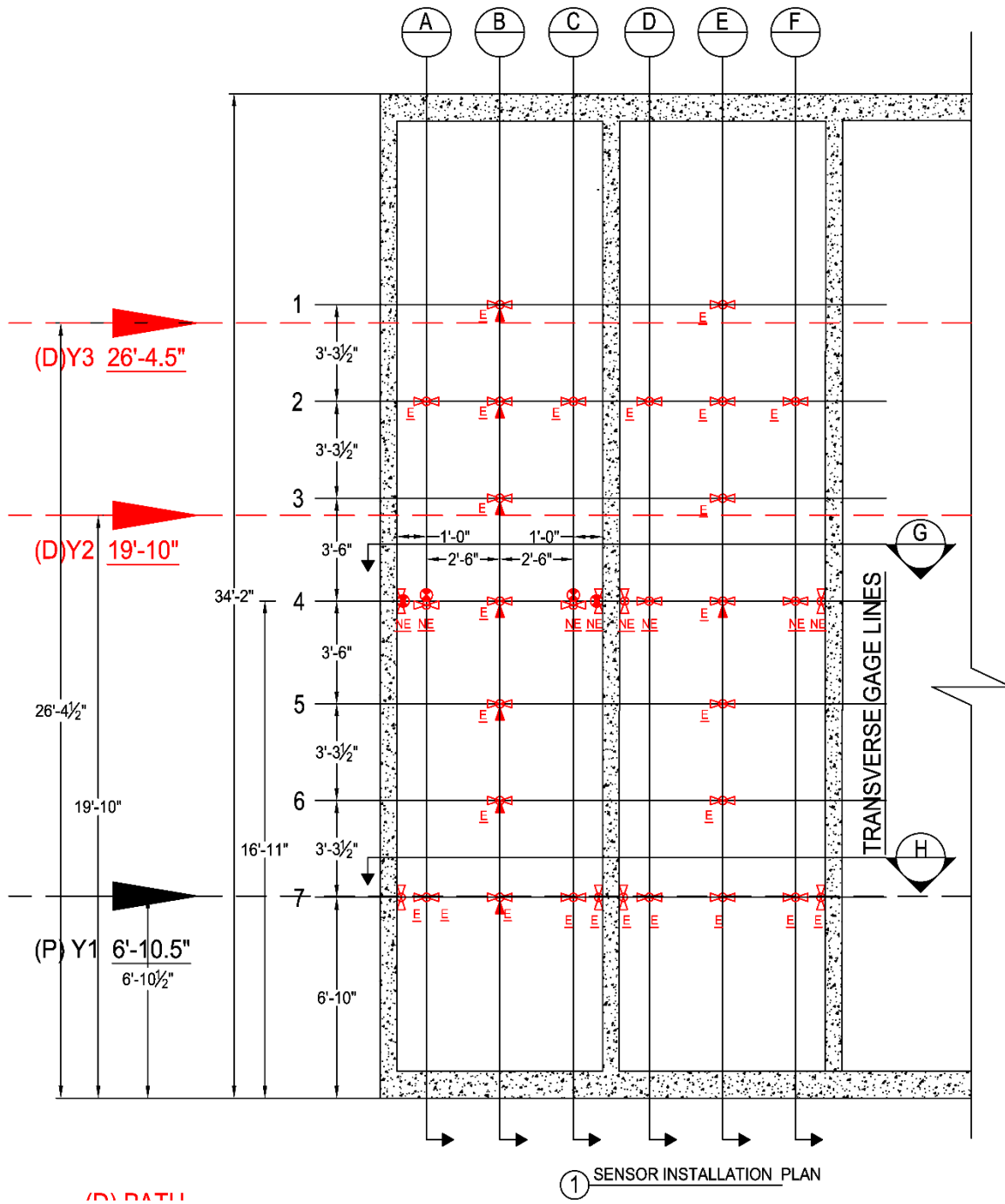


Figure A-3
Sensor Instrumentation Plan for Culvert #1

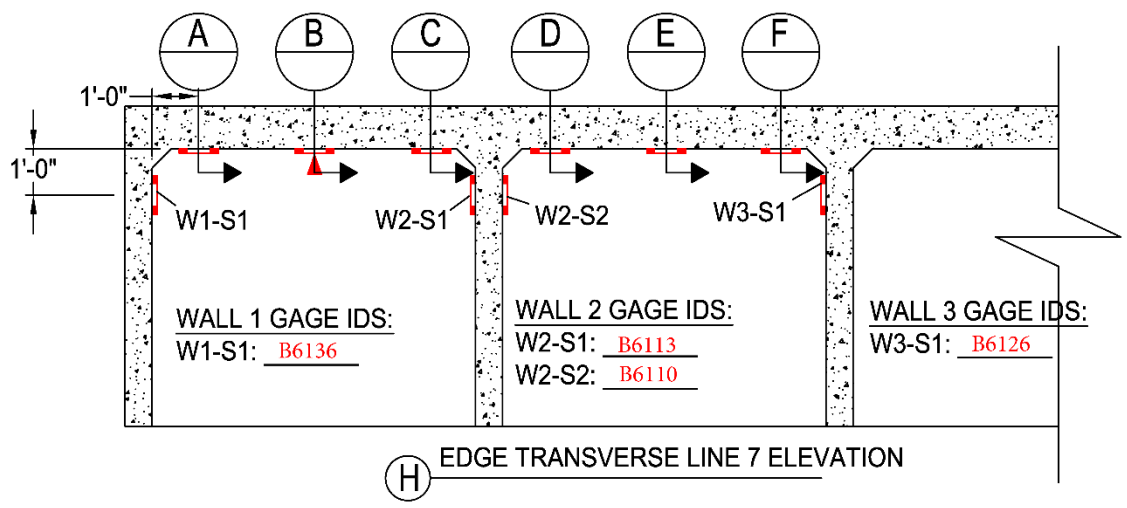
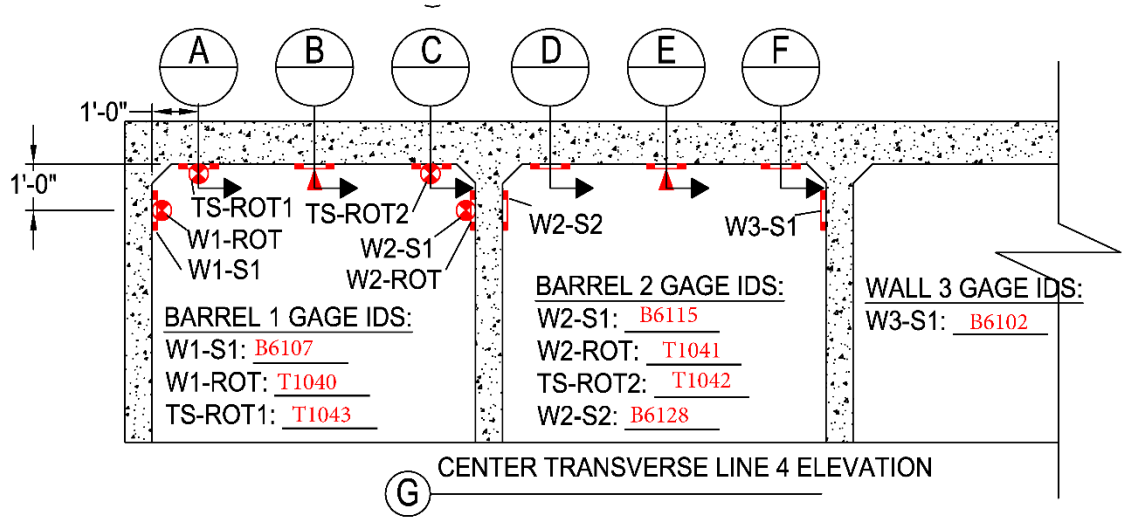


Figure A-4
Elevation views – Culvert #1

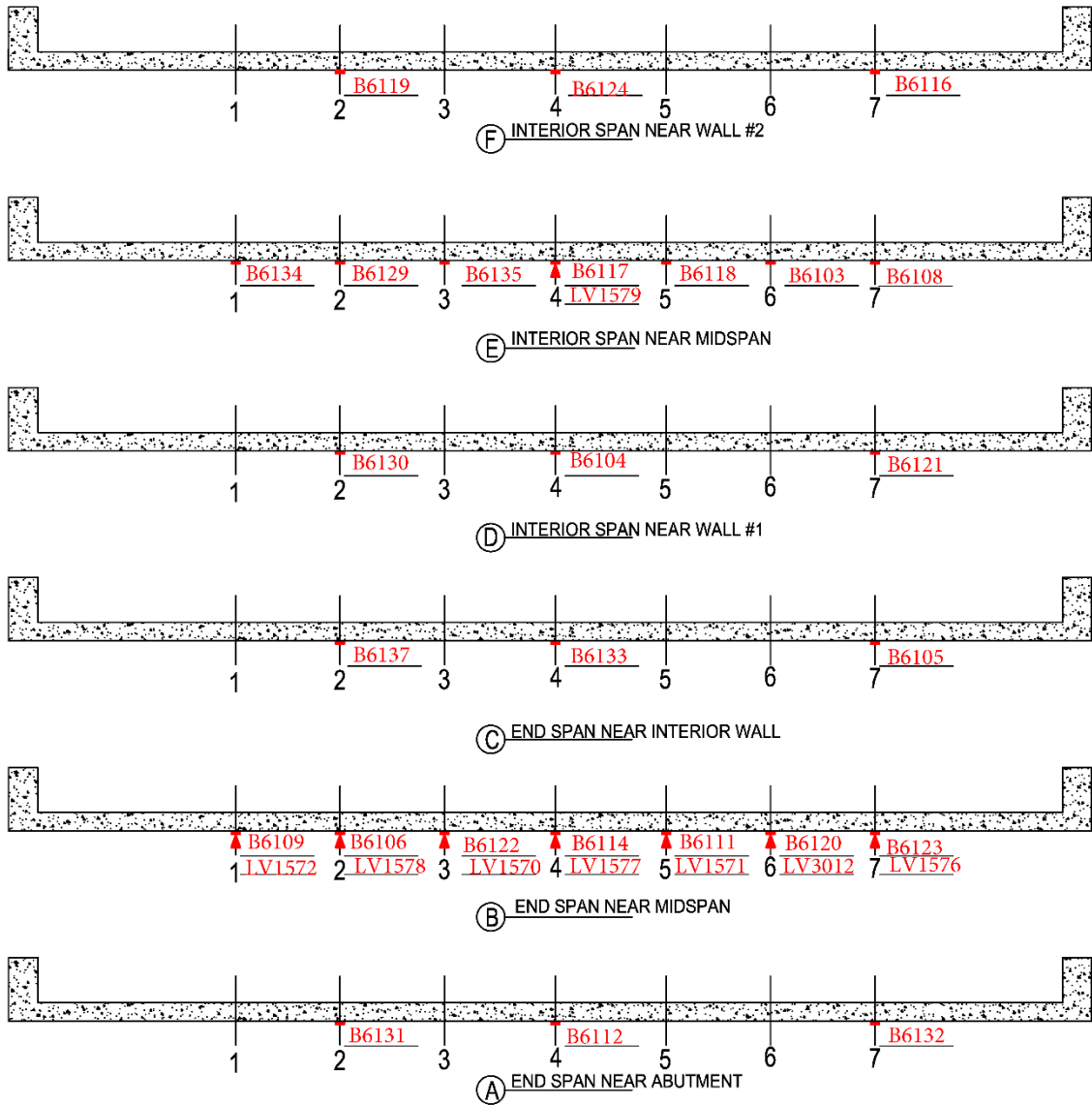


Figure A-5
Section view – Culvert #1

Culvert #2

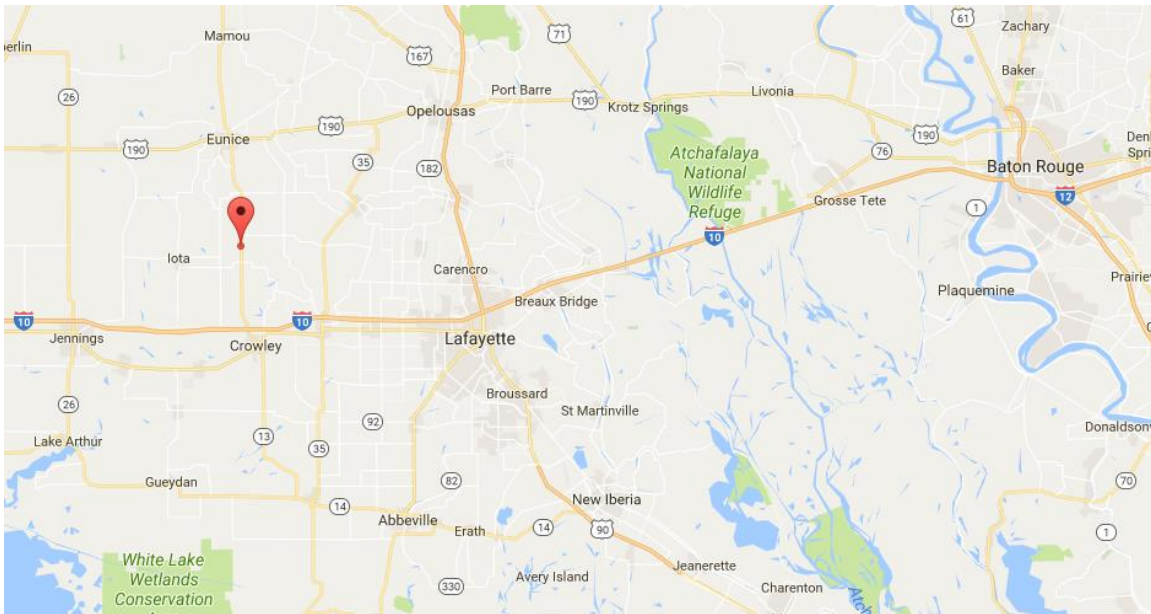


Figure A-6
Map location of Culvert #2 – Crowley, LA

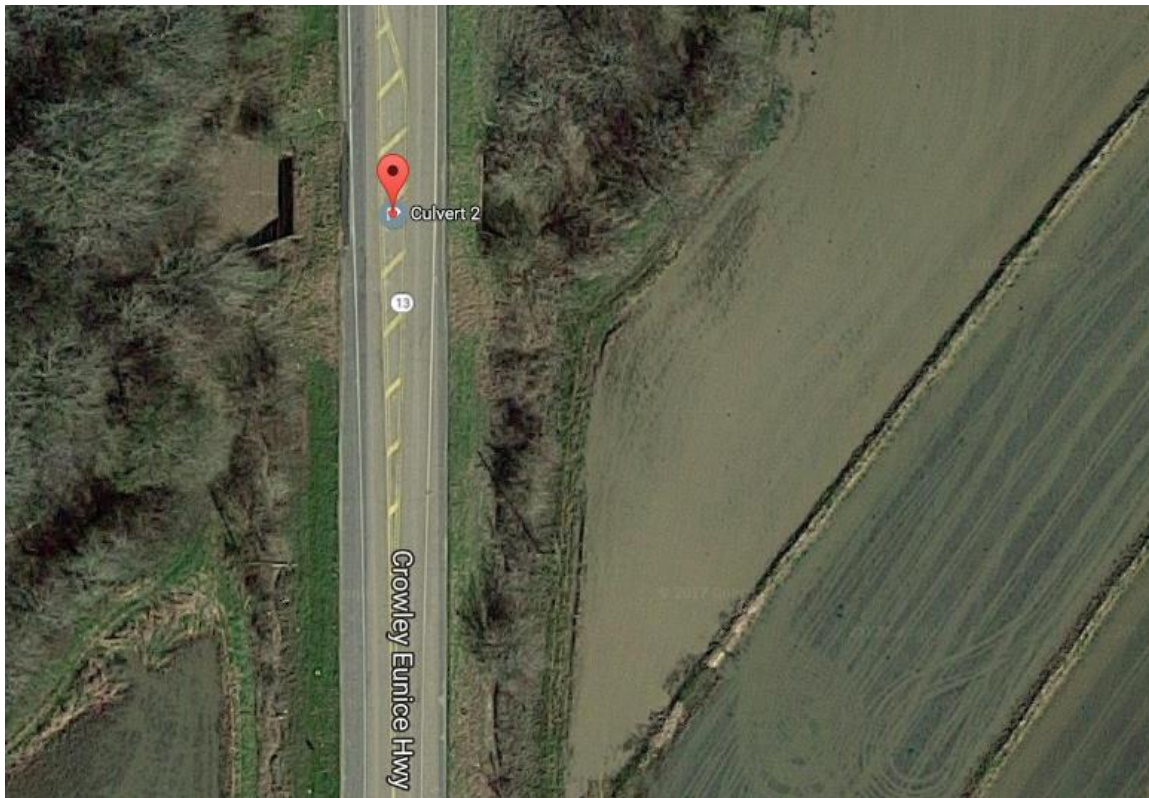


Figure A-7
Aerial view of Culvert #2 – Crowley, LA

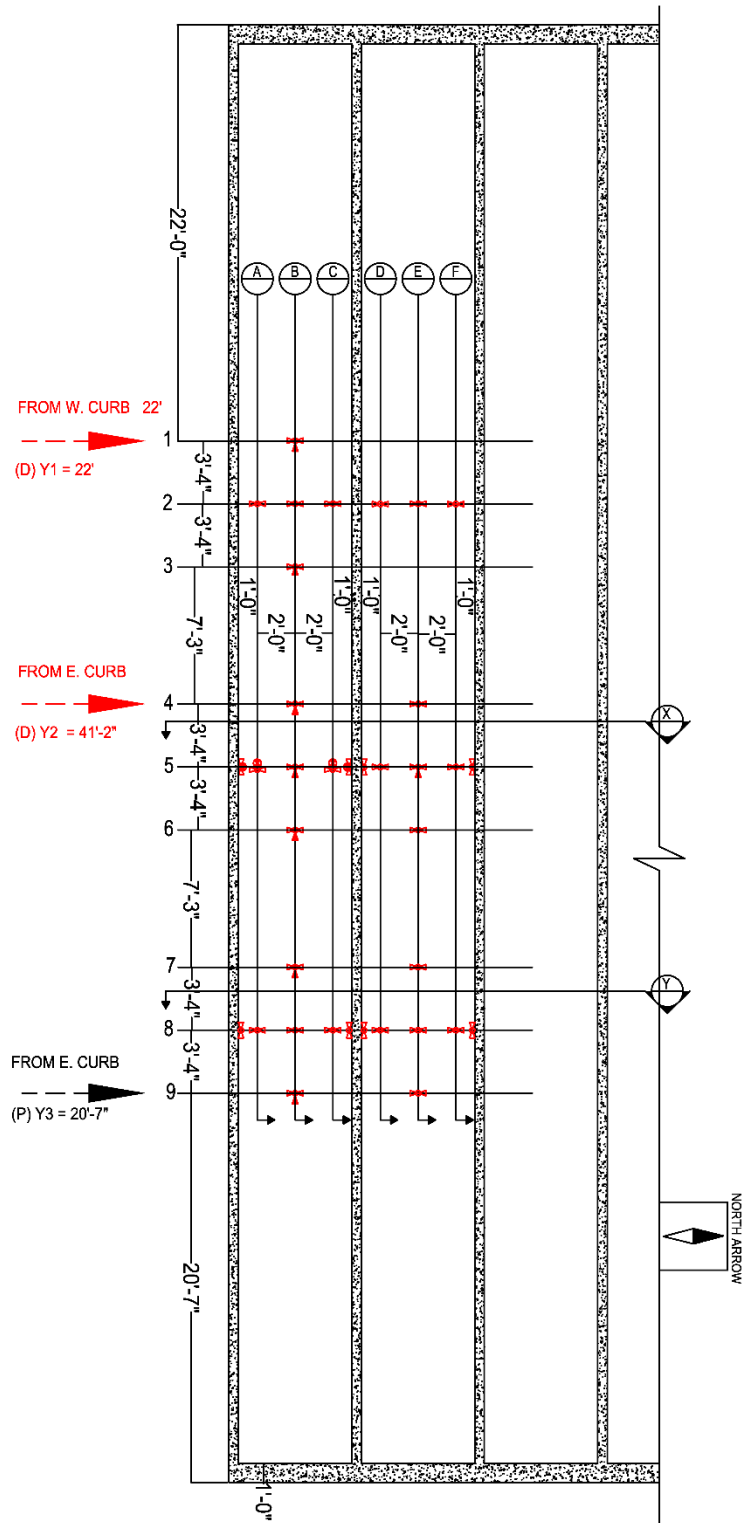


Figure A-8
Sensor Instrumentation Plan for Culvert #2

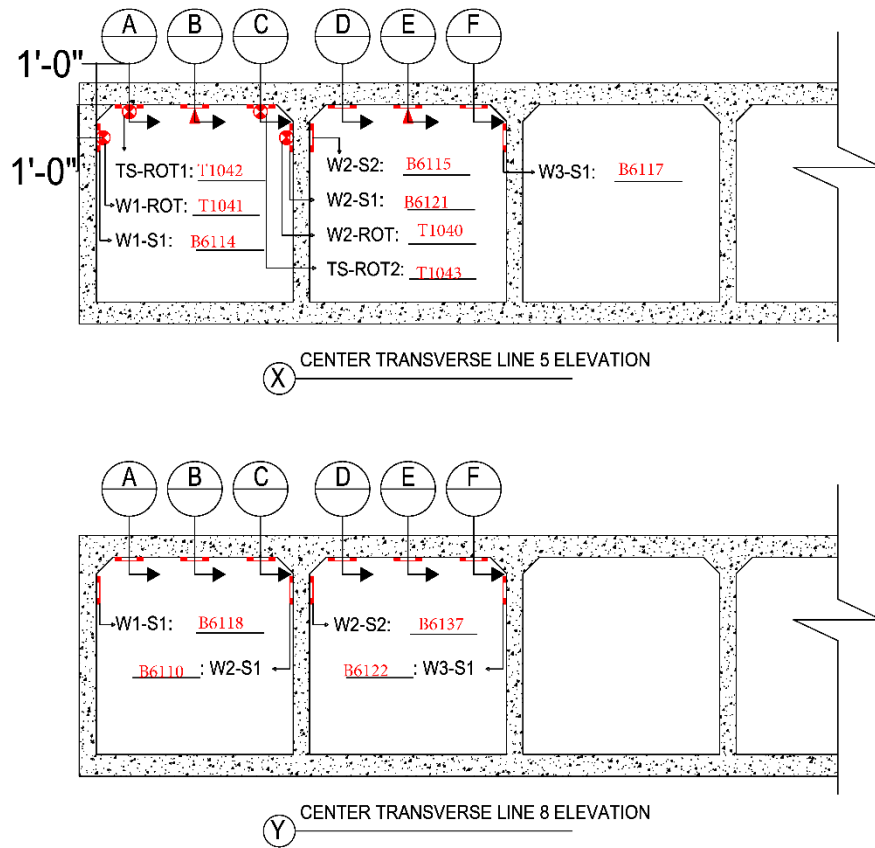


Figure A-9
Elevation views – Culvert #2

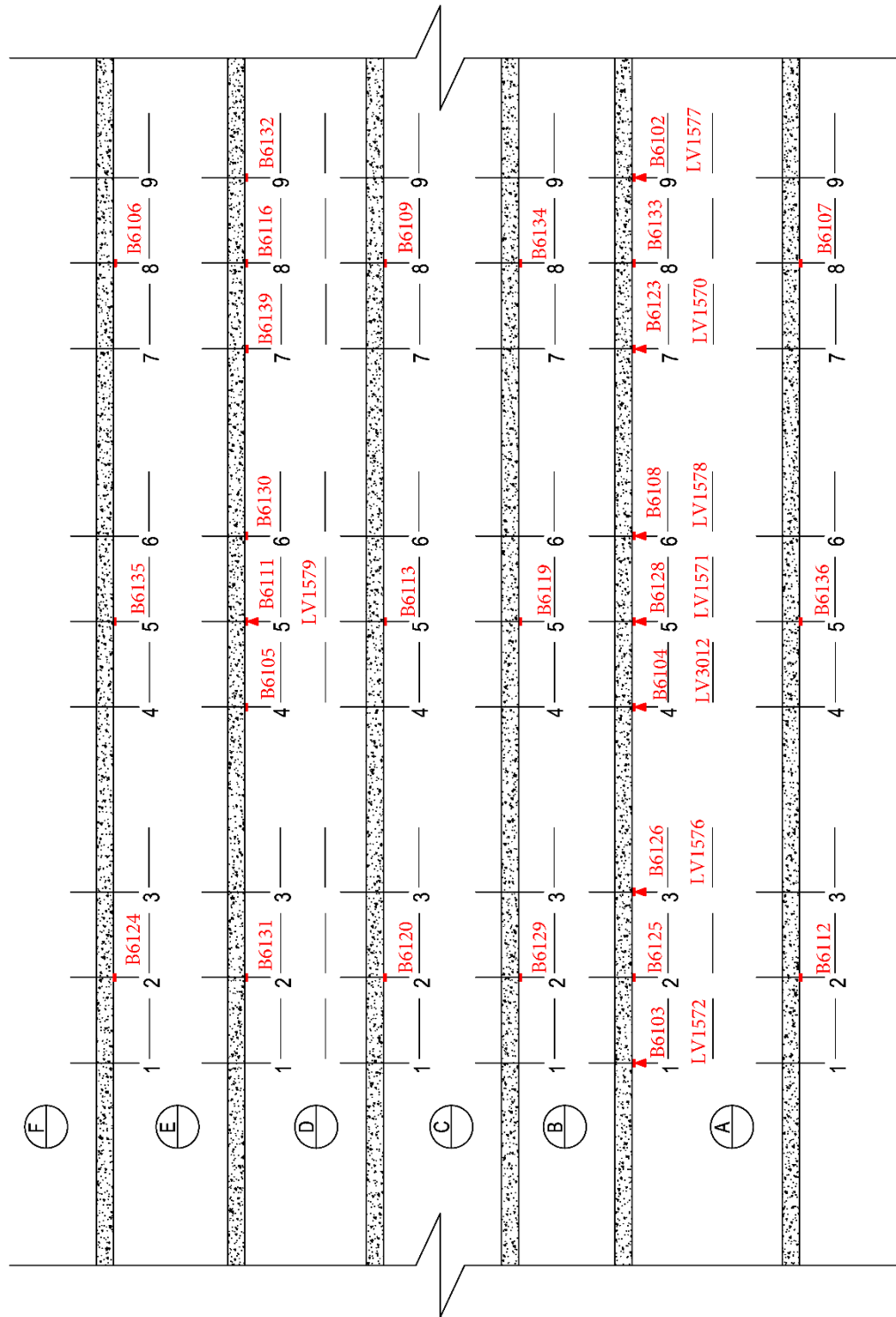


Figure A-10
Section view – Culvert #2

Culvert #3

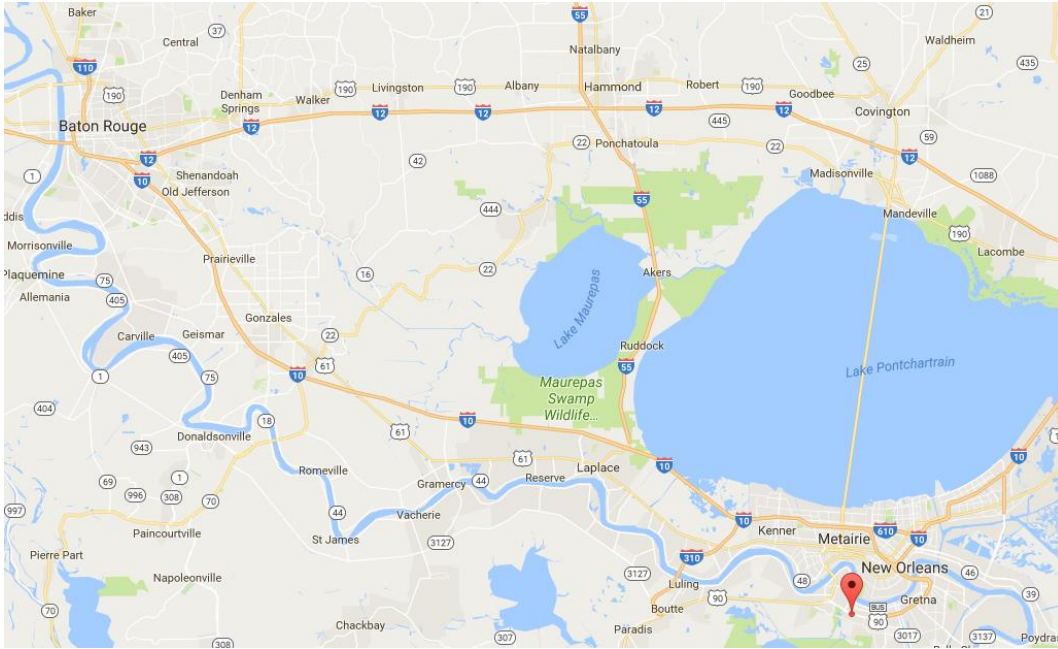


Figure A-11
Map location of Culvert #3 – New Orleans, LA



Figure A-12
Arial view of Culvert #3 – New Orleans, LA



Figure A-13
Sensor Instrumentation Plan – Culvert #3

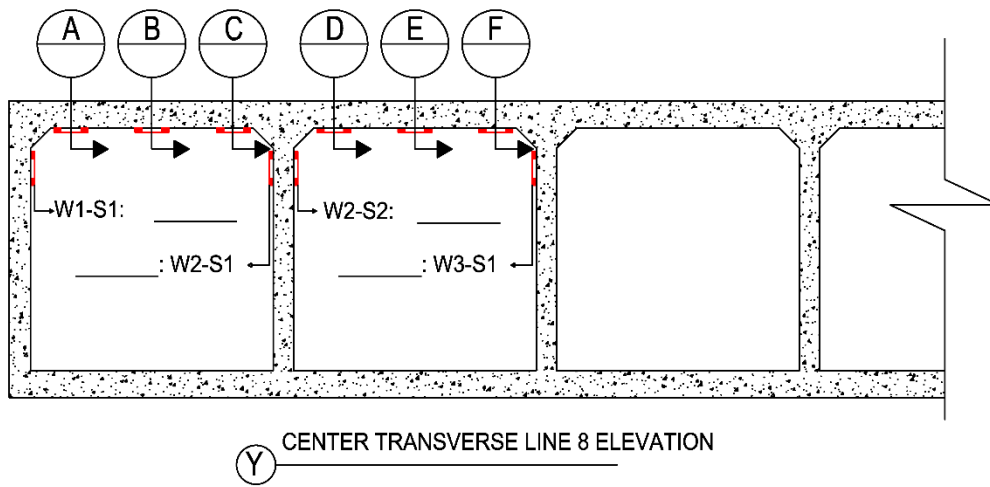
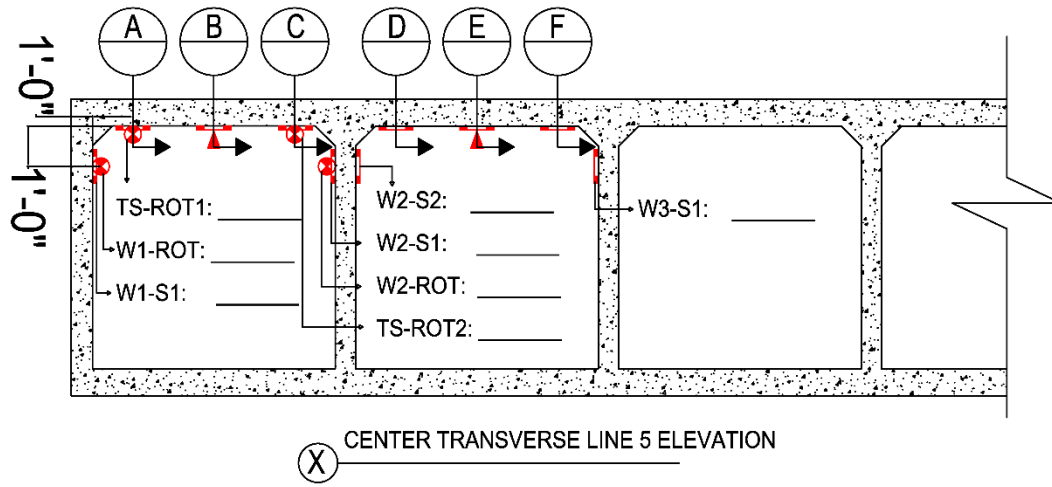


Figure A-14
Elevation views – Culvert #3

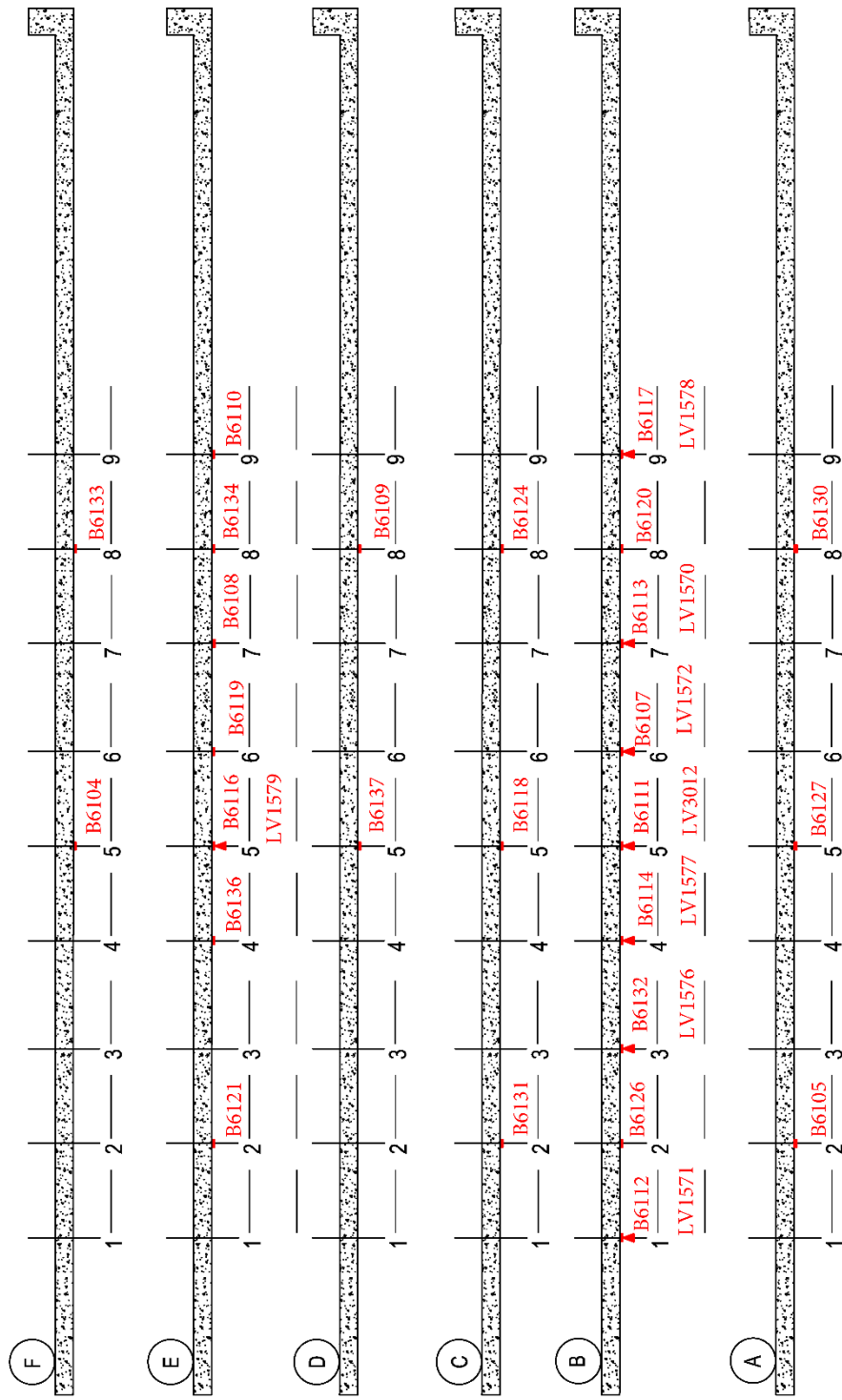


Figure A-15
Section view – Culvert #3

Culvert #4

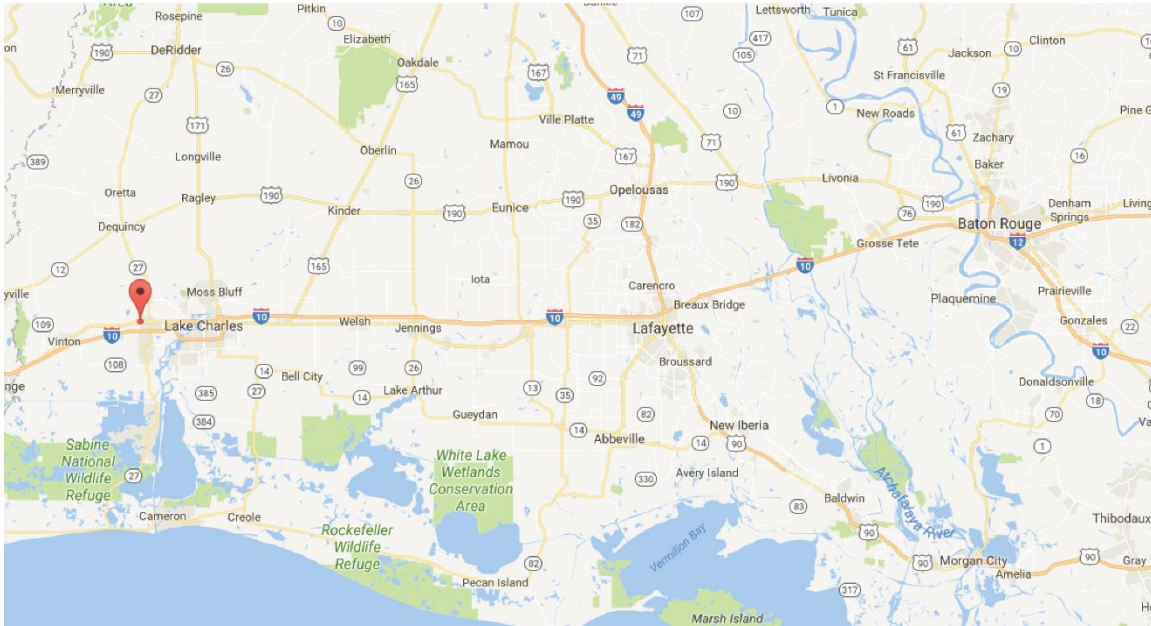


Figure A-16
Map location of Culvert #4 – Sulphur, LA



Figure A-17
Aerial view of Culvert #4 – Sulphur, LA

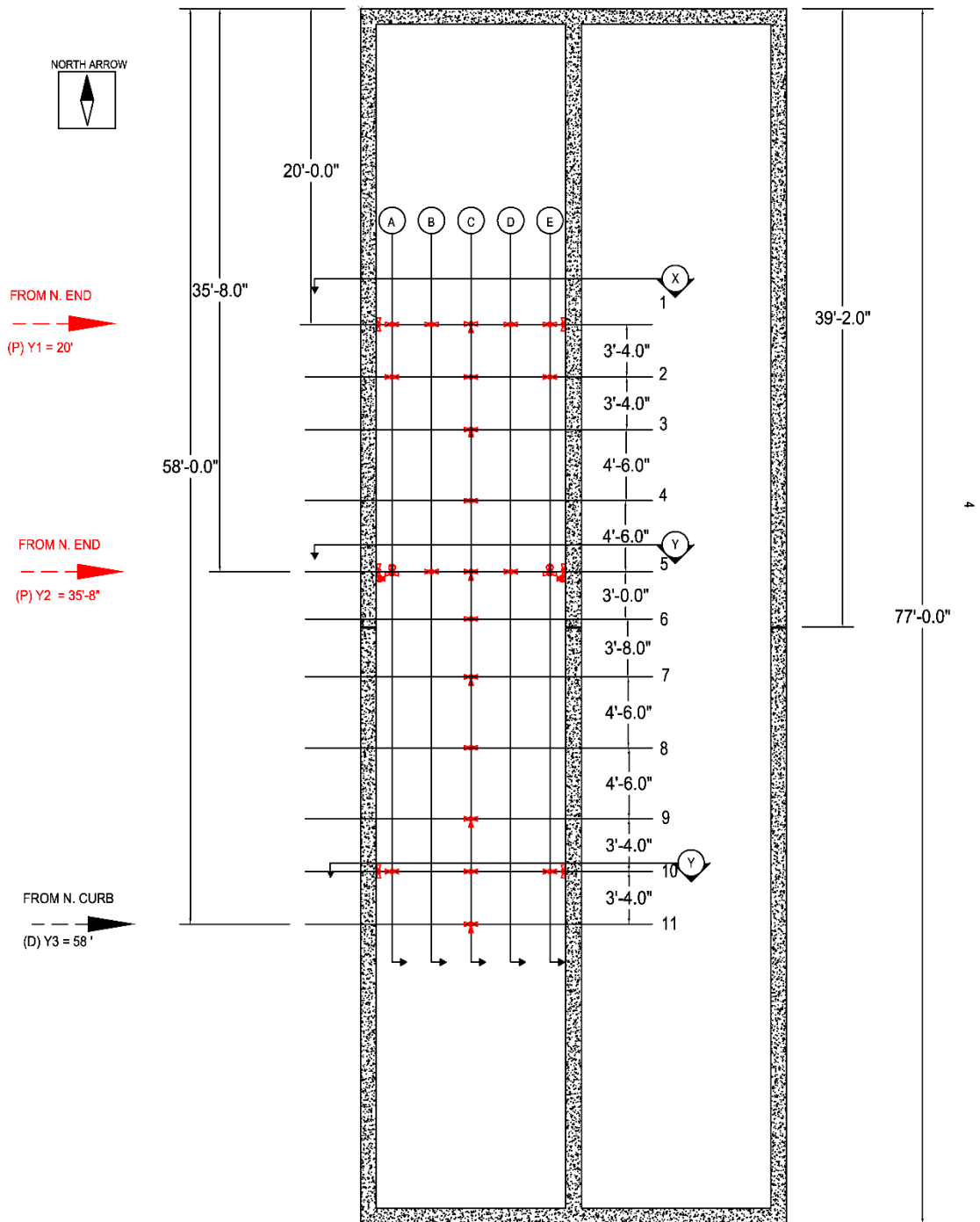


Figure A-18
Sensor Instrumentation Plan – Culvert #4

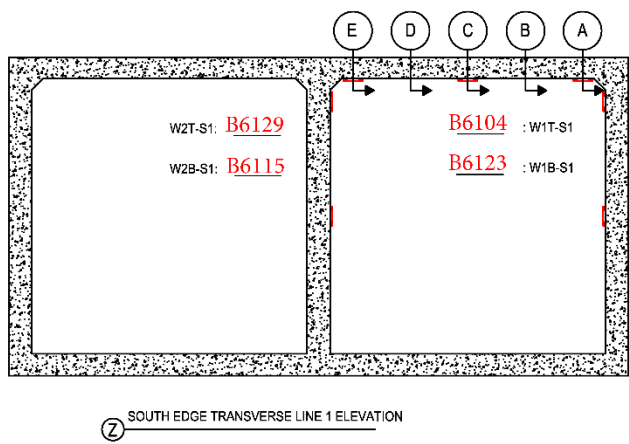
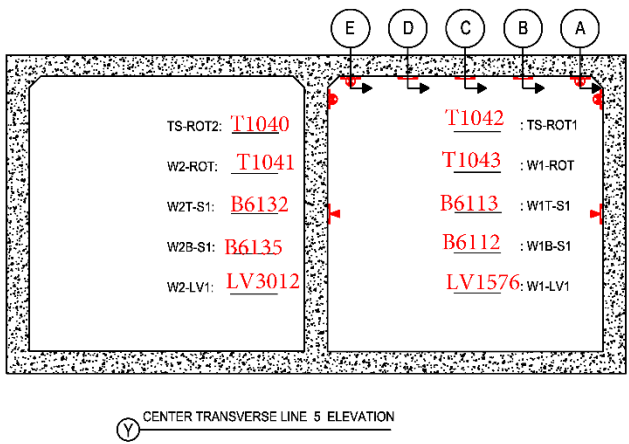
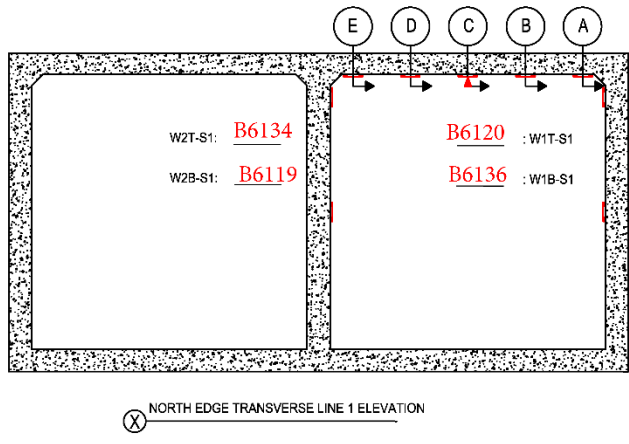


Figure A-19
Elevation views – Culvert #4

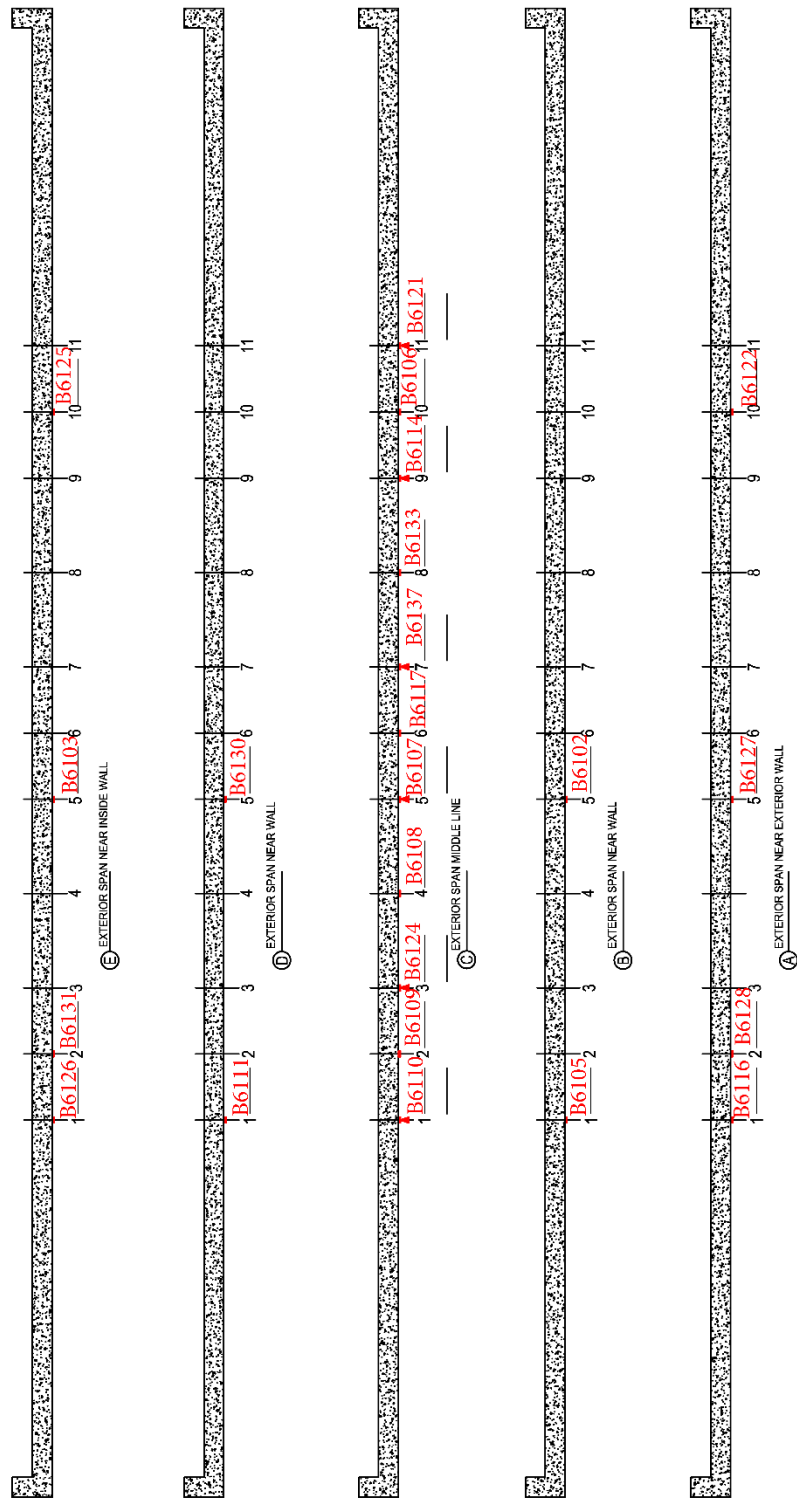


Figure A-20
Section view – Culvert #4

Culvert #5

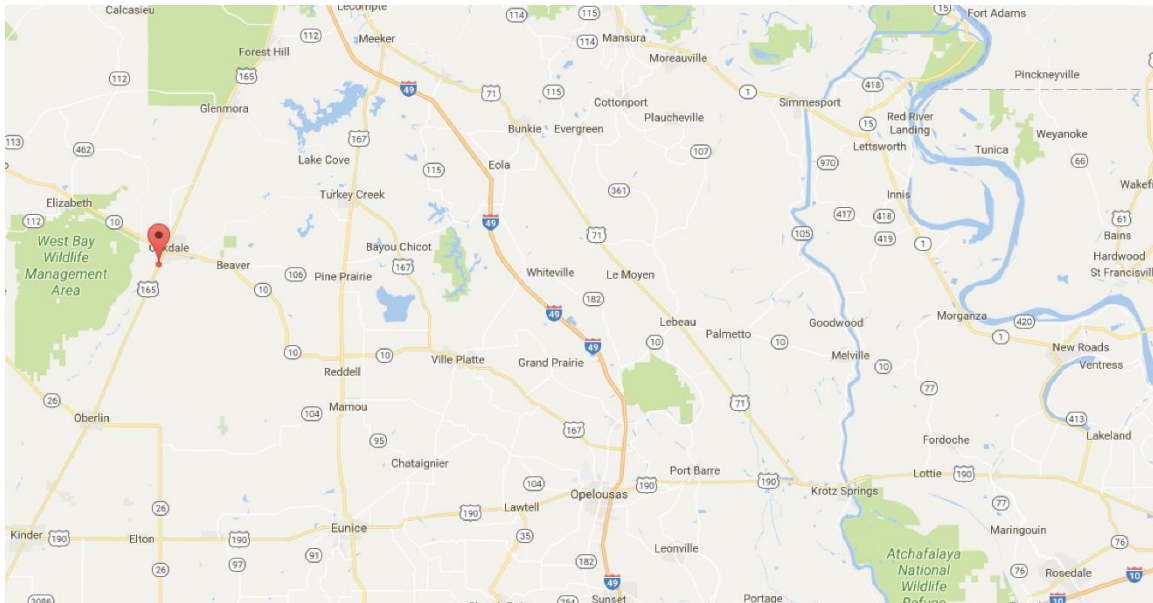


Figure A-21
Map location of Culvert #5 – Oakdale, LA

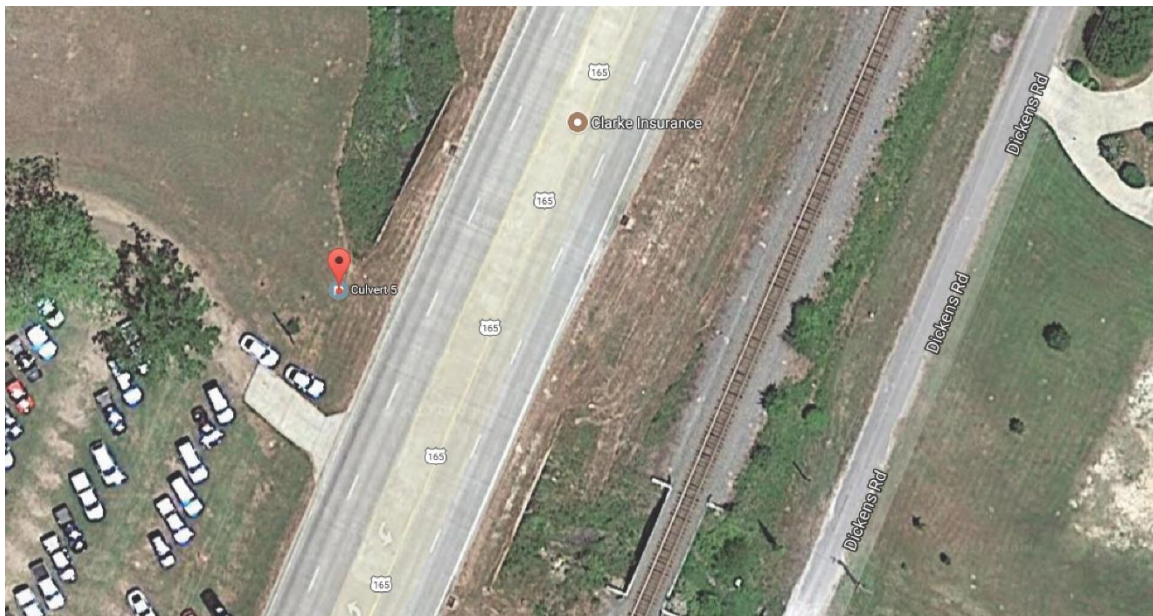


Figure A-22
Aerial view of Culvert #5 – Oakdale, LA

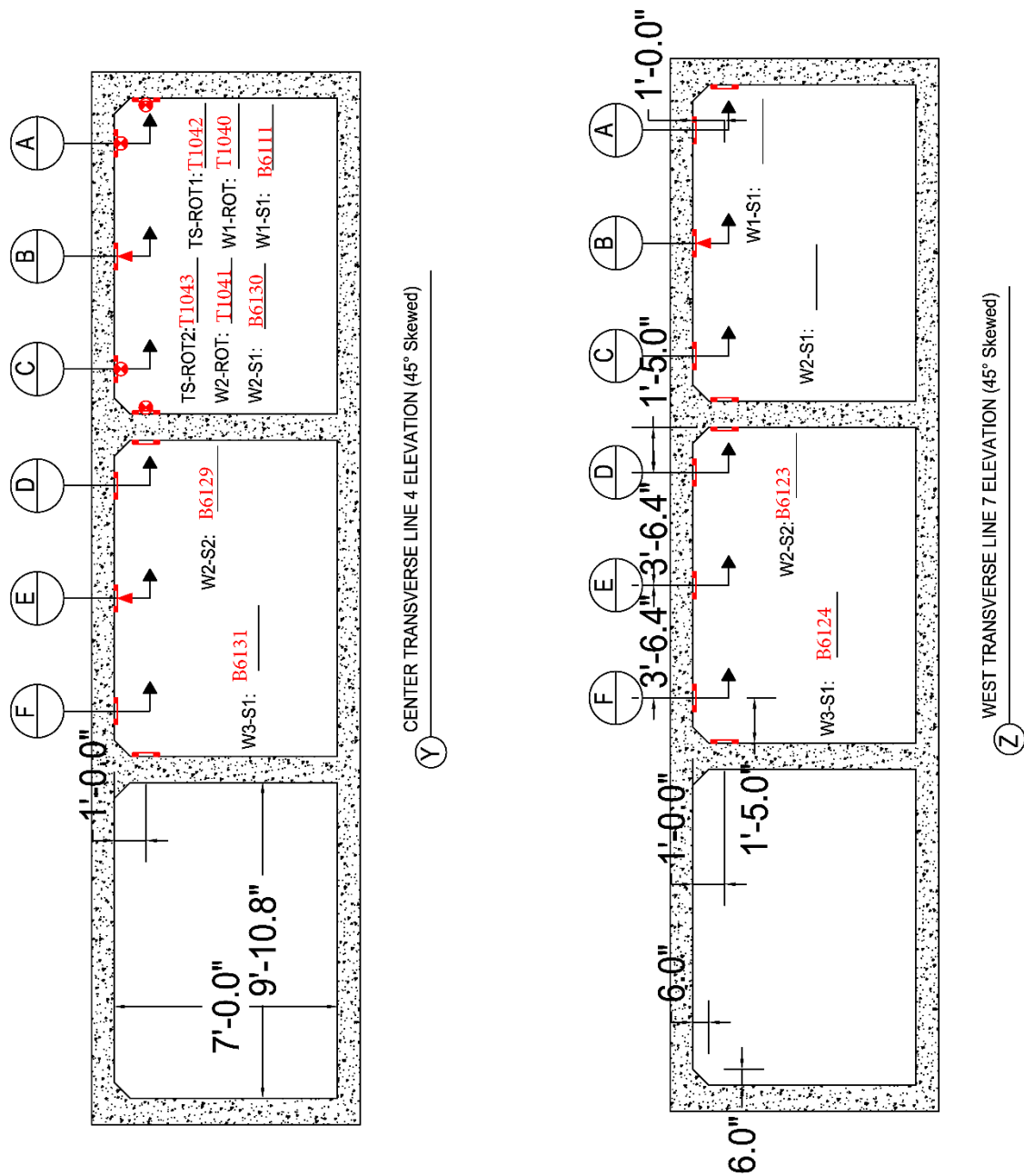


Figure A-24
Elevation views – Culvert #5

Culvert #6

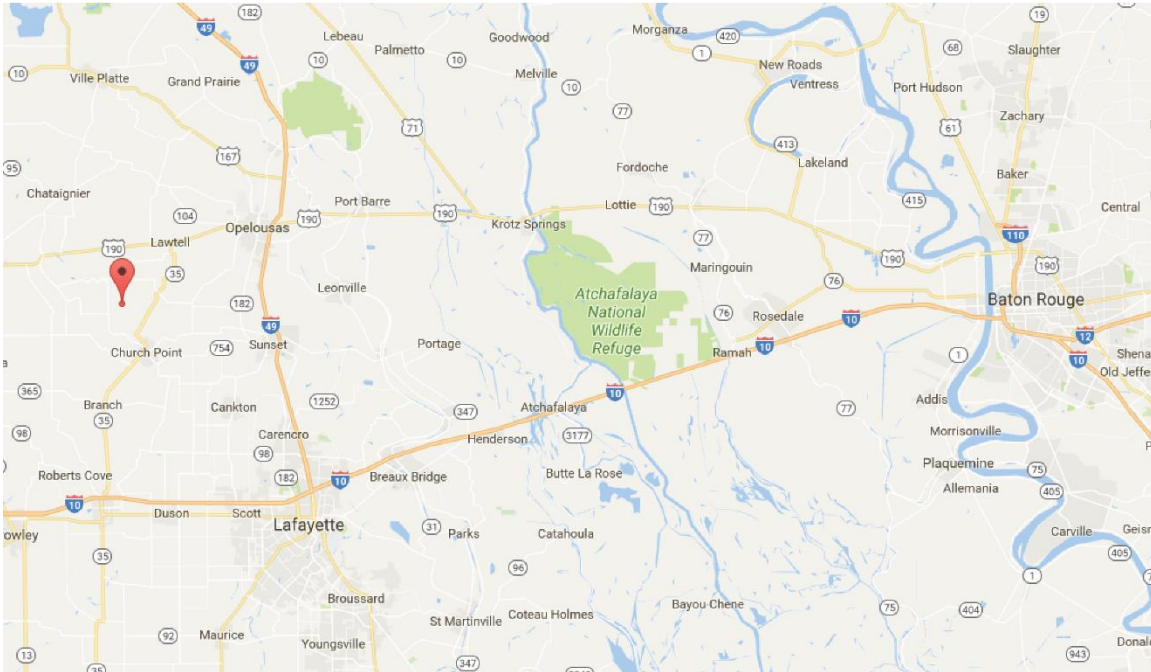


Figure A-26
Map location of Culvert #6 – Church Point, LA

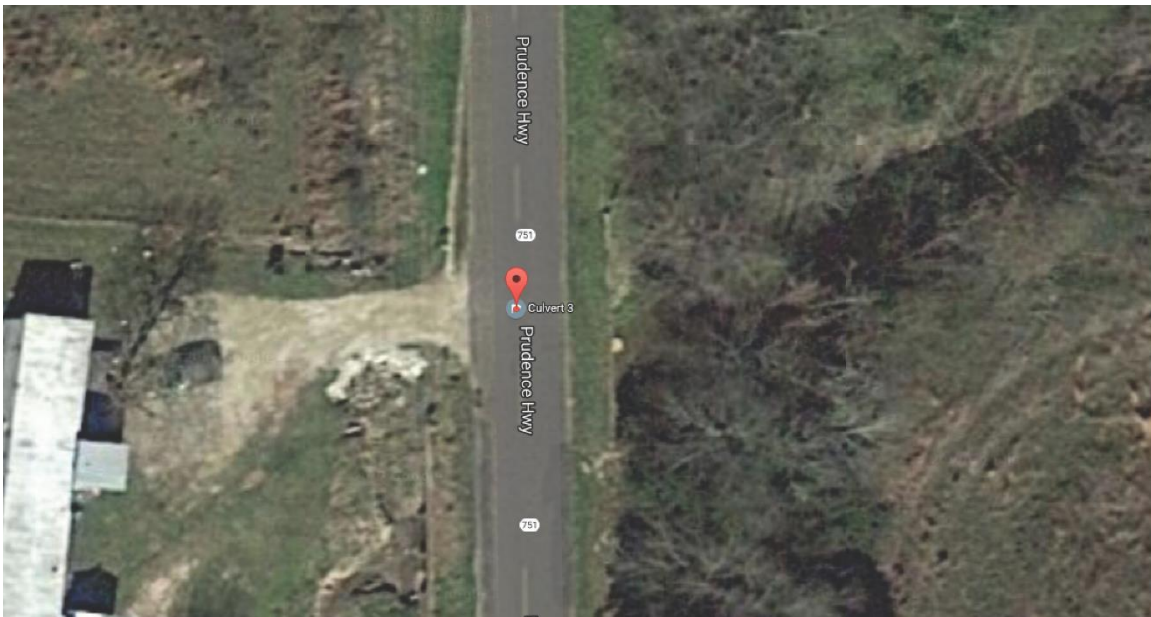


Figure A-27
Aerial view of Culvert #6 – Church Point, LA

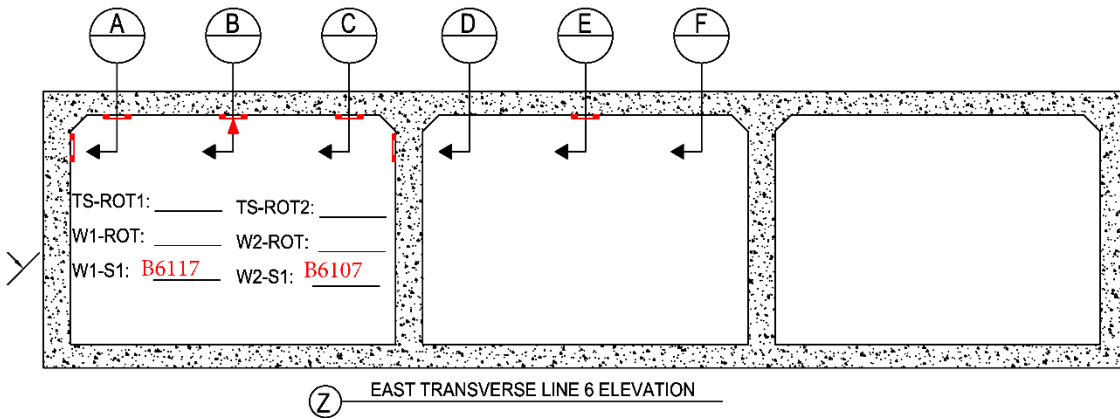
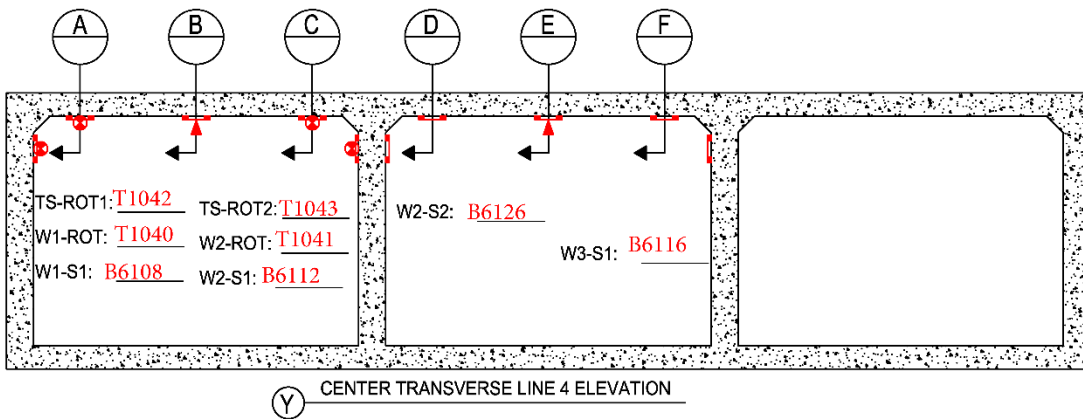
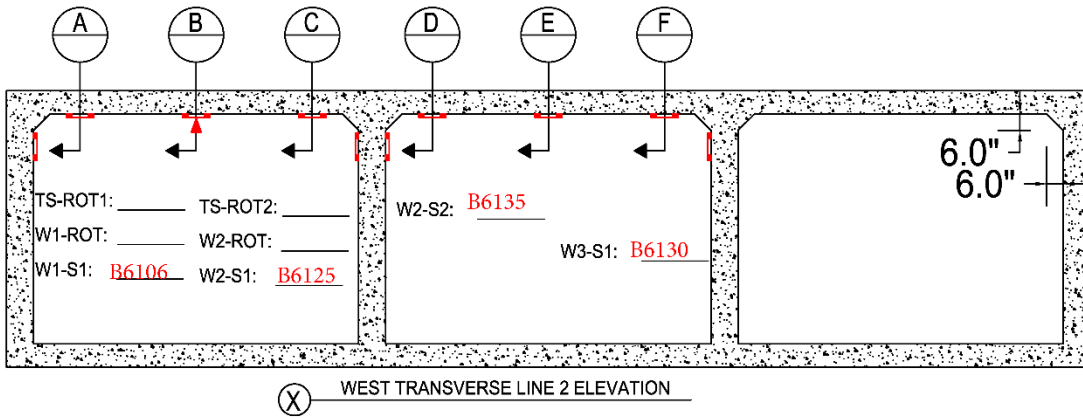


Figure A-29
Elevation views – Culvert #6

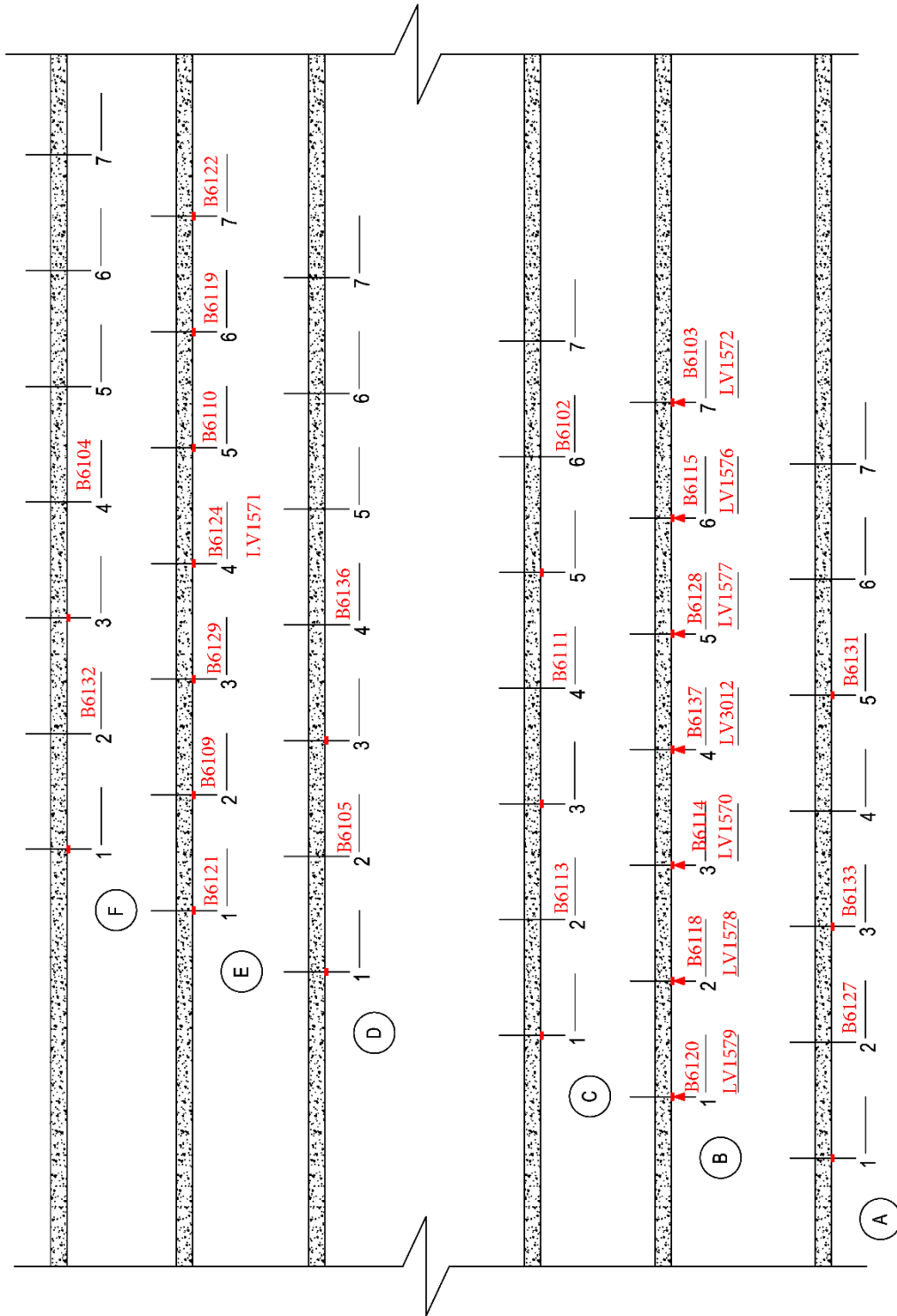


Figure A-30
Section view – Culvert #6

Culvert #7

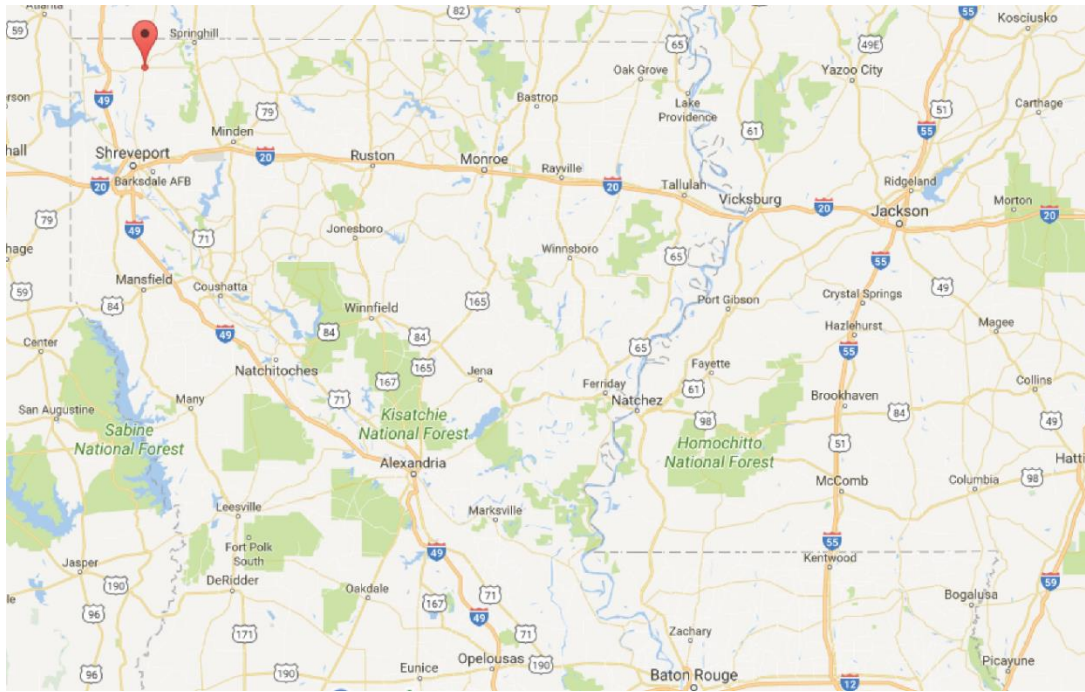


Figure A-31
Map location of Culvert #7; Plain Dealing, LA

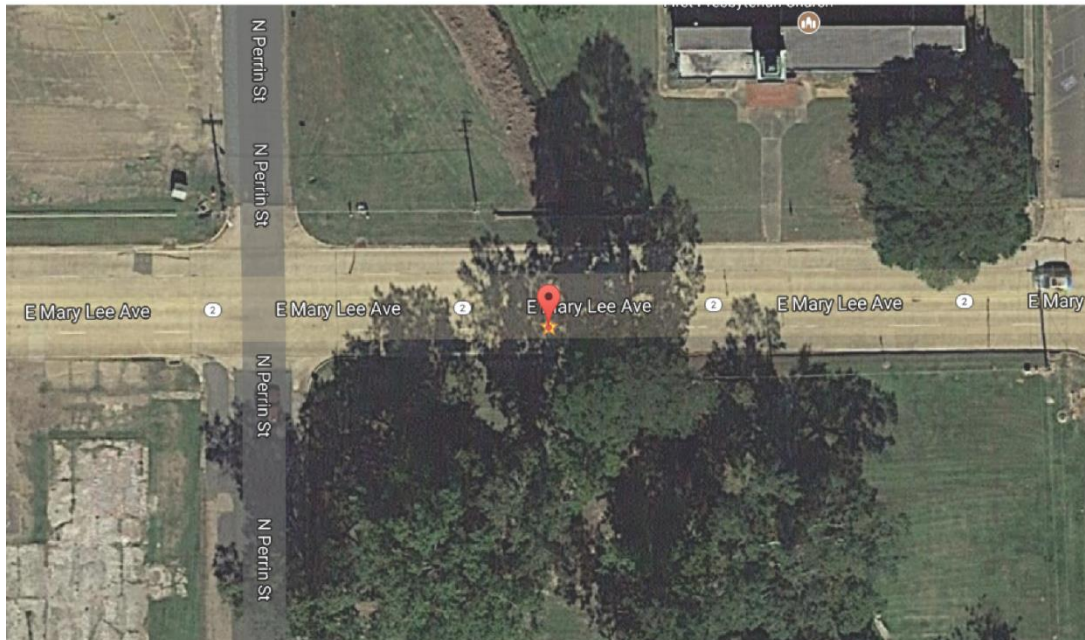


Figure A-32
Aerial view of Culvert #7 – Plain Dealing, LA

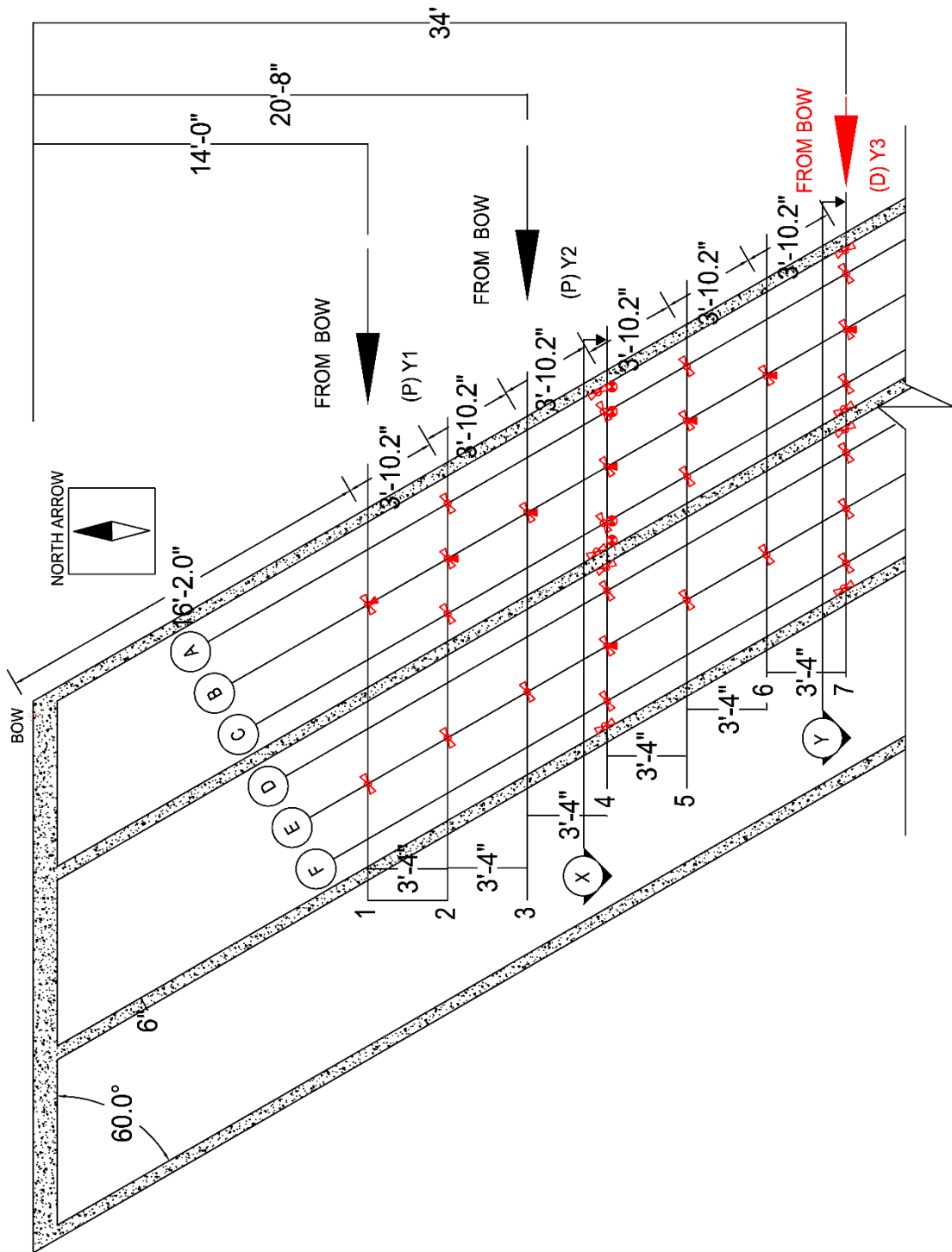
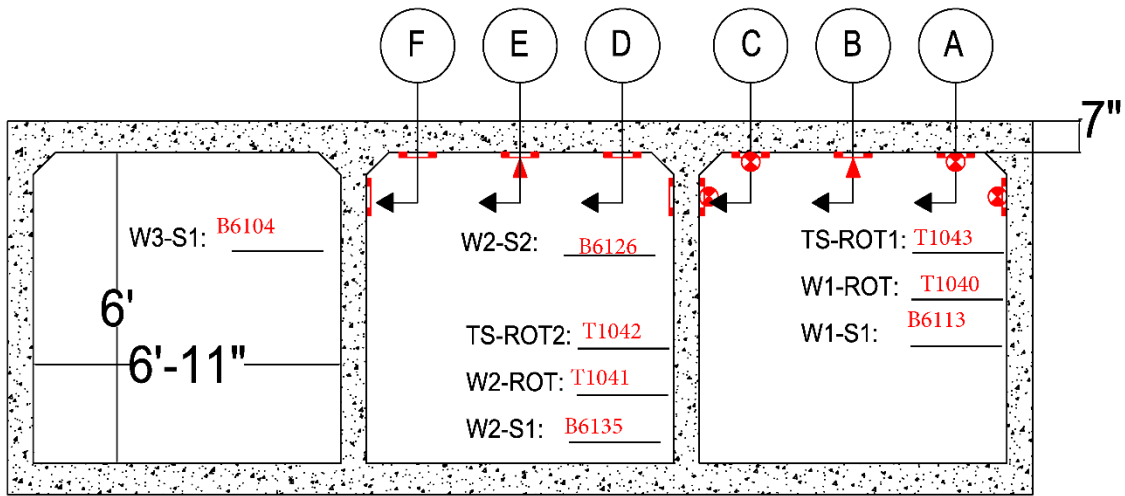
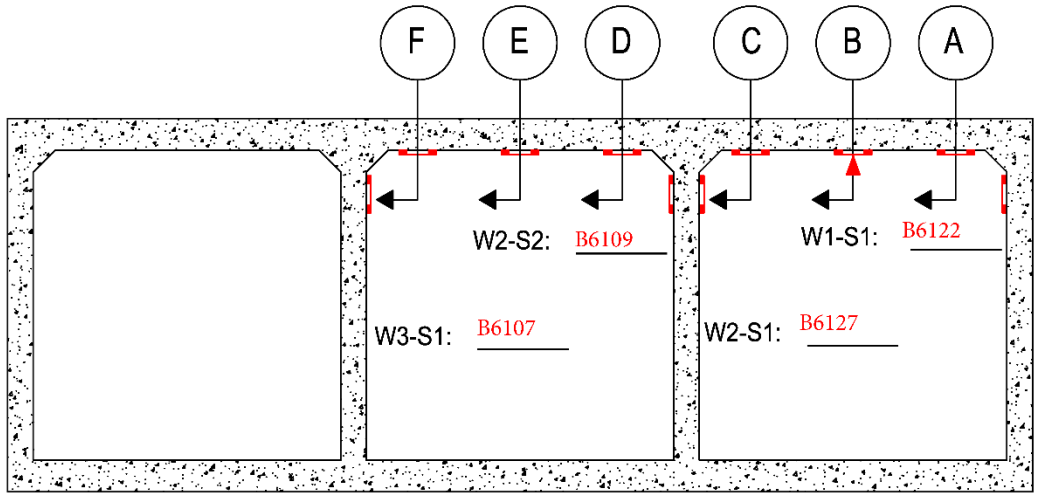


Figure A-33
Sensor Instrumentation Plan – Culvert #7



(X) CENTER TRANSVERSE LINE 4 ELEVATION



(Y) SOUTH TRANSVERSE LINE 7 ELEVATION

Figure A-34
Elevation views – Culvert #7

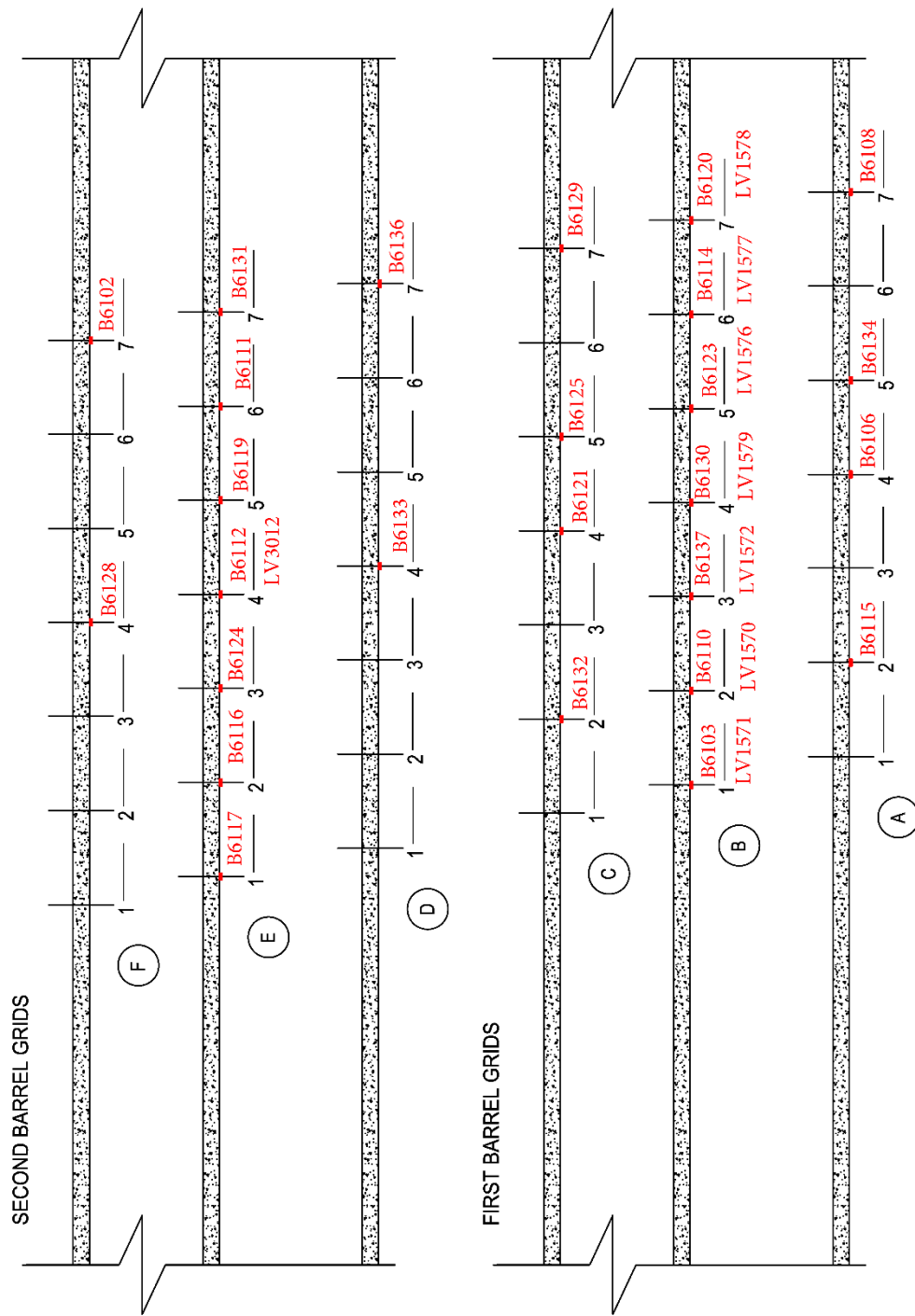


Figure A-35
Section view – Culvert #7

Culvert #8

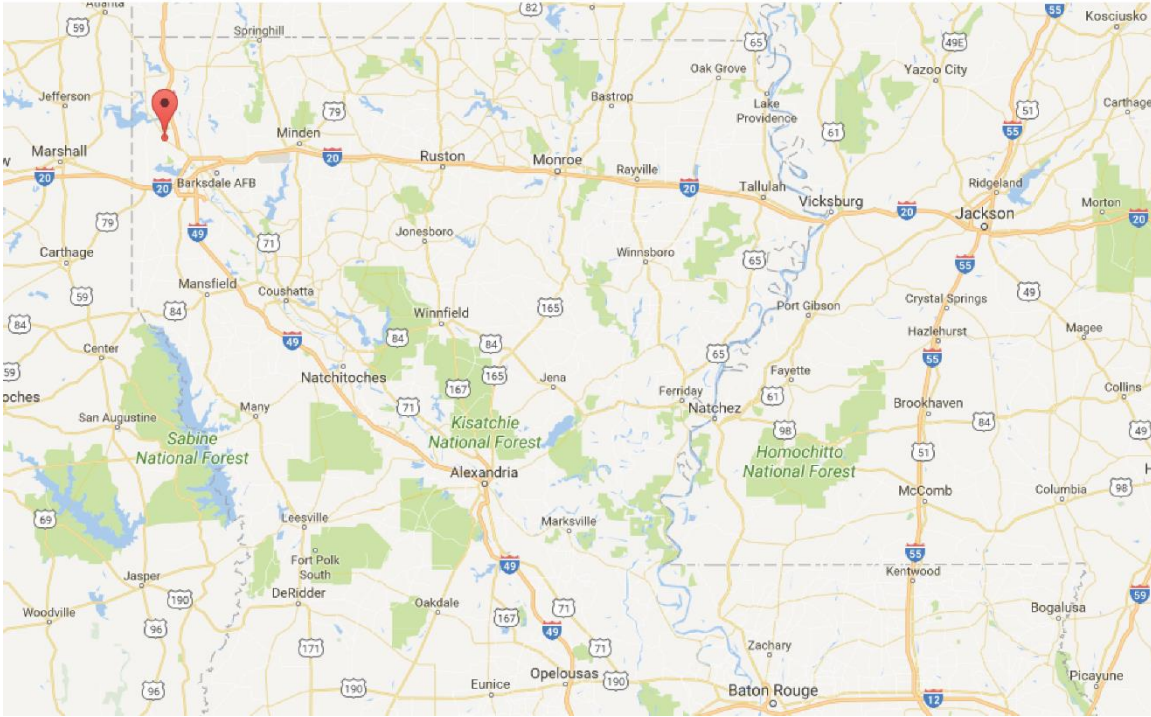


Figure A-36
Map location of Culvert #8 – Blanchard, LA

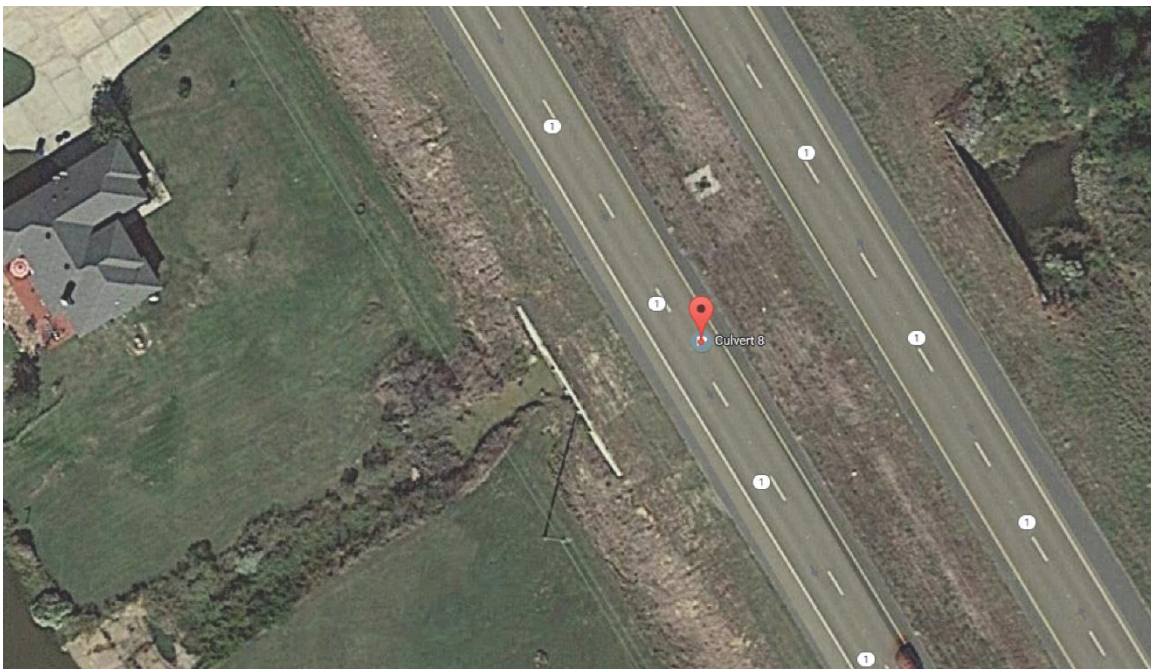


Figure A-37
Bird's eye view of Culvert #8 – Blanchard, LA

Y1 to Y2, (CL to CL of white pavement markings)
 NEEDS FIELD CONFIRMATION AND
 ASSUMED - 20 FT



FROM HEADWALL

(D) Y3

FROM HEADWALL

(D) Y2

FROM HEADWALL

(D) Y1

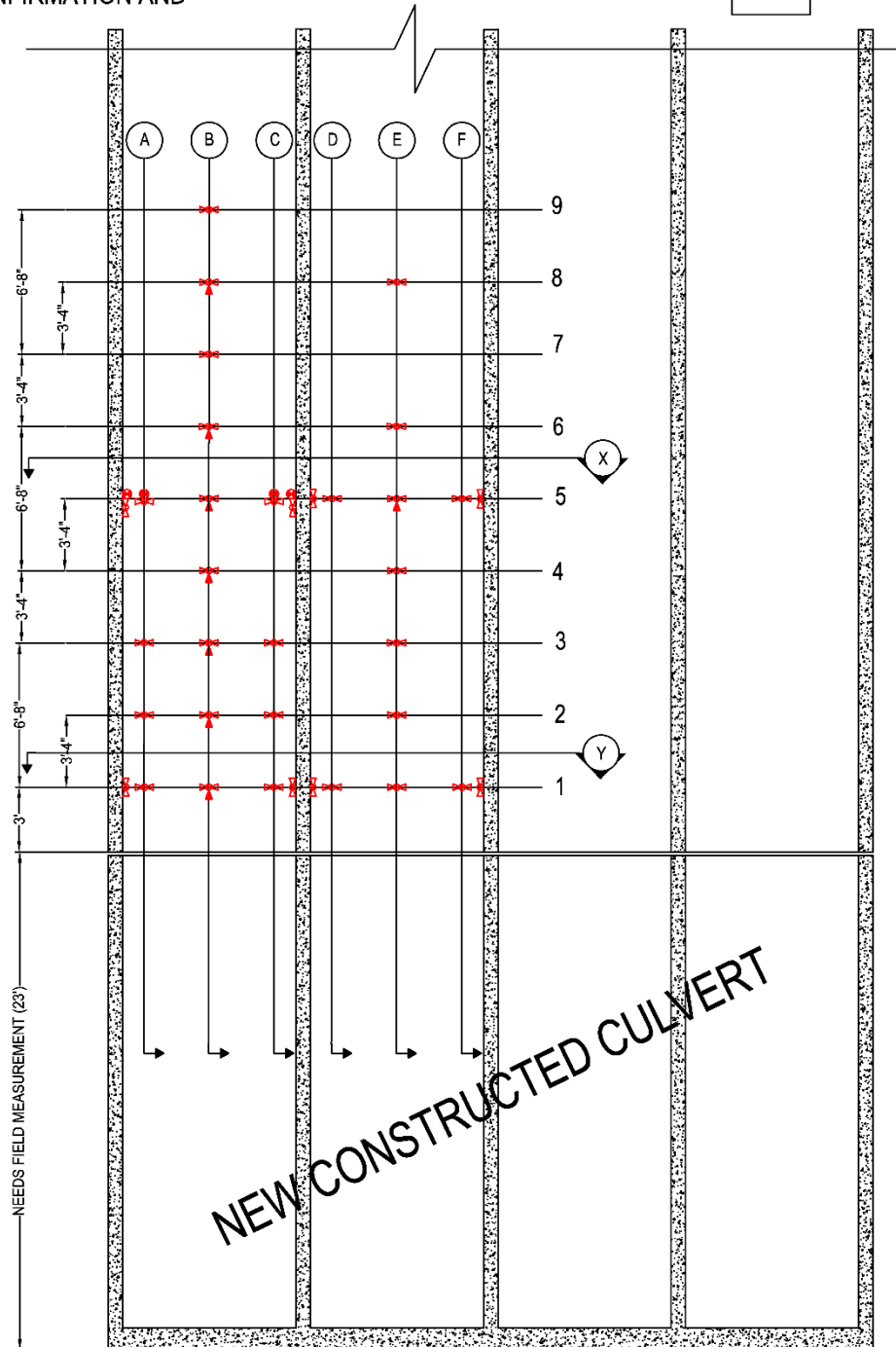


Figure A-38
Sensor Instrumentation Plan – Culvert #8

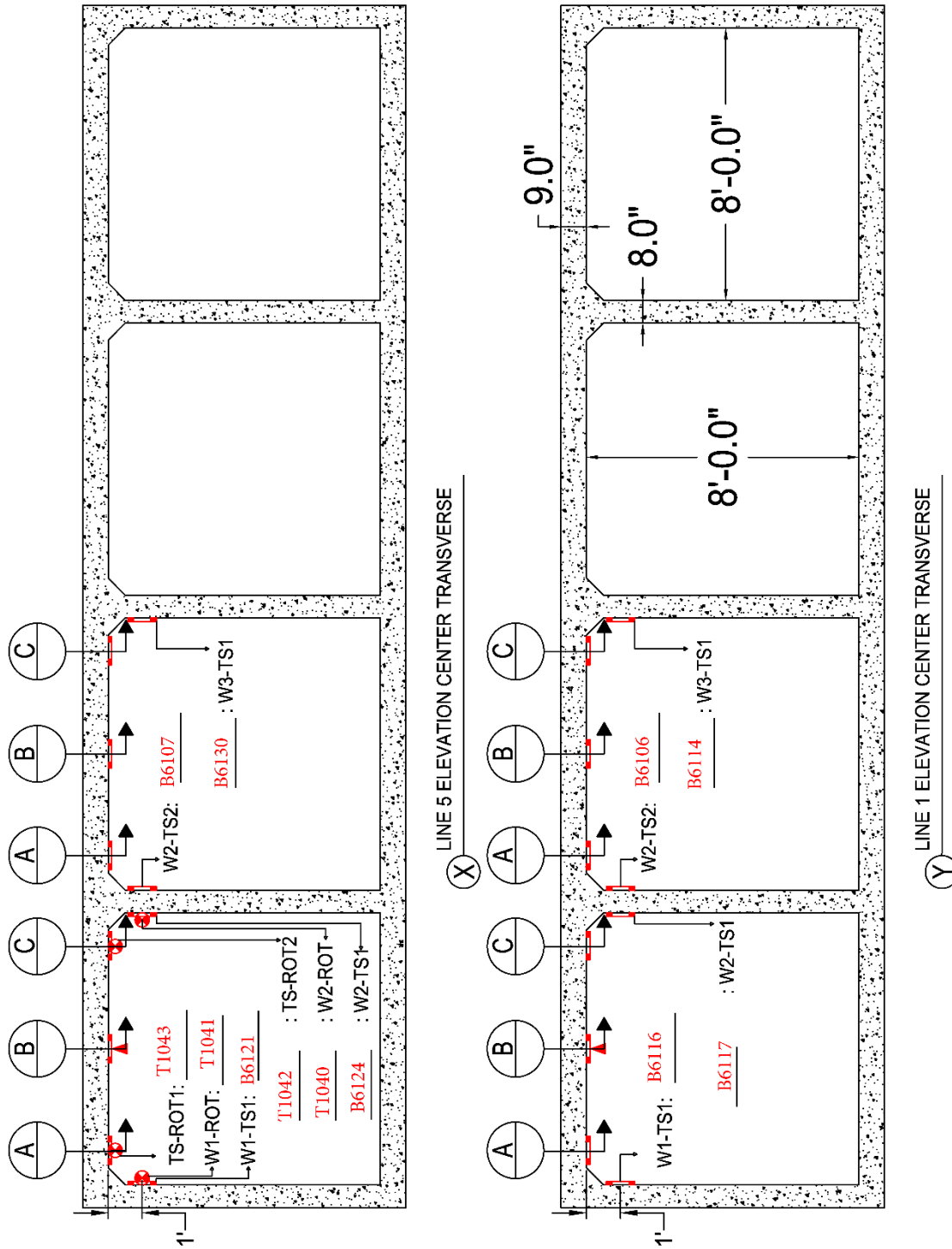


Figure A-39
Elevation views – Culvert #8

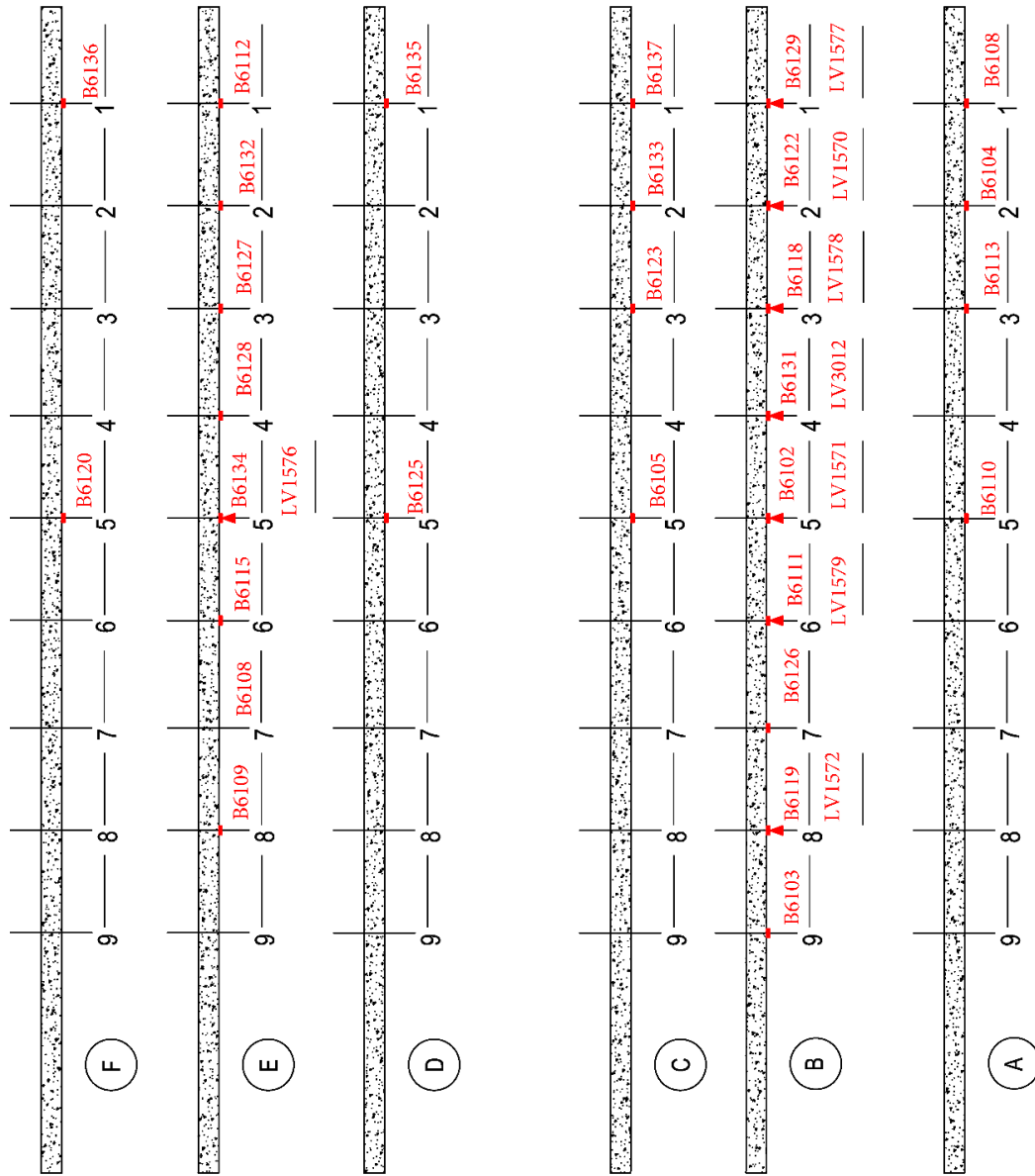


Figure A-40
Section view – Culvert #8

APPENDIX B

Field and FE Model Data Readings

In this section, all sensor readings recorded during the field testing of the selected culverts are documented for archival purposes.

Culvert #1

Load Path 1 Sensors

Figure B-1
Culvert #1 load path 1 calibration plots for strain sensors

Figure B-2
Culvert #1 load path 1 calibration plots for strain sensors

Figure B-3
Culvert #1 load path 1 calibration plots for strain sensors

Figure B-4
Culvert #1 load path 1 calibration plots for strain sensors

Figure B-5
Culvert #1 load path 1 calibration plots for LVDT sensors

Figure B-6
Culvert #1 load path 1 calibration plots for tilt-meter sensors

Load Path 2 Sensors

Figure B-7
Culvert #1 load path 2 calibration plots for strain sensors

Figure B-8
Culvert #1 load path 2 calibration plots for strain sensors

Figure B-9
Culvert #1 load path 2 calibration plots for strain sensors

Figure B-10
Culvert #1 load path 2 calibration plots for strain sensors

Figure B-11
Culvert #1 load path 2 calibration plots for LVDT sensors

Figure B-12
Culvert #1 load path 2 calibration plots for tilt-meter sensors

Load Path 3 Sensors

Figure B-13
Culvert #1 load path 3 calibration plots for strain sensors

Figure B-14
Culvert #1 load path 3 calibration plots for strain sensors

Figure B-15
Culvert #1 load path 3 calibration plots for strain sensors

Figure B-16
Culvert #1 load path 3 calibration plots for strain sensors

Figure B-17
Culvert #1 load path 3 calibration plots for LVDT sensors

Figure B-18
Culvert #1 load path 3 calibration plots for tilt-meter sensors

Culvert #2

Load Path 1 Sensors

Figure B-19
Culvert #2 load path 1 calibration plots for strain sensors

Figure B-20
Culvert #2 load path 1 calibration plots for strain sensors

Figure B-21
Culvert #2 load path 1 calibration plots for strain sensors

Figure B-22
Culvert #2 load path 1 calibration plots for strain sensors

Figure B-23
Culvert #2 load path 1 calibration plots for LVDT sensors

Figure B-24
Culvert #2 load path 1 calibration plots for tilt-meter sensors

Load Path 2 Sensors

Figure B-25
Culvert #2 load path 2 calibration plots for strain sensors

Figure B-26
Culvert #2 load path 2 calibration plots for strain sensors

Figure B-27
Culvert #2 load path 2 calibration plots for strain sensors

Figure B-28
Culvert #2 load path 2 calibration plots for strain sensors

Figure B-29
Culvert #2 load path 2 calibration plots for LVDT sensors

Figure B-30
Culvert #2 load path 2 calibration plots for tilt-meter sensors

Load Path 3 Sensors

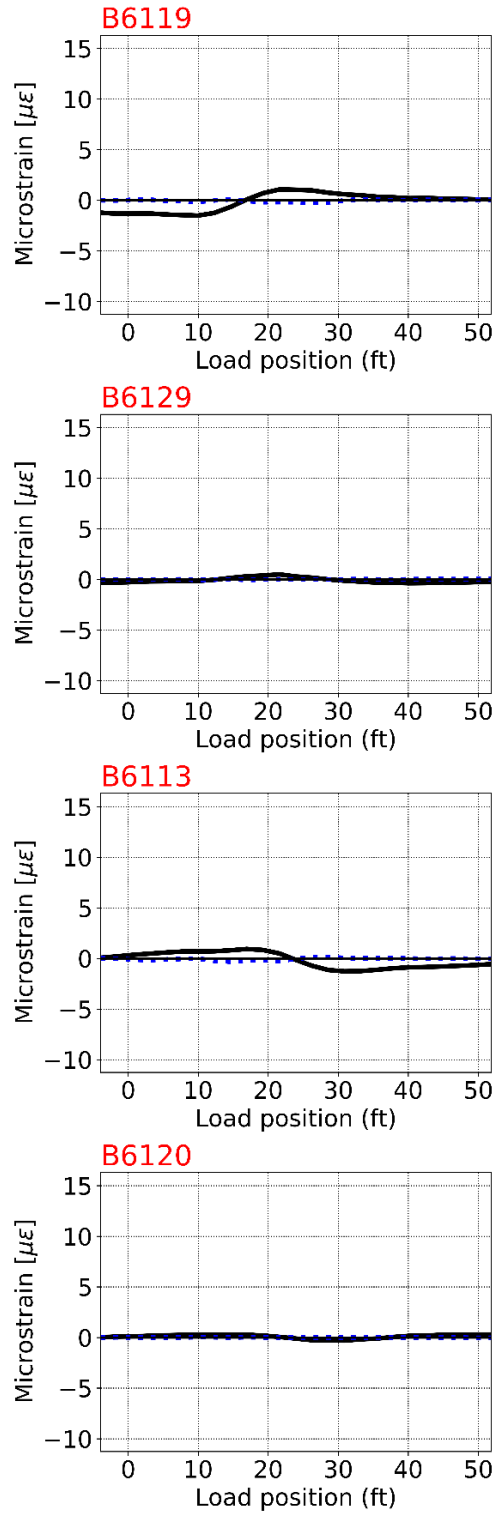


Figure B-31
Culvert #2 load path 3 calibration plots for strain sensors

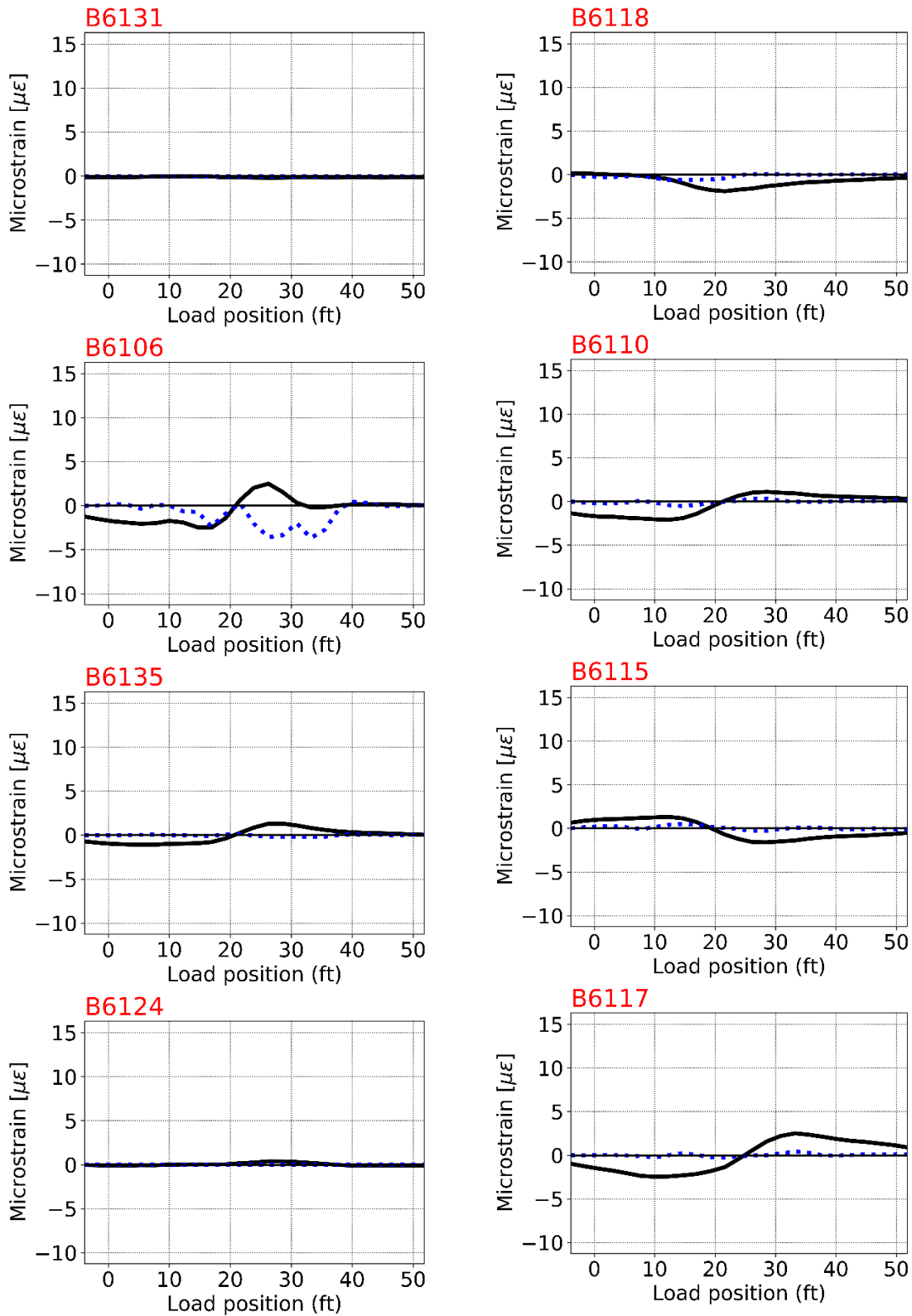


Figure B-32
Culvert #2 load path 3 calibration plots for strain sensors

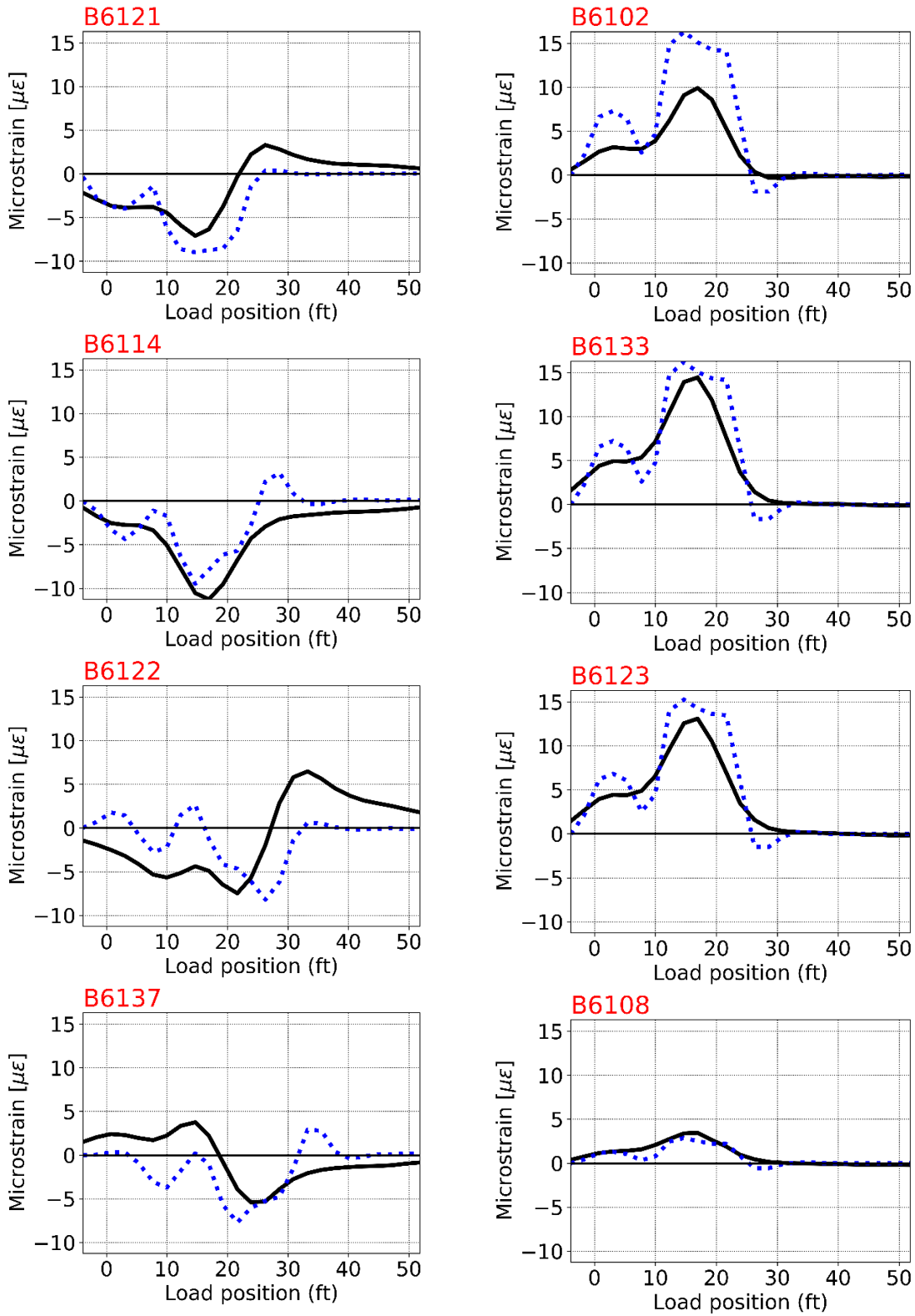


Figure B-33
Culvert #2 load path 3 calibration plots for strain sensors

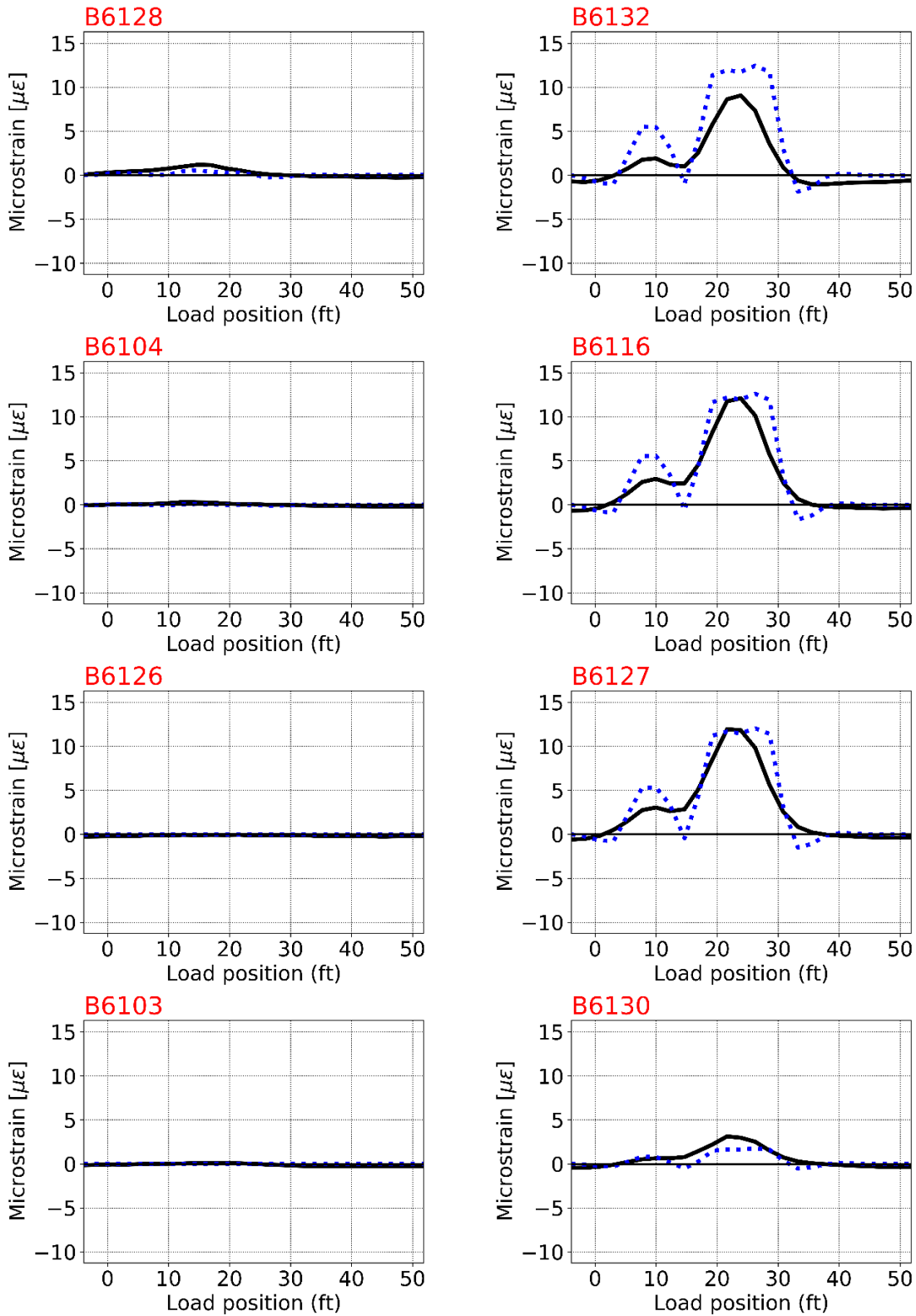


Figure B-34
Culvert #2 load path 3 calibration plots for strain sensors

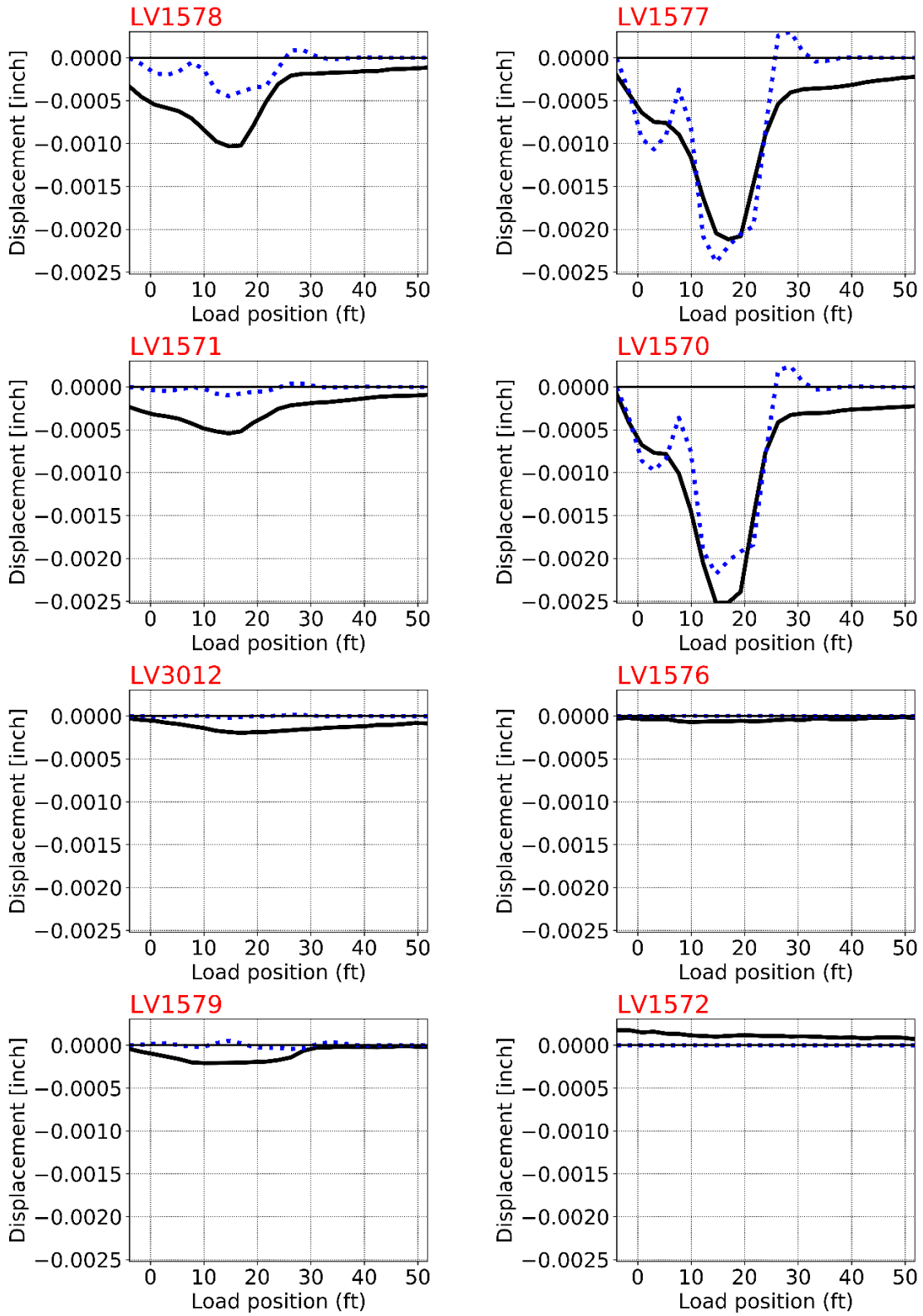


Figure B-35
Culvert #2 load path 3 calibration plots for LVDT sensors

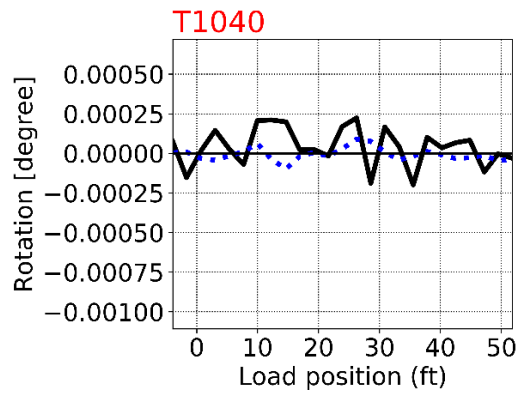
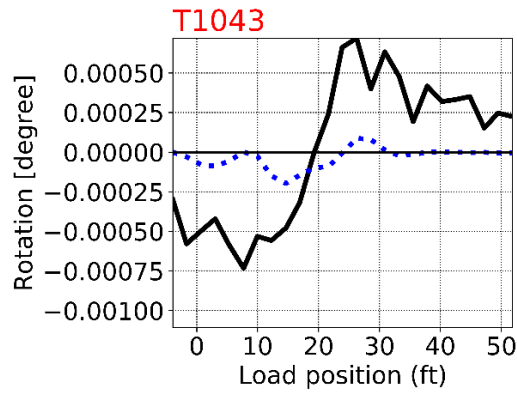
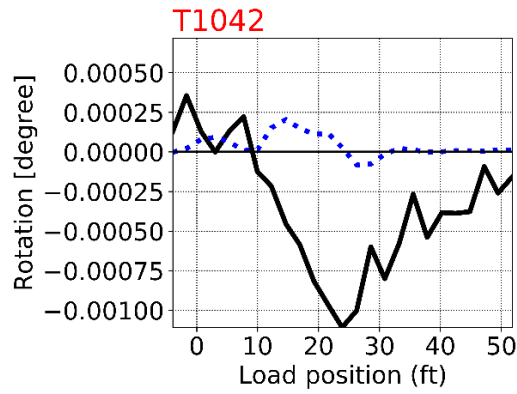
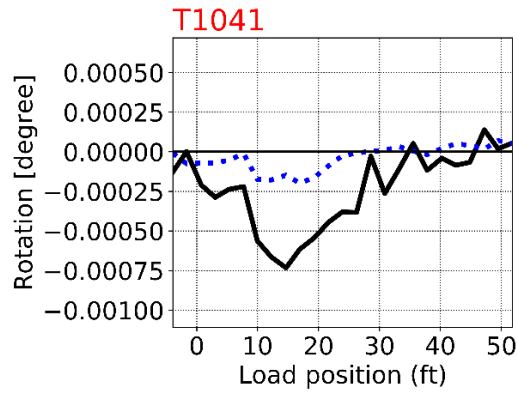


Figure B-36
Culvert #2 load path 3 calibration plots for tilt-meter sensors

Culvert #3

Load Path 1 Sensors

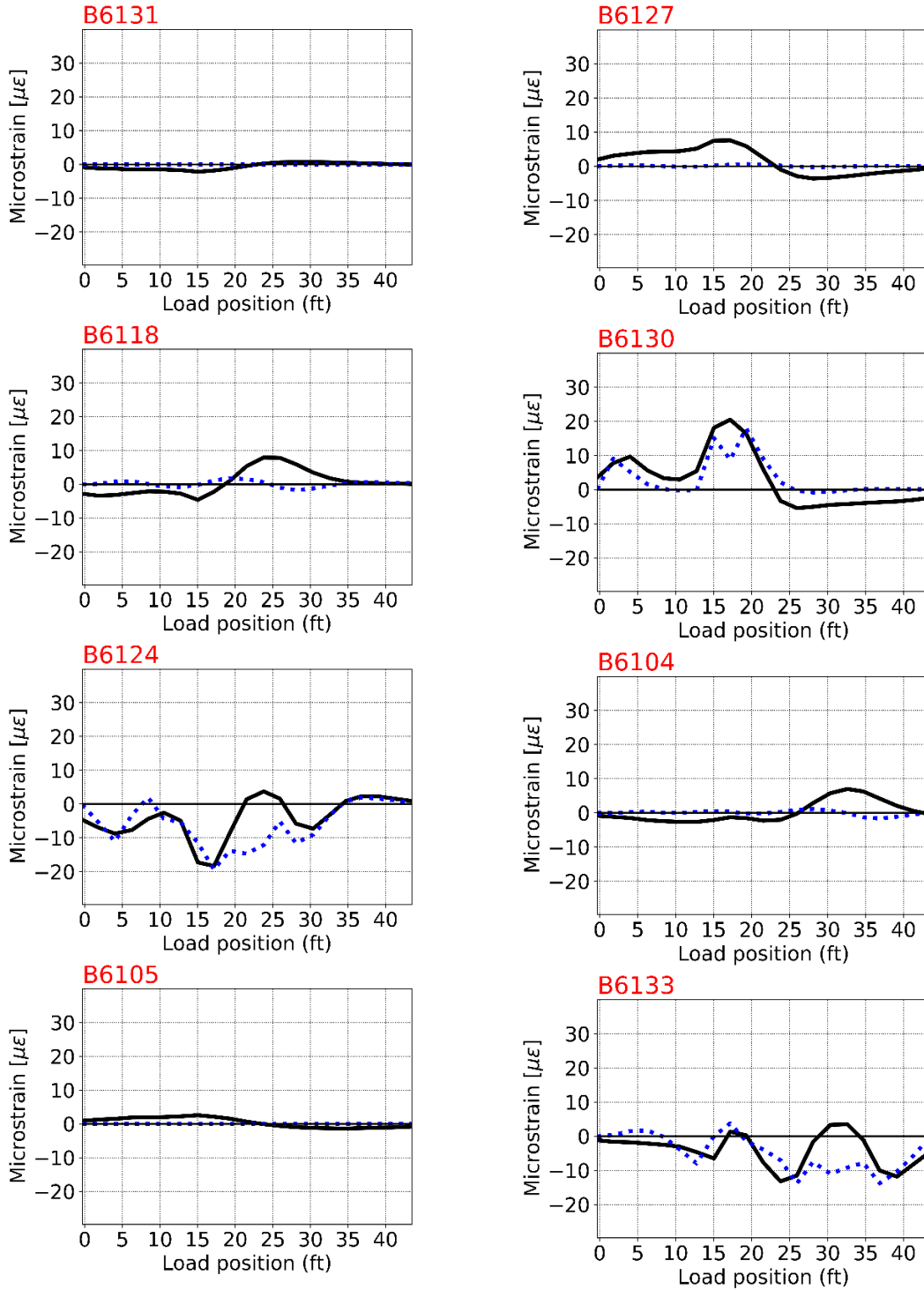


Figure B-37
Culvert #3 load path 1 calibration plots for strain sensors

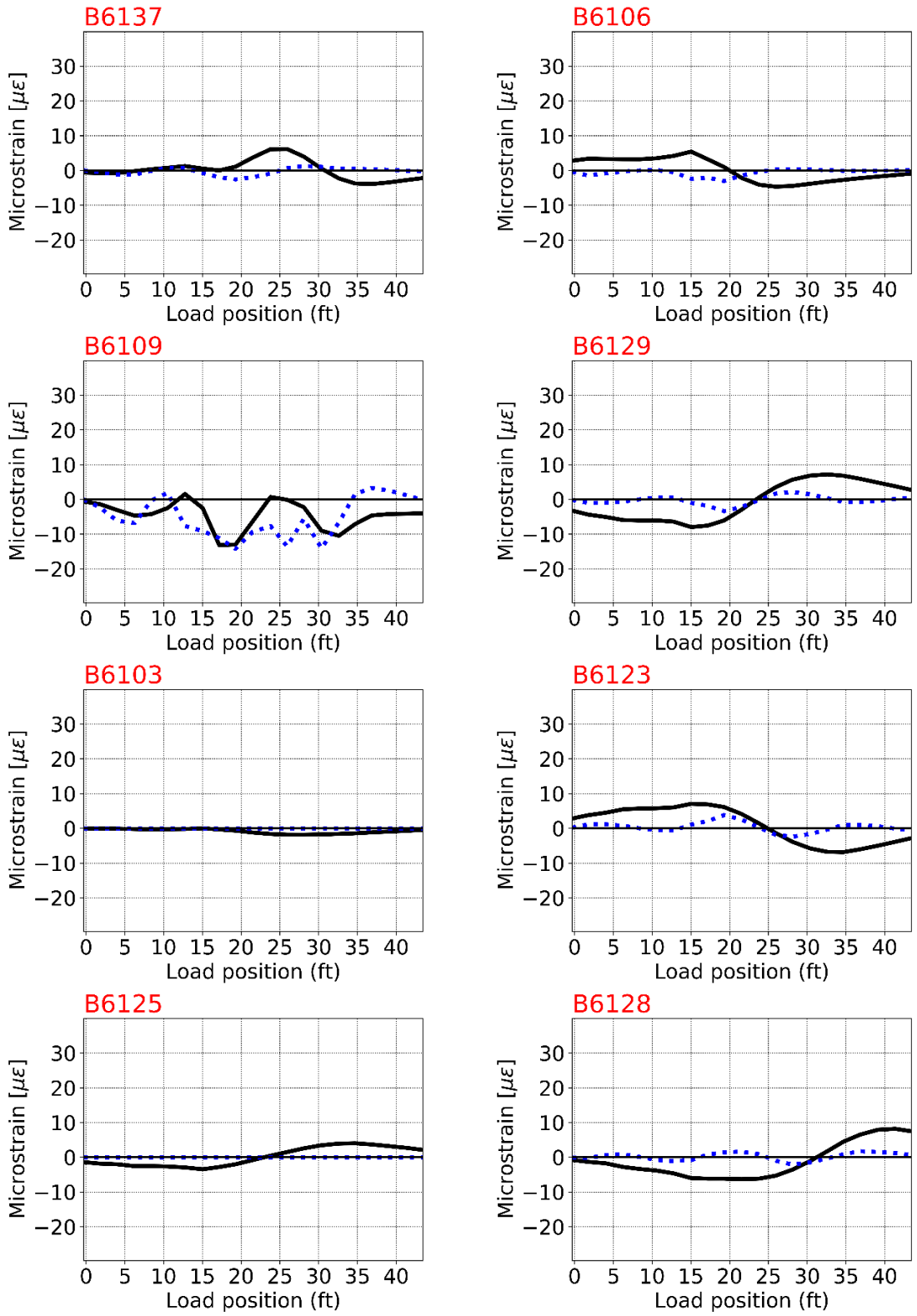


Figure B-38
Culvert #3 load path 1 calibration plots for strain sensors

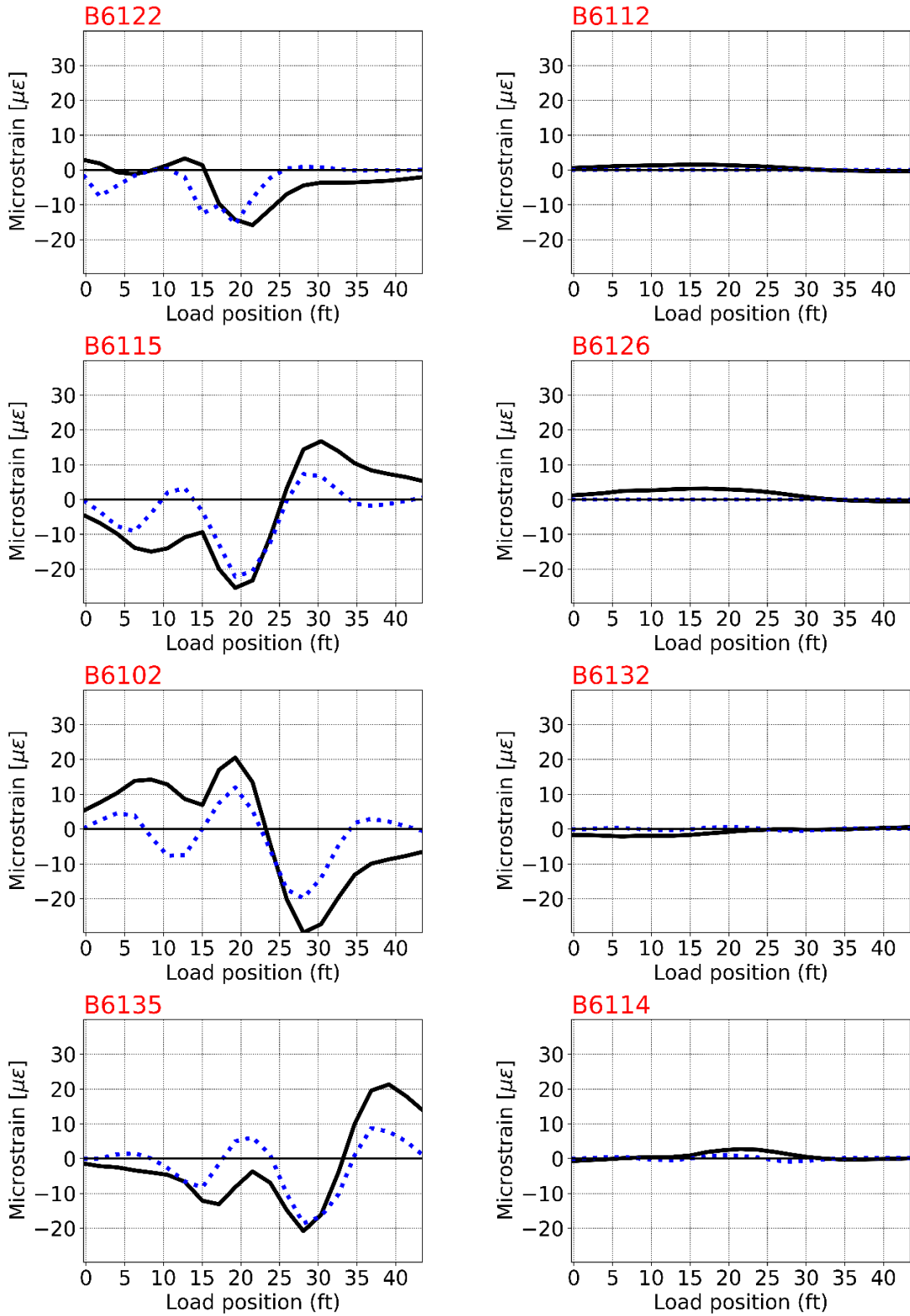


Figure B-39
Culvert #3 load path 1 calibration plots for strain sensors

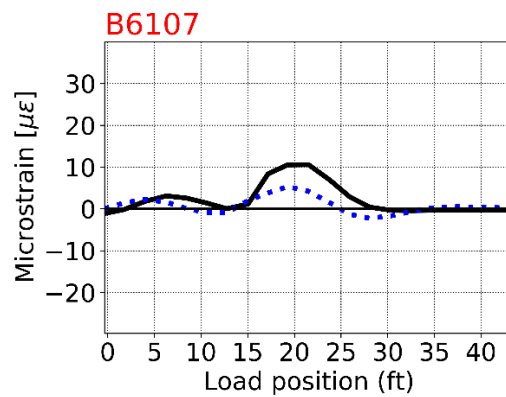
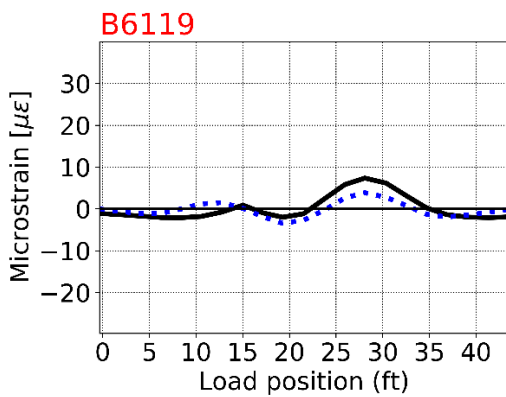
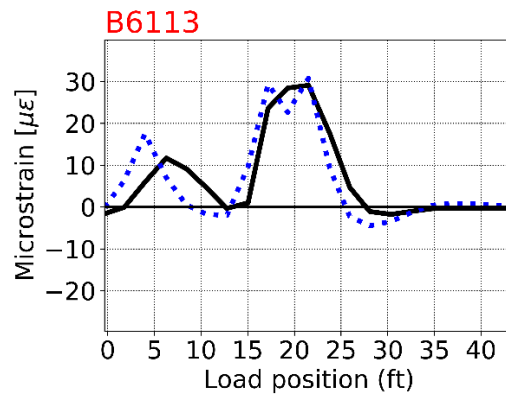
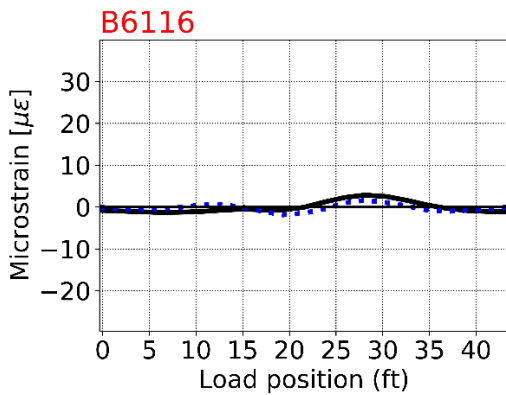
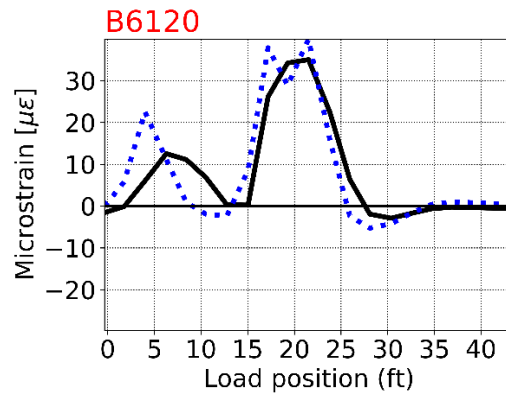
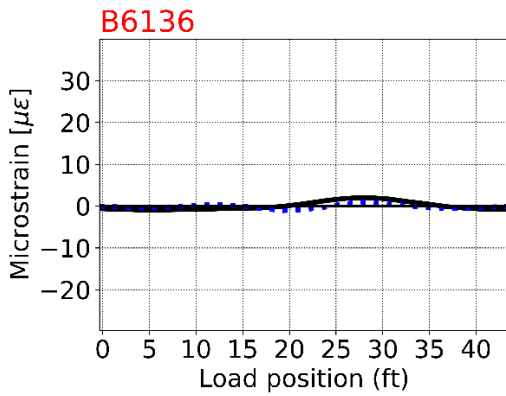
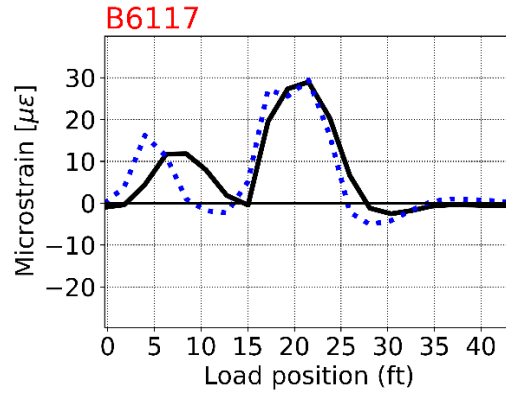


Figure B-40
Culvert #3 load path 1 calibration plots for strain sensors

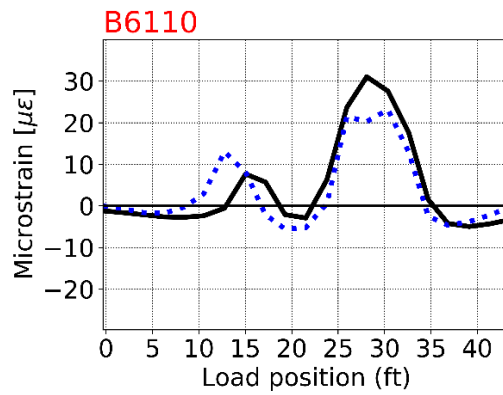
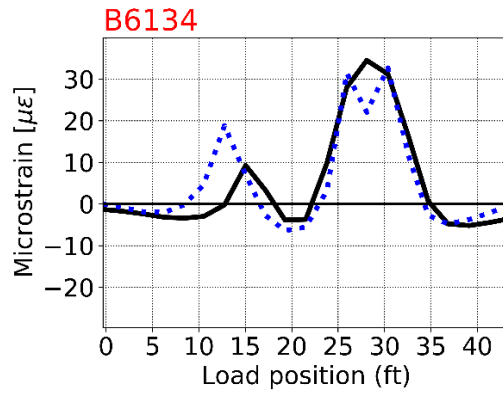
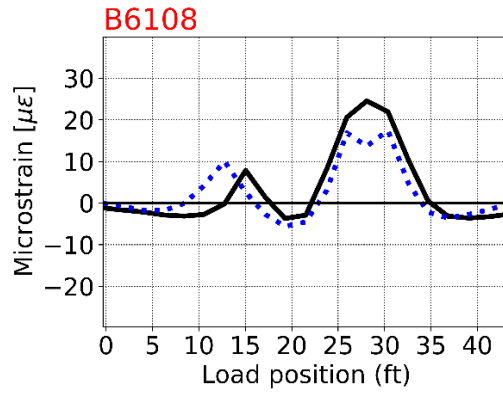
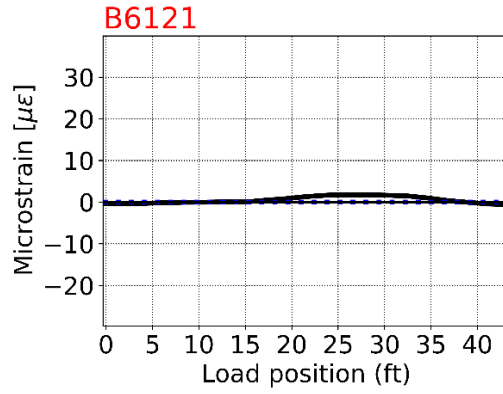


Figure B-41
Culvert #3 load path 1 calibration plots for strain sensors

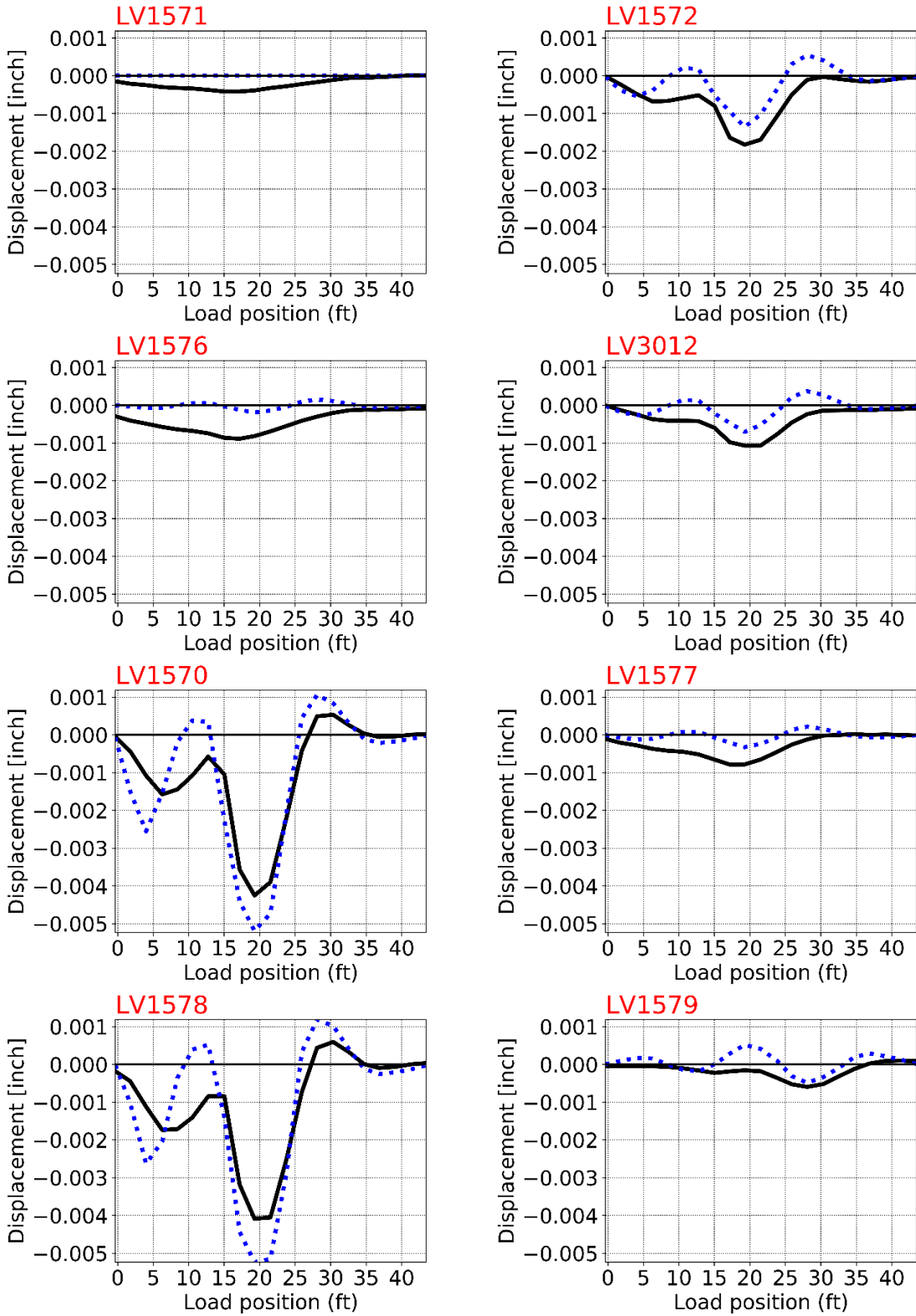


Figure B-42
Culvert #3 load path 1 calibration plots for LVDT sensors

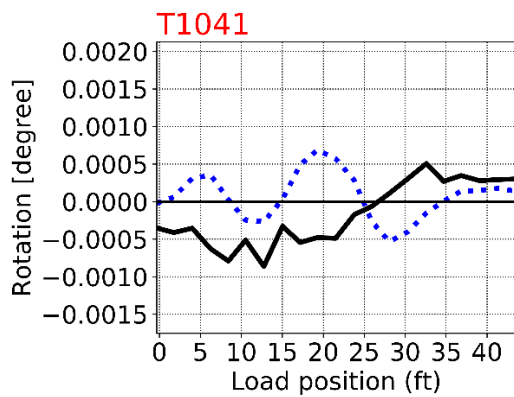
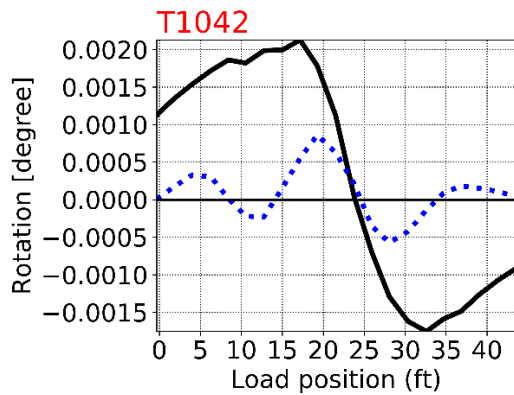
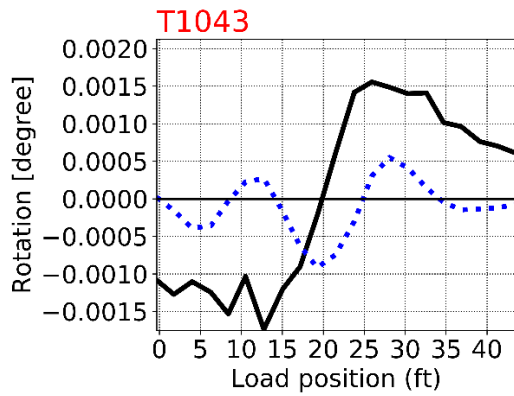
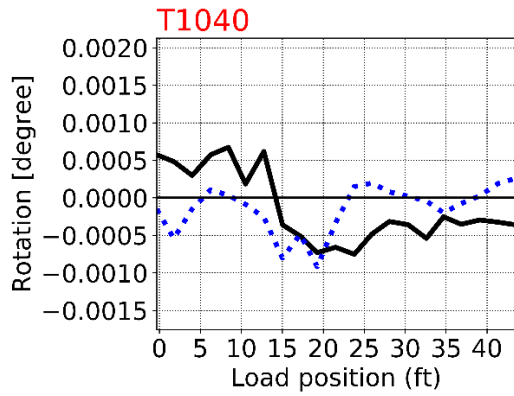


Figure B-43
Culvert #3 load path 1 calibration plots for tilt-meter sensors

Load Path 2 Sensors

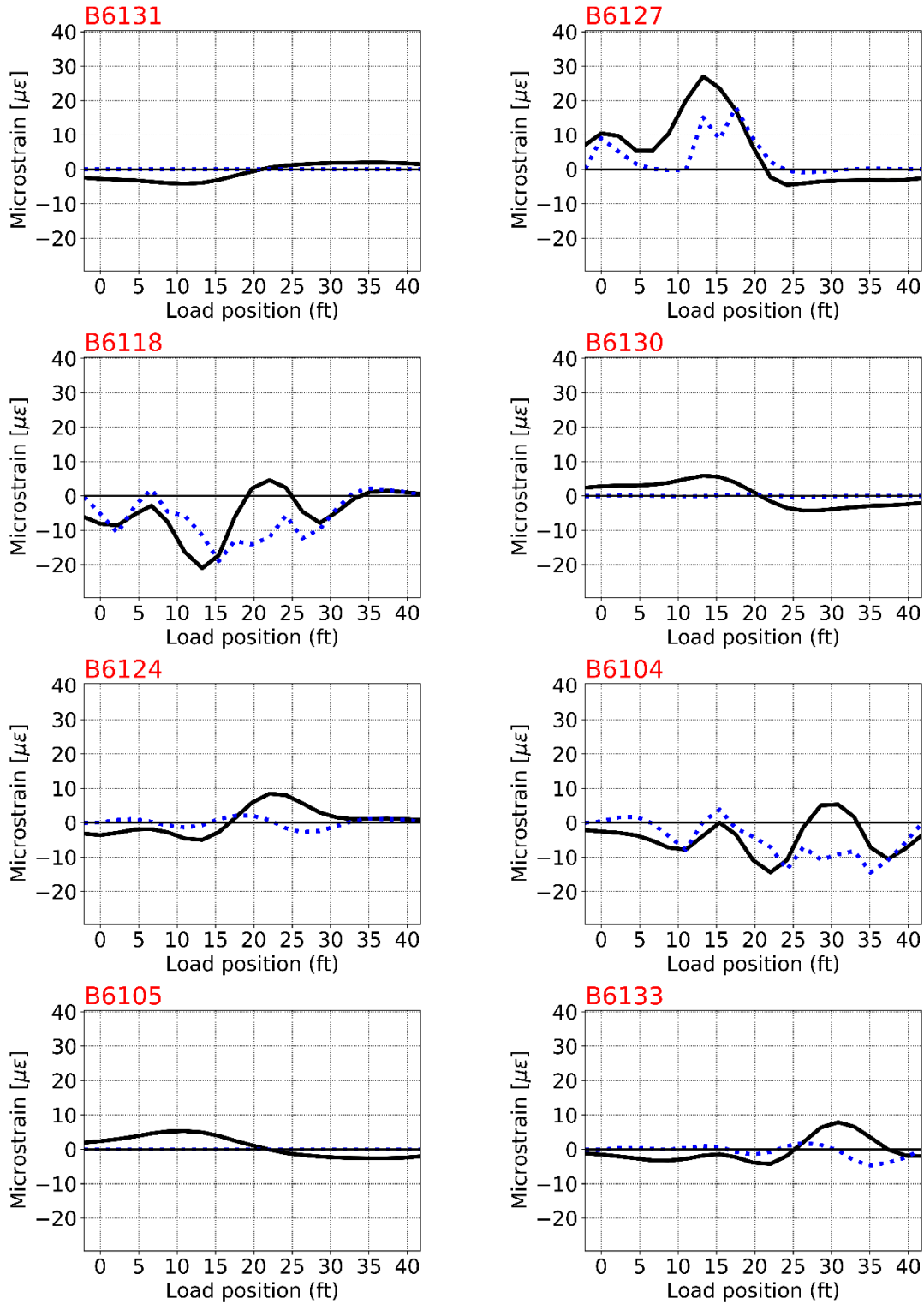


Figure B-44
Culvert #3 load path 2 calibration plots for strain sensors

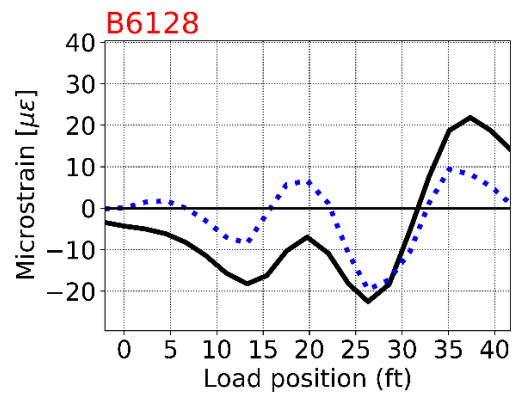
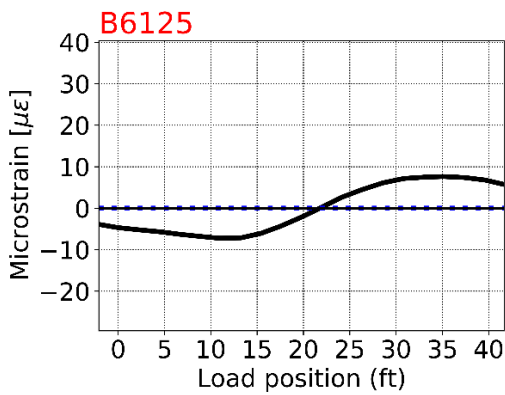
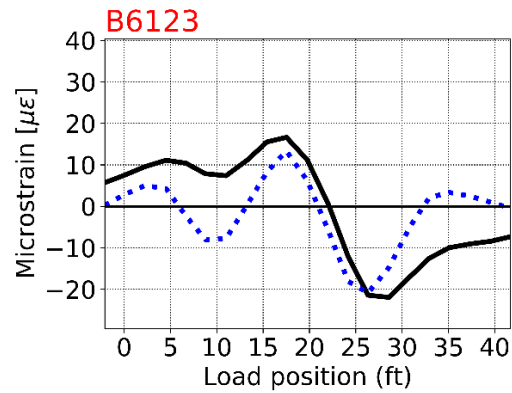
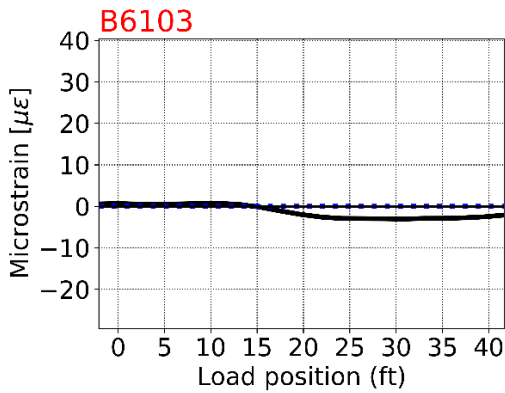
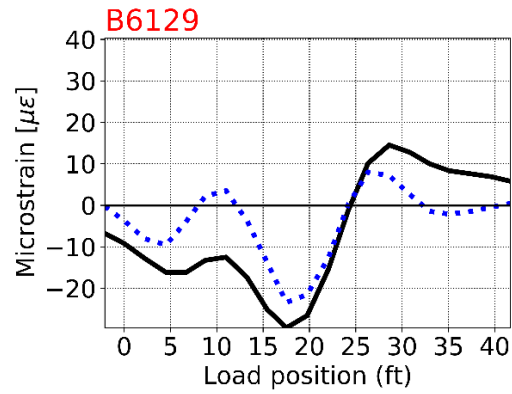
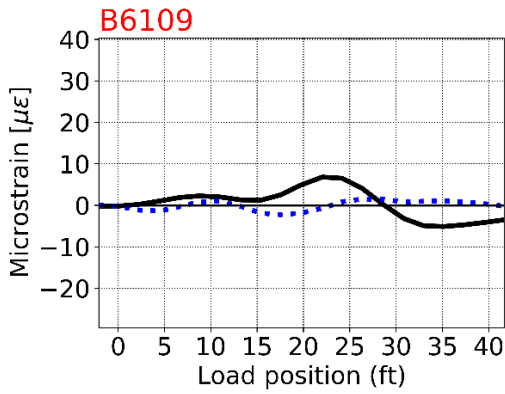
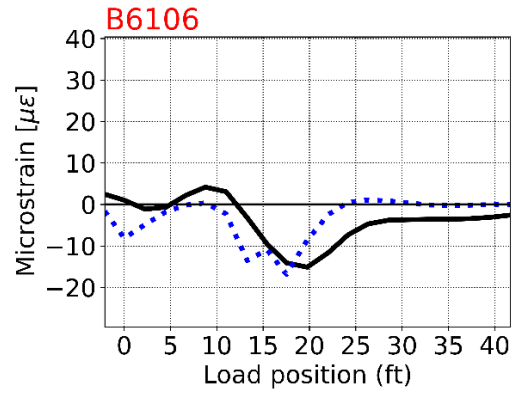
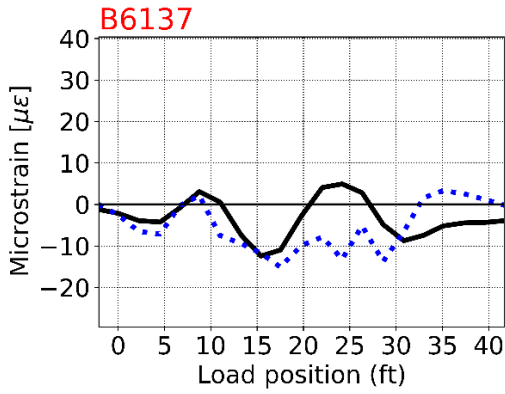


Figure B-45
Culvert #3 load path 2 calibration plots for strain sensors

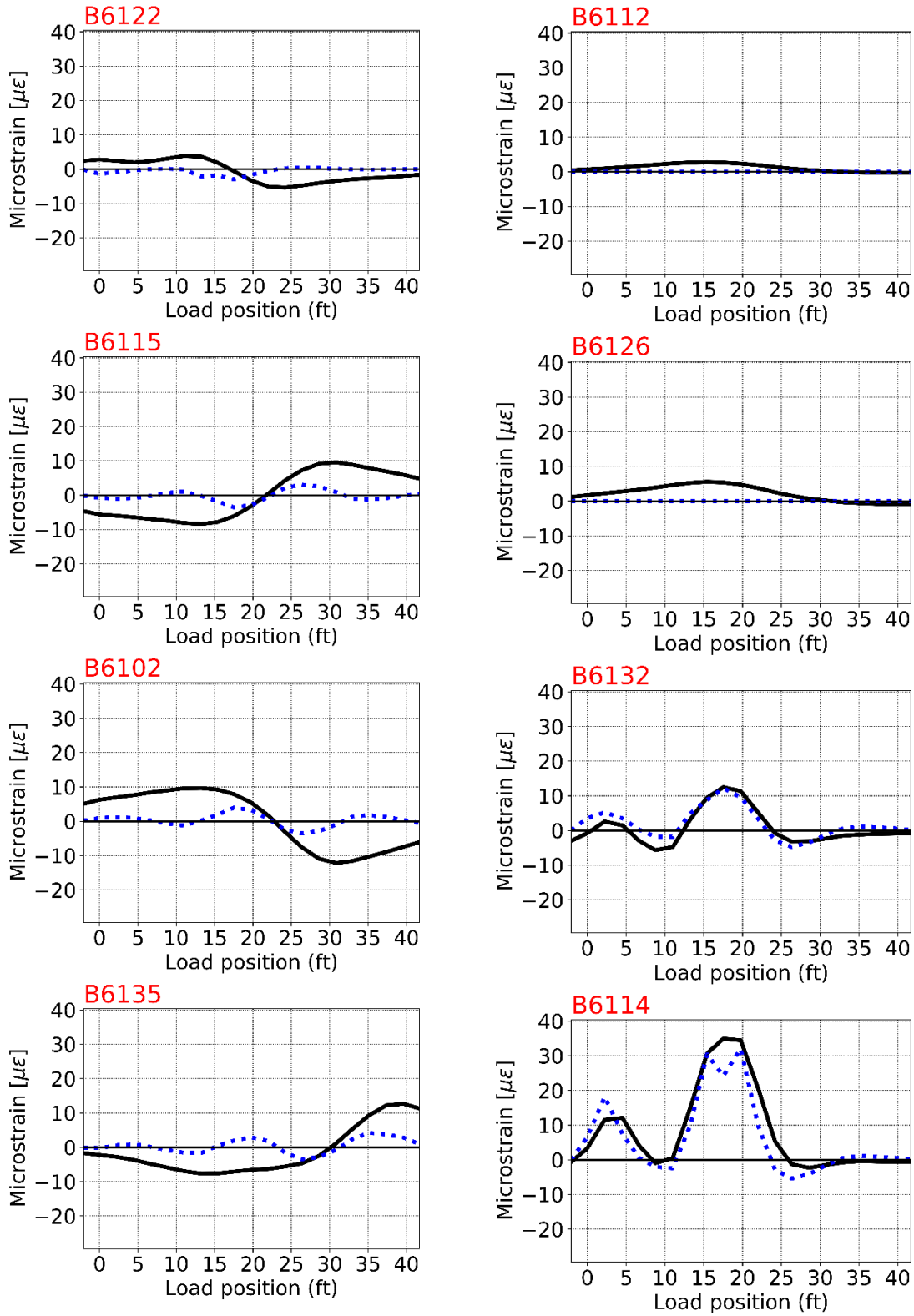


Figure B-46
Culvert #3 load path 2 calibration plots for strain sensors

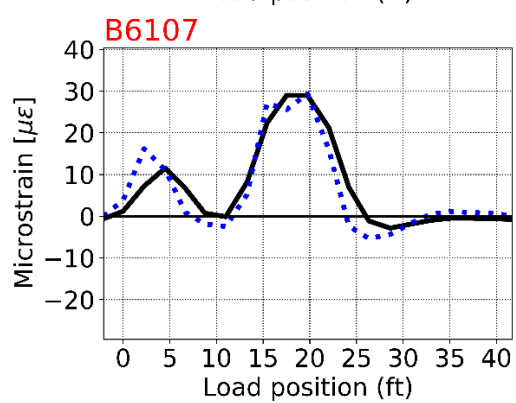
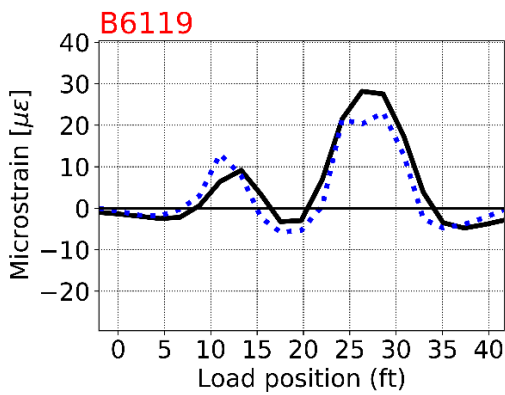
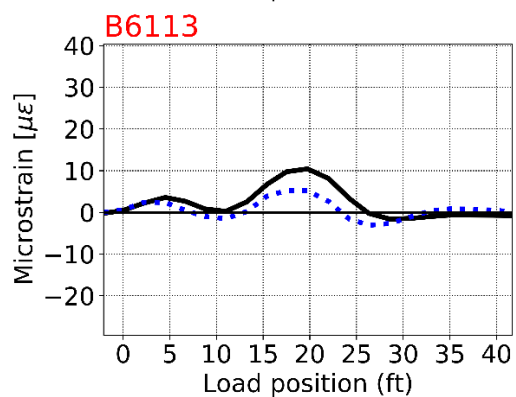
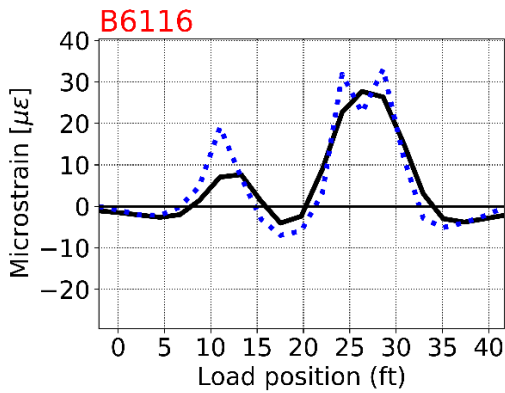
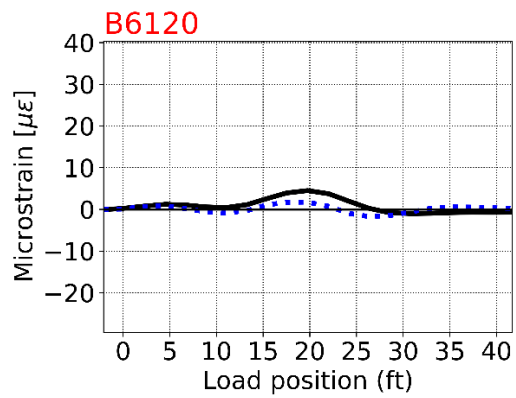
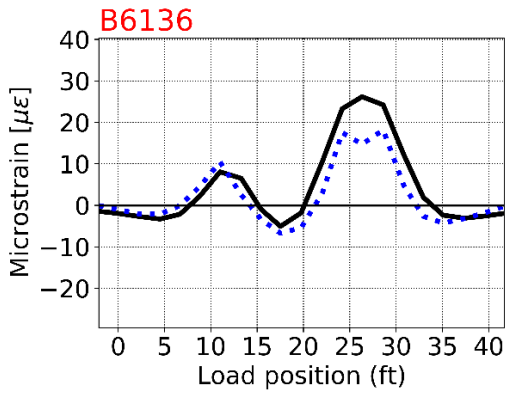
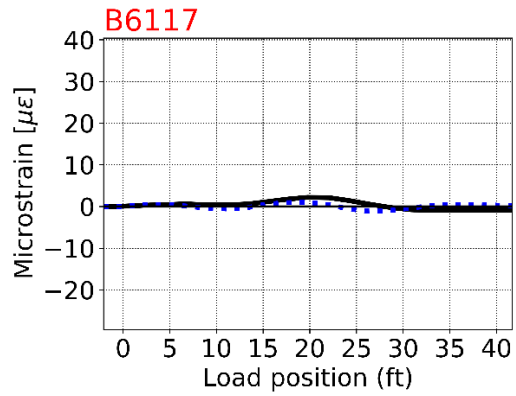
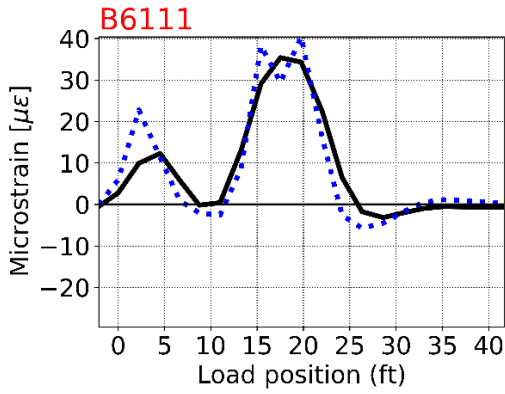


Figure B-47
Culvert #3 load path 2 calibration plots for strain sensors

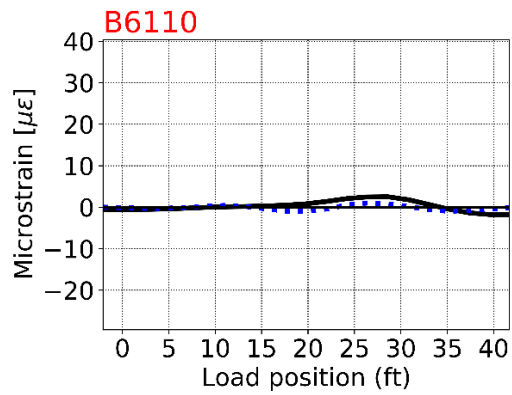
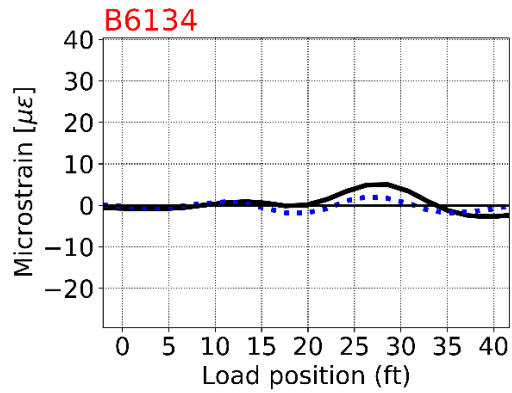
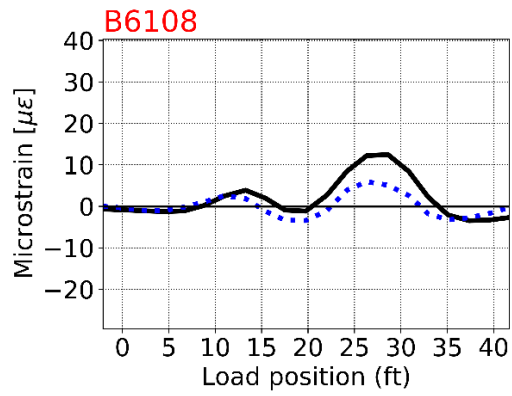
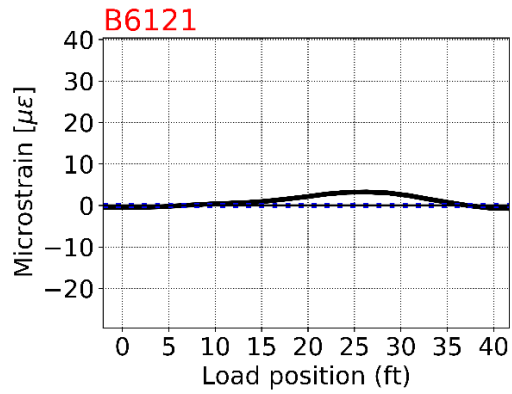


Figure B-48
Culvert #3 load path 2 calibration plots for strain sensors

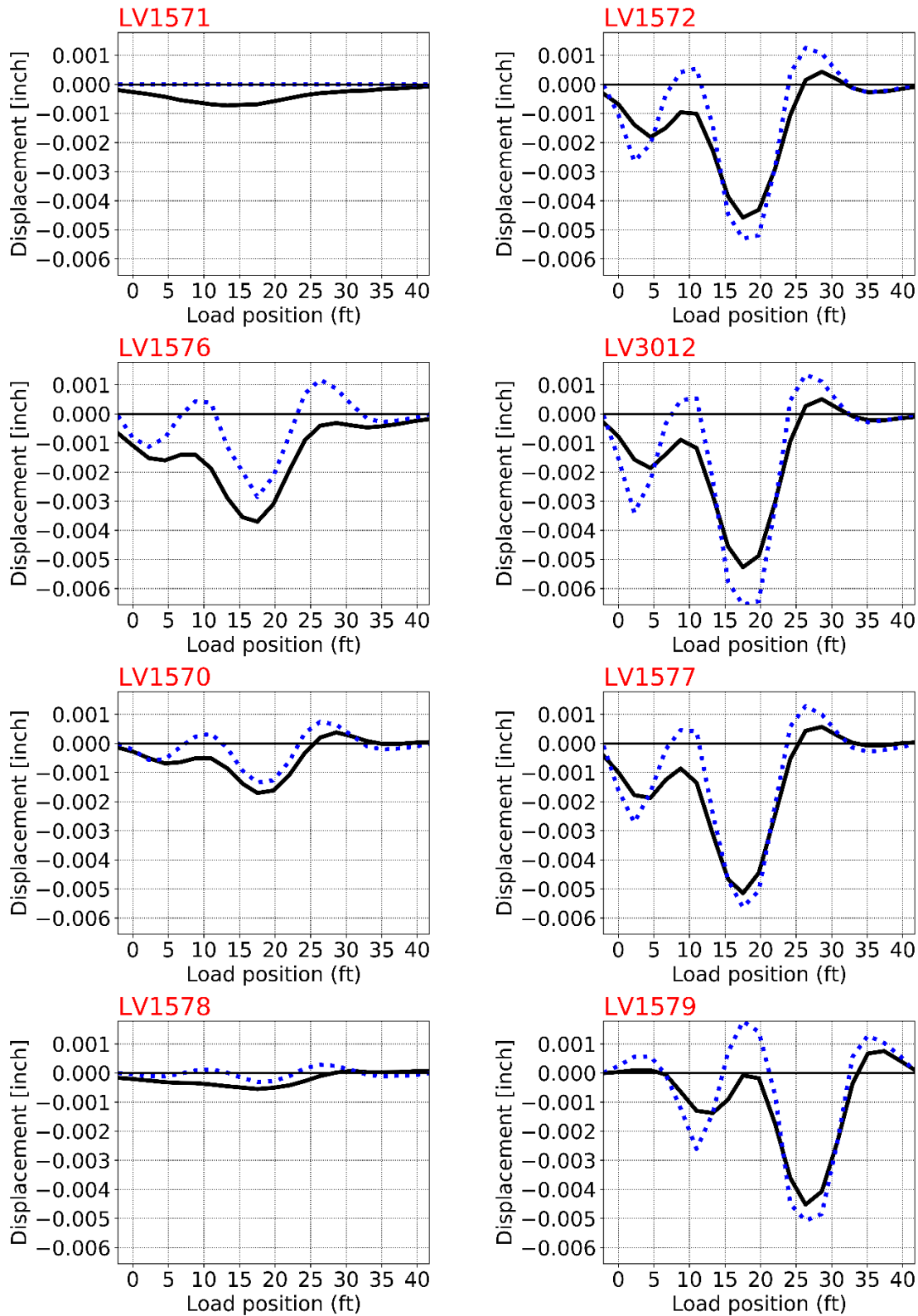


Figure B-49
Culvert #3 load path 2 calibration plots for LVDT sensors

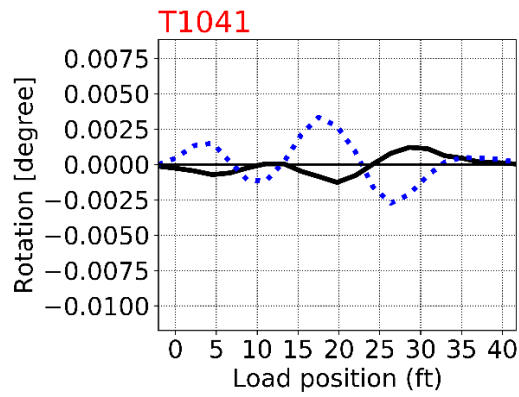
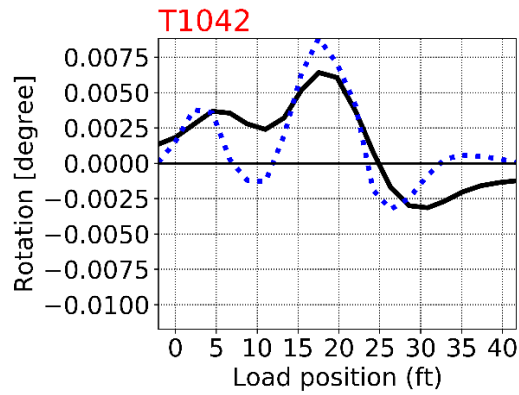
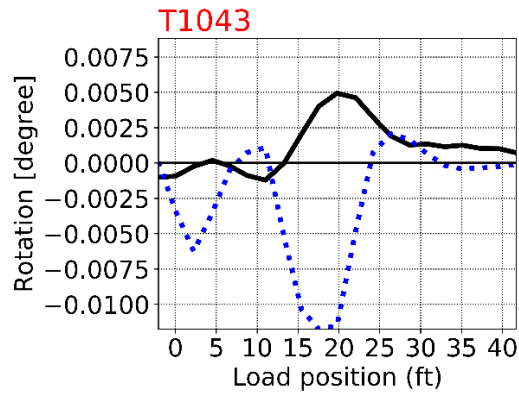
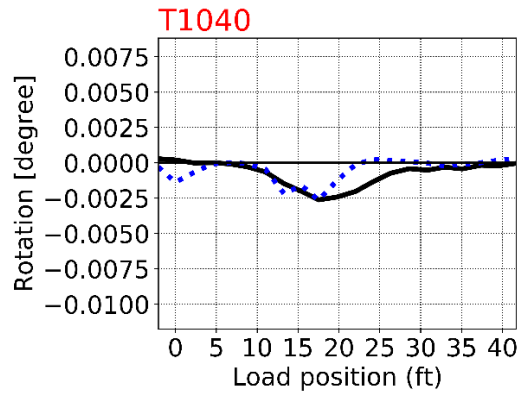


Figure B-50
Culvert #3 load path 2 calibration plots for tilt-meter sensors

Load Path 3 Sensors

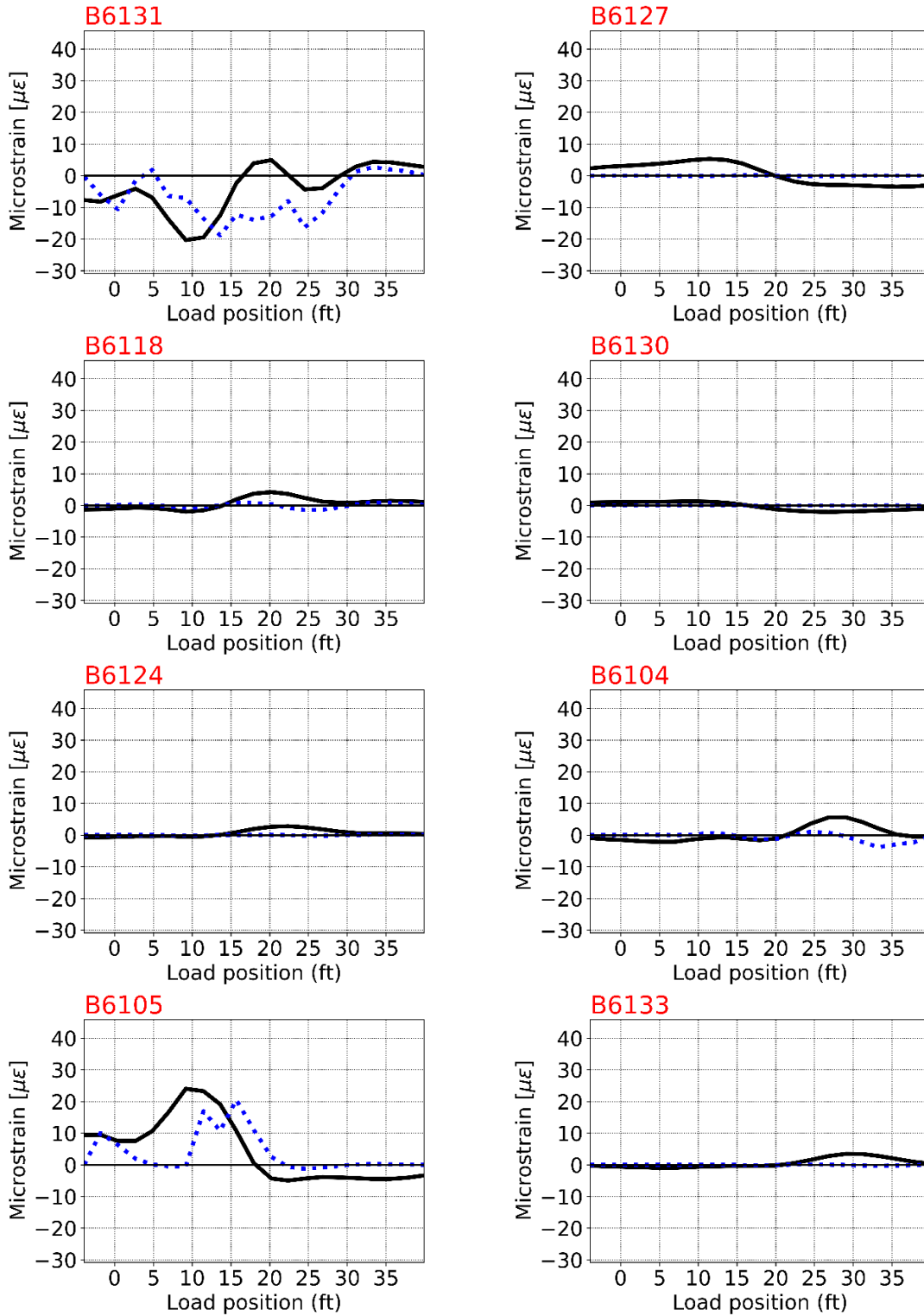


Figure B-51
Culvert #3 load path 3 calibration plots for strain sensors

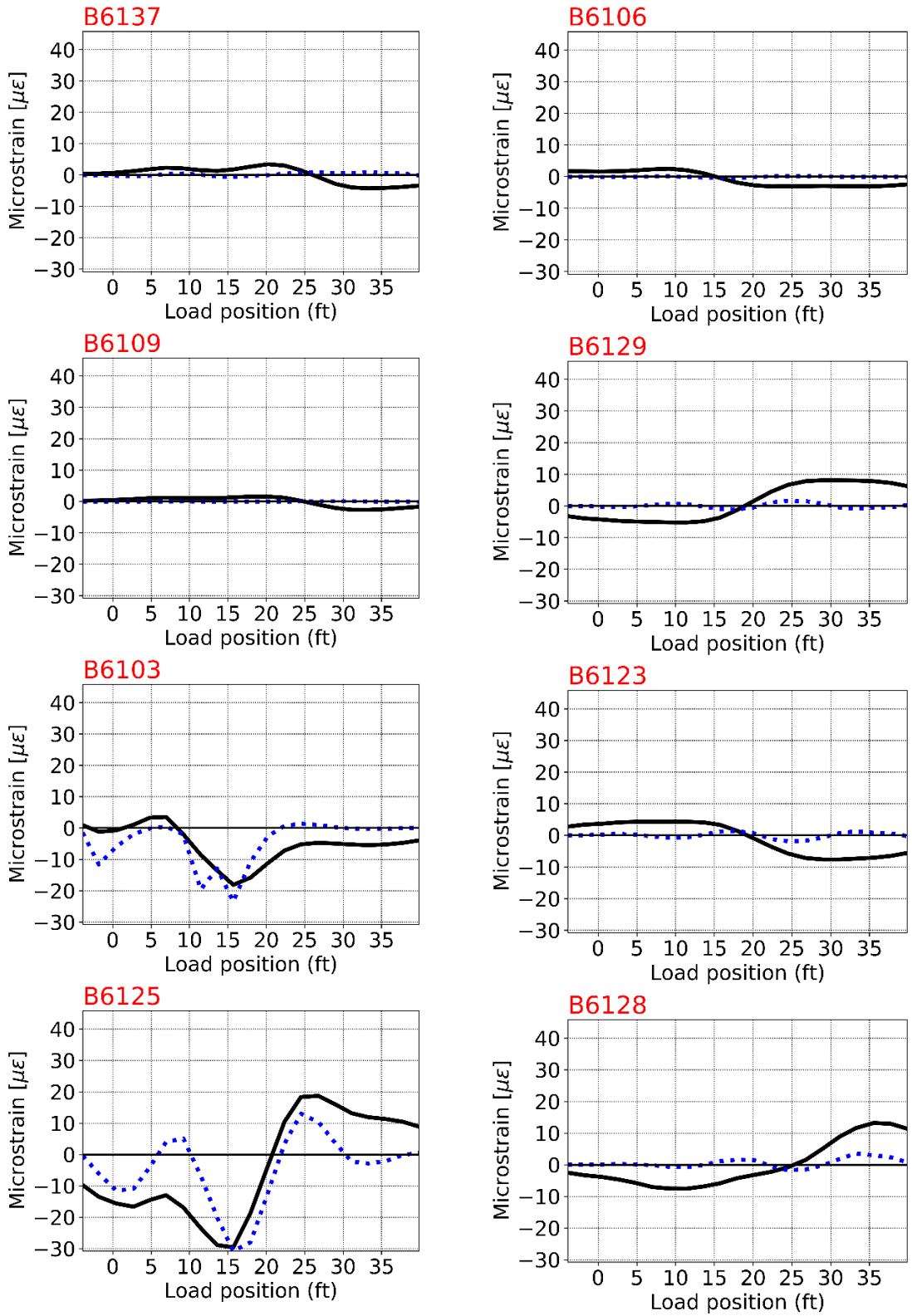


Figure B-52
Culvert #3 load path 3 calibration plots for strain sensors

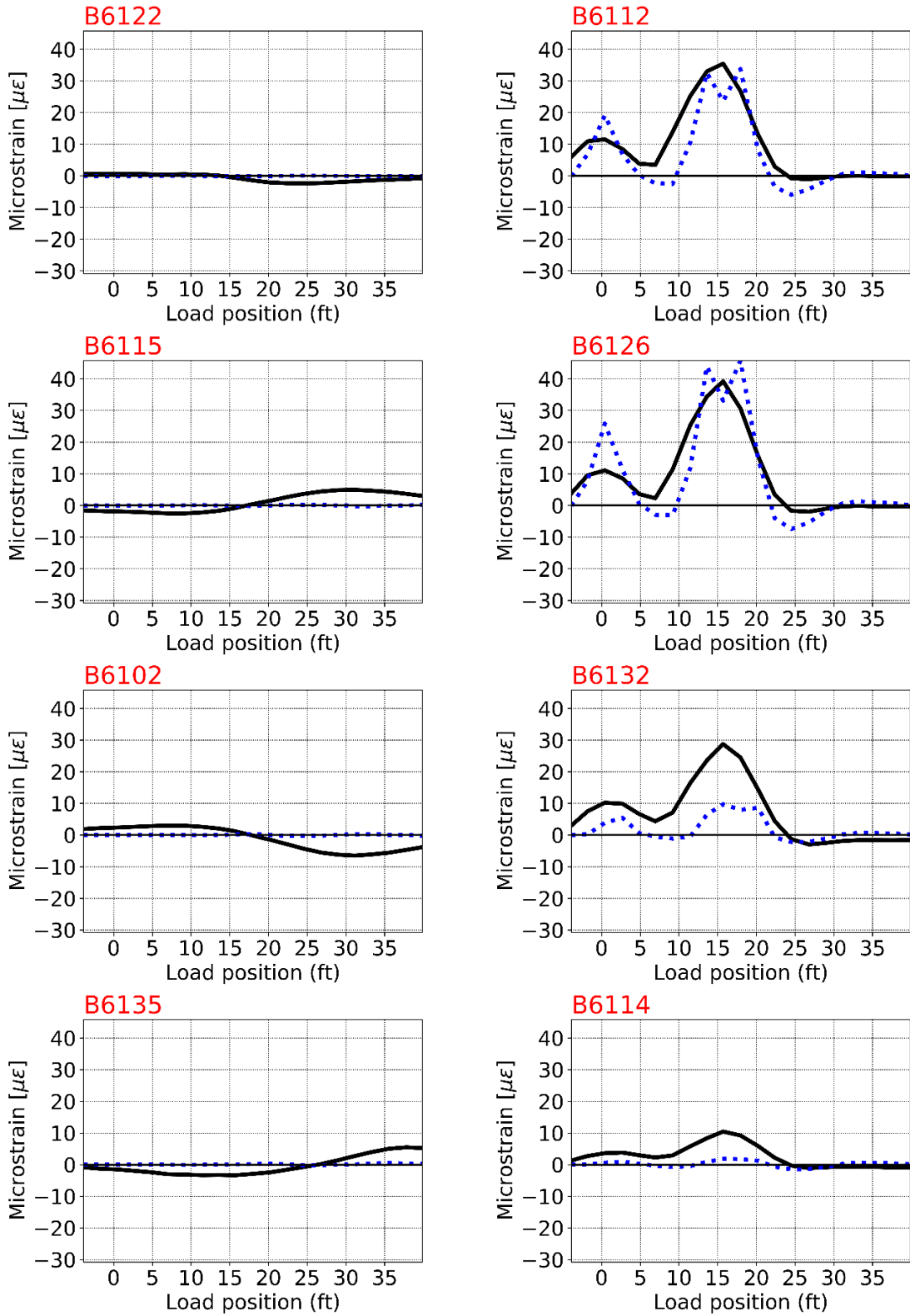


Figure B-53
Culvert #3 load path 3 calibration plots for strain sensors

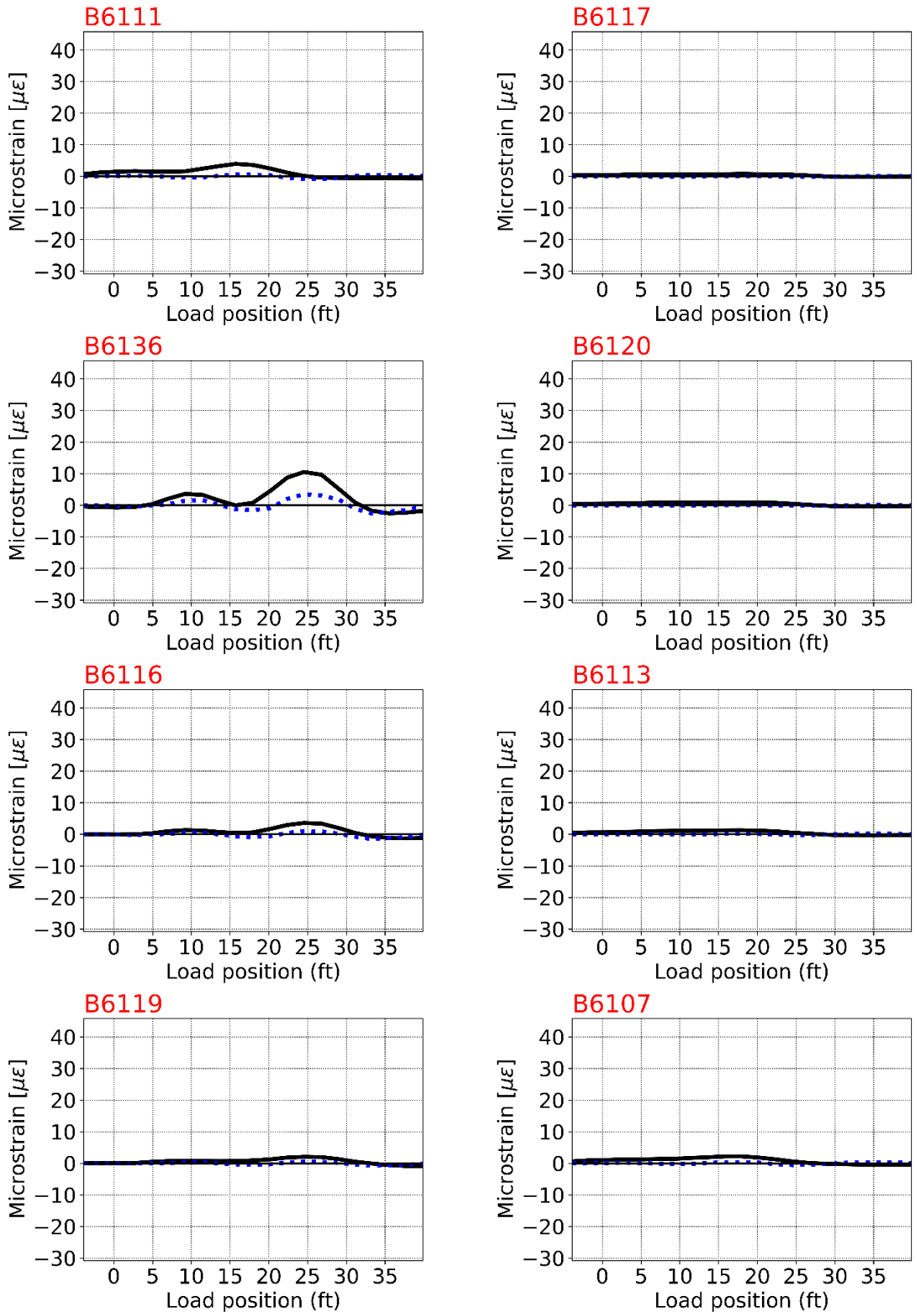


Figure B-54
Culvert #3 load path 3 calibration plots for strain sensors

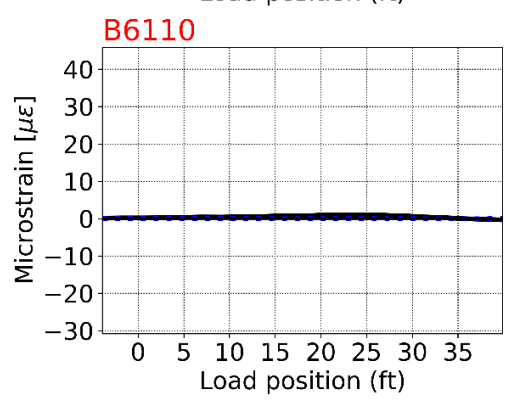
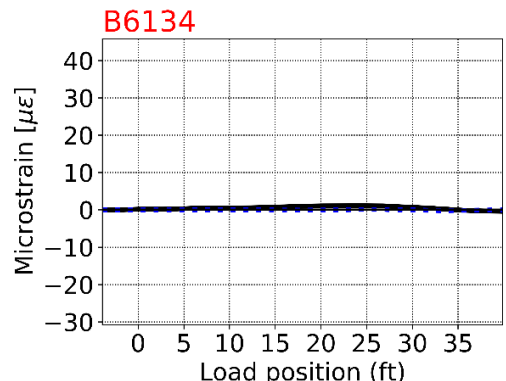
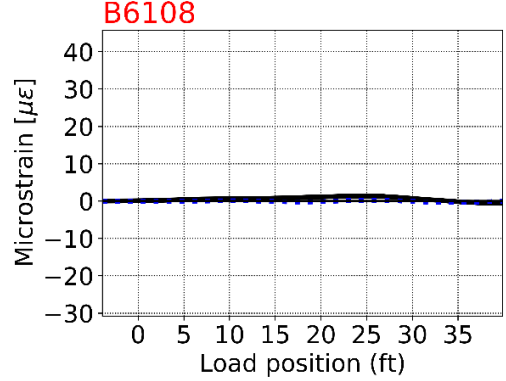
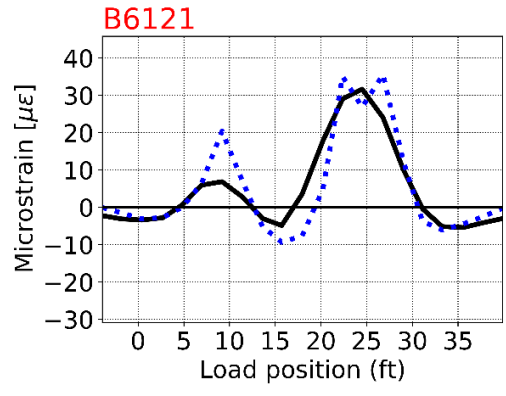


Figure B-55
Culvert #3 load path 3 calibration plots for strain sensors

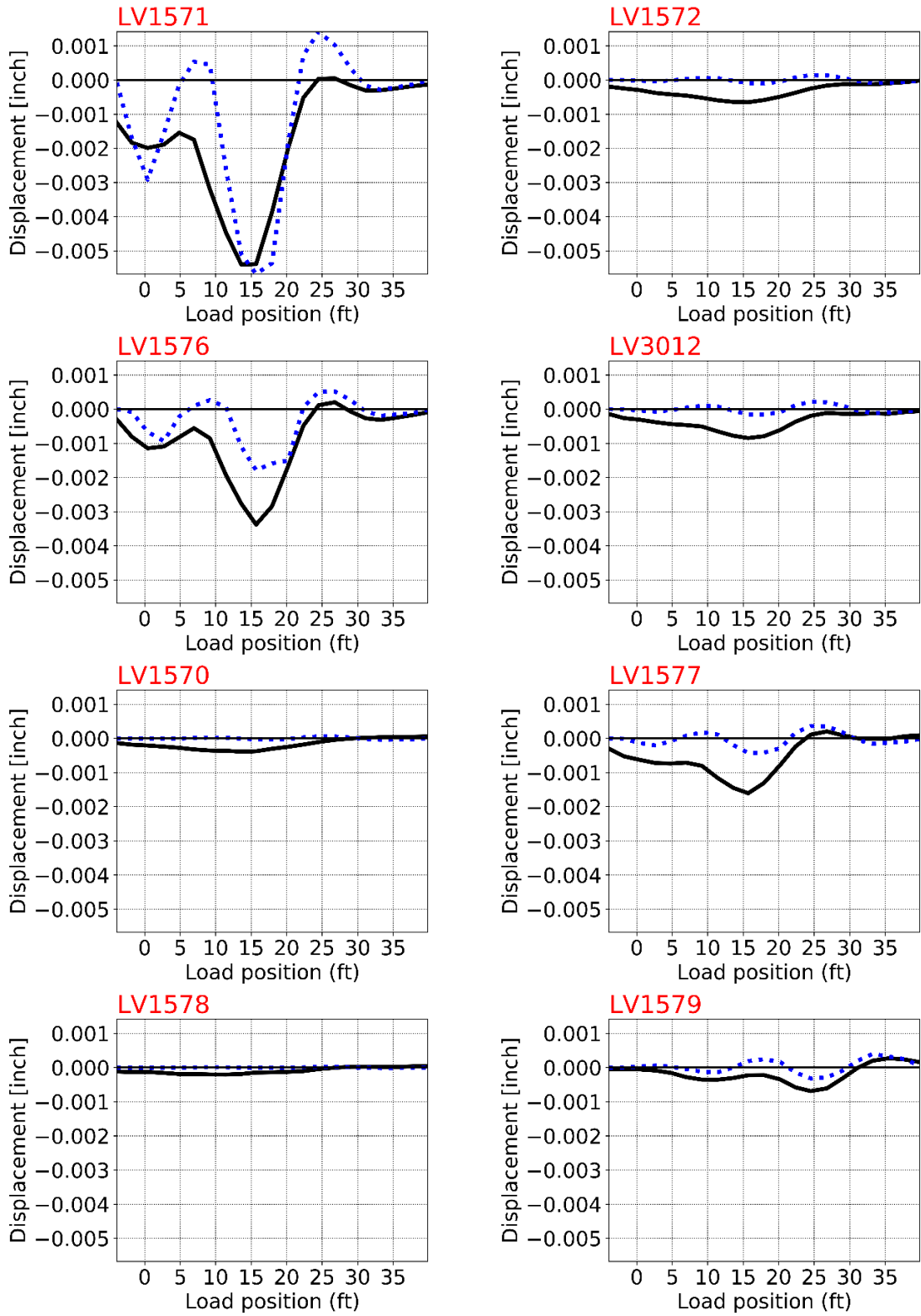


Figure B-56
Culvert #3 load path 3 calibration plots for LVDT sensors

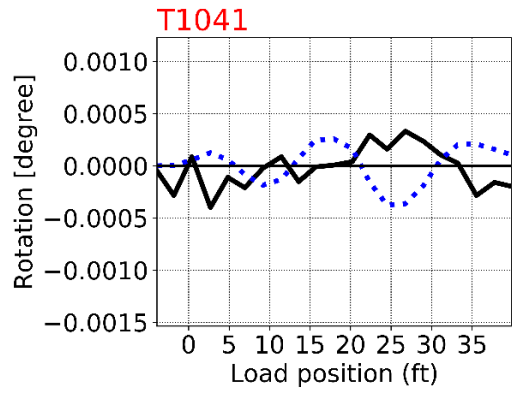
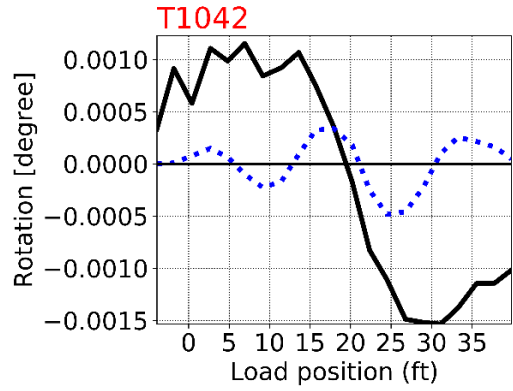
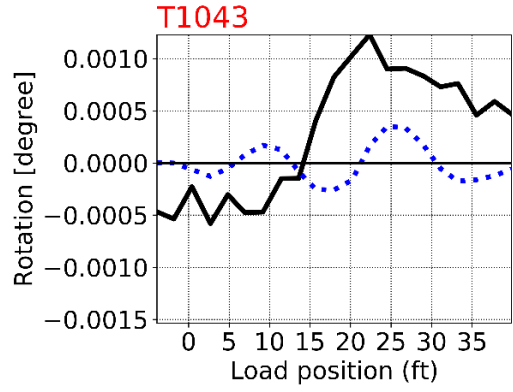
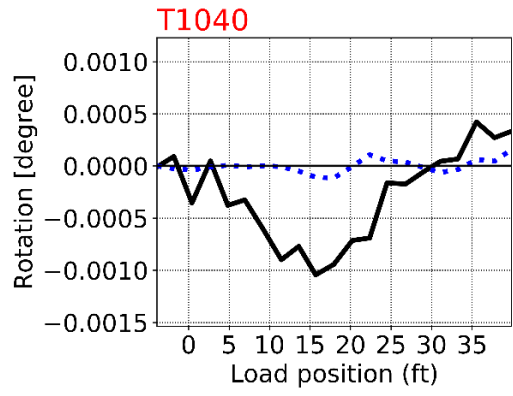


Figure B-57
Culvert #3 load path 3 calibration plots for tilt-meter sensors

Culvert #4

Load Path 1 Sensors

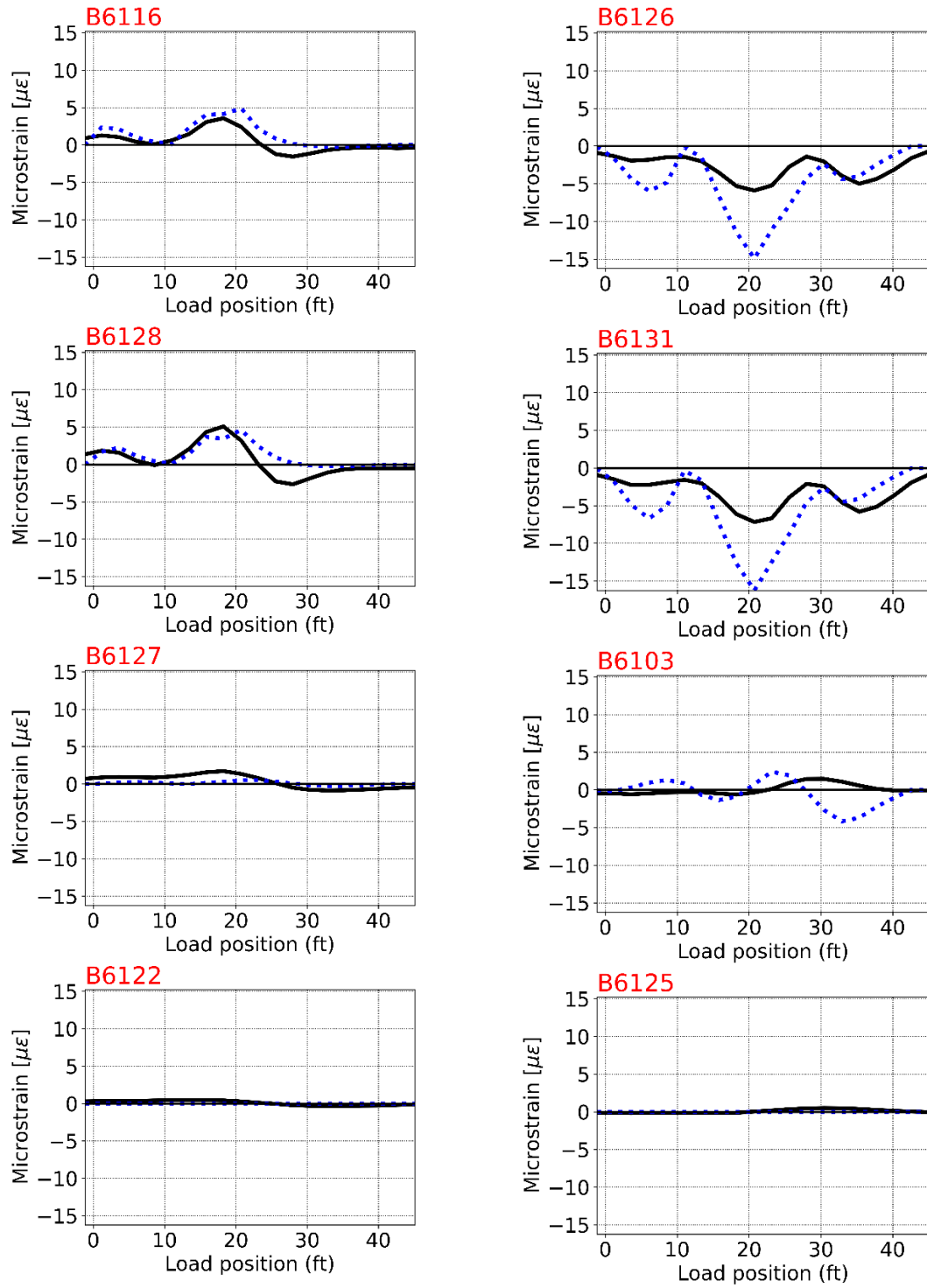


Figure B-58
Culvert #4 load path 1 calibration plots for strain sensors

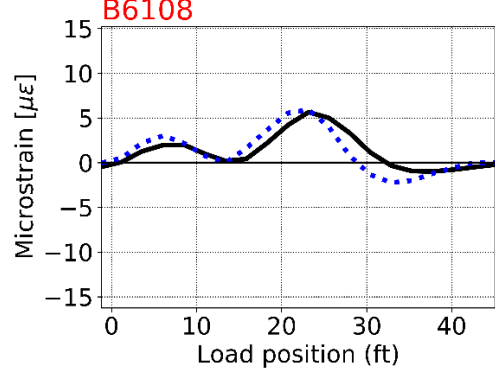
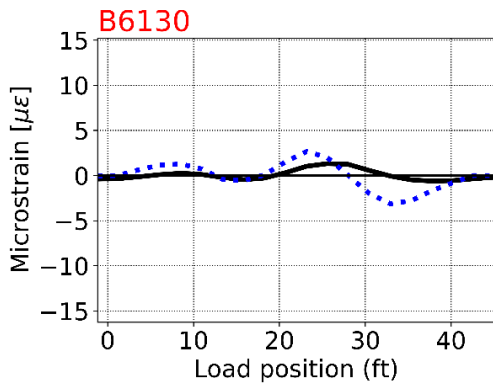
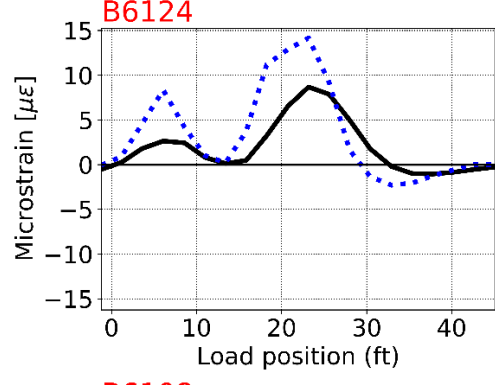
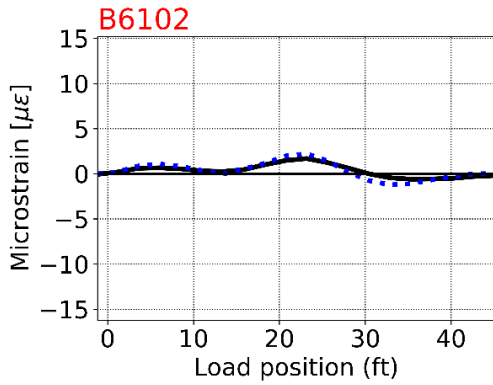
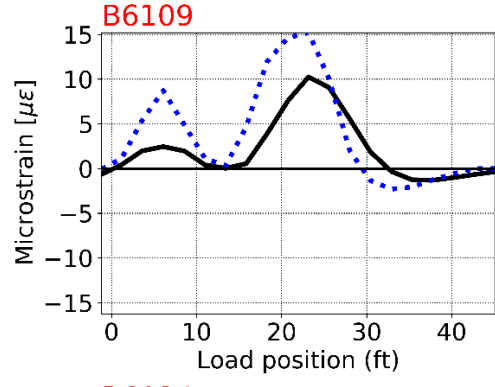
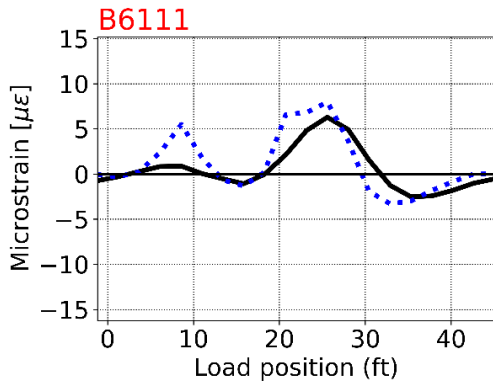
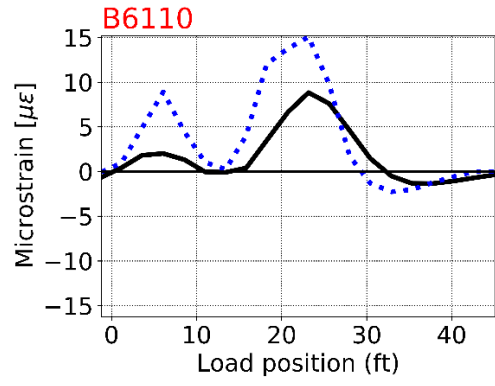
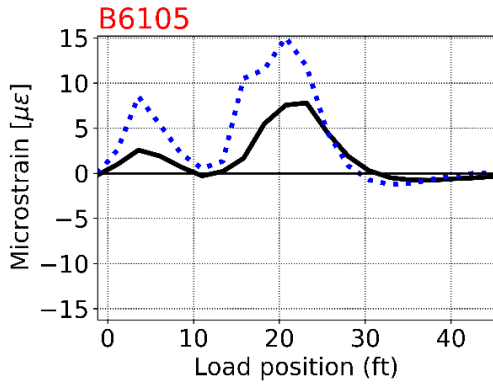


Figure B-59
Culvert #4 load path 1 calibration plots for strain sensors

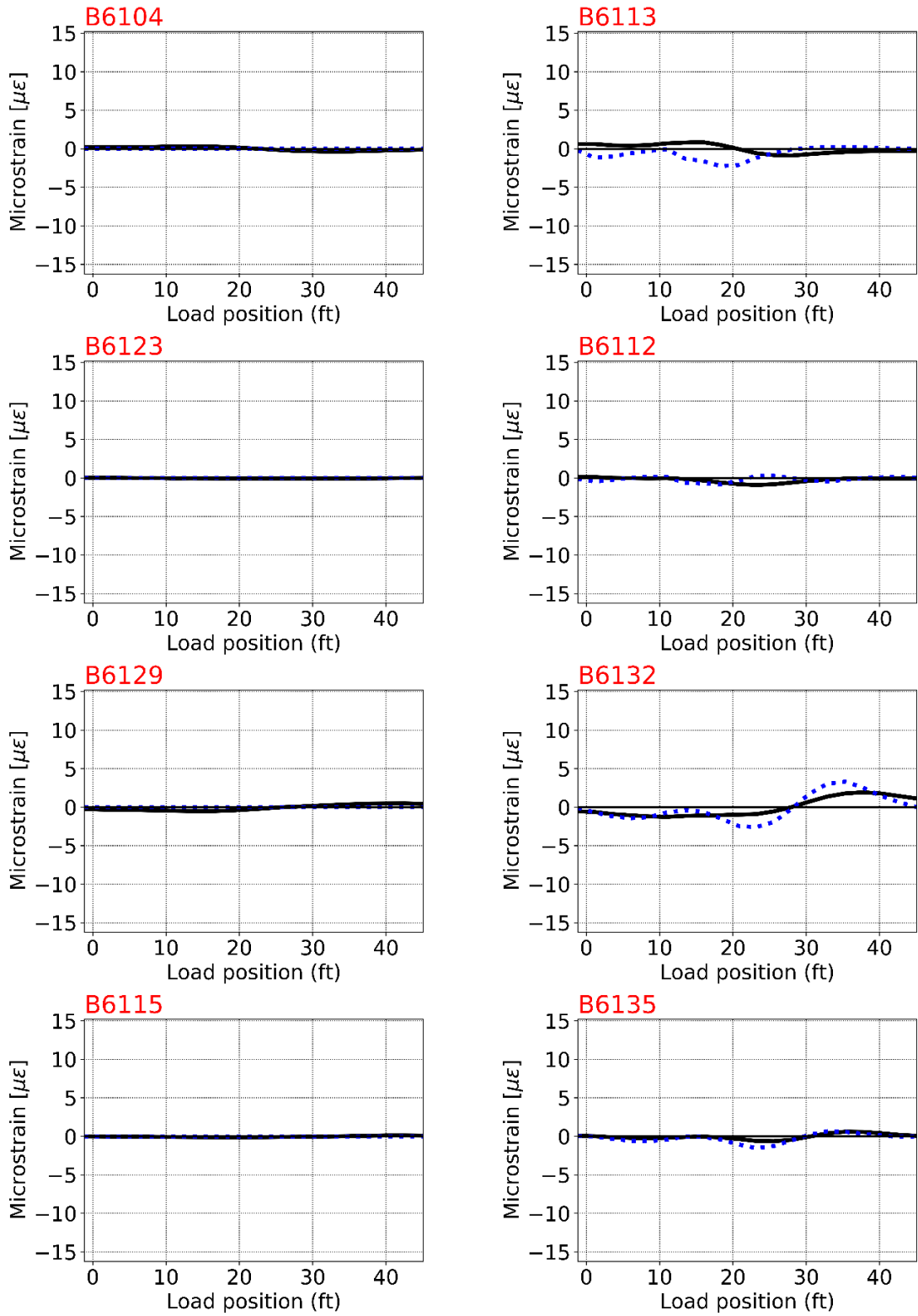


Figure B-60
Culvert #4 load path 1 calibration plots for strain sensors

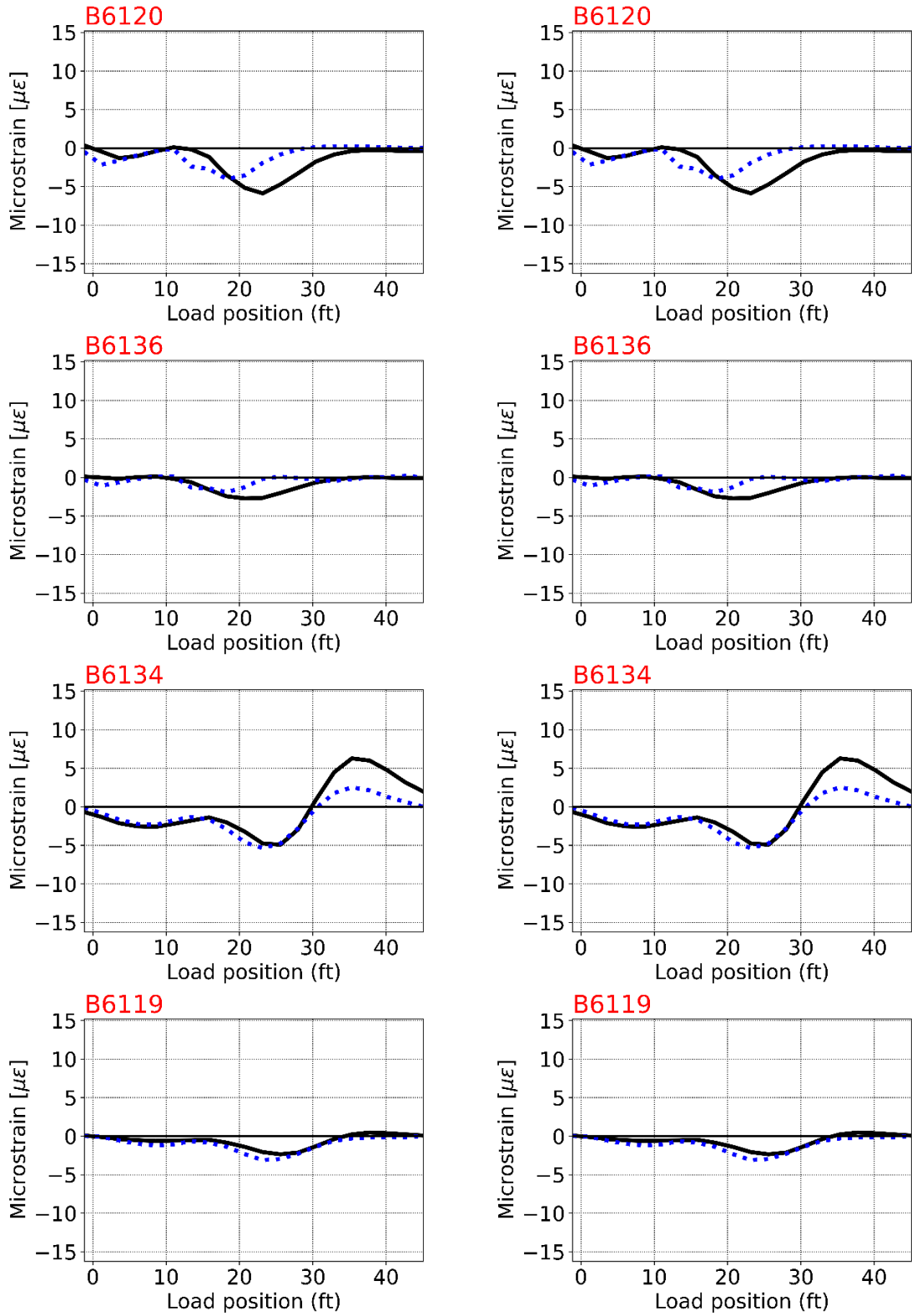


Figure B-61
Culvert #4 load path 1 calibration plots for strain sensors

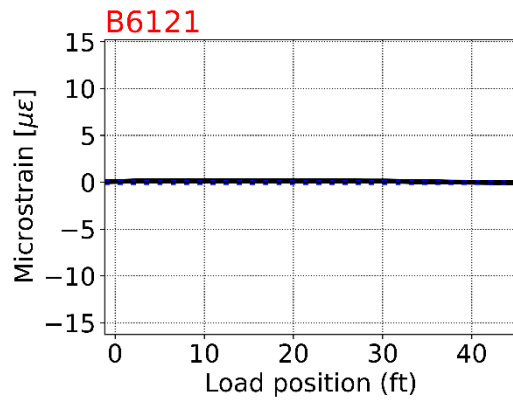
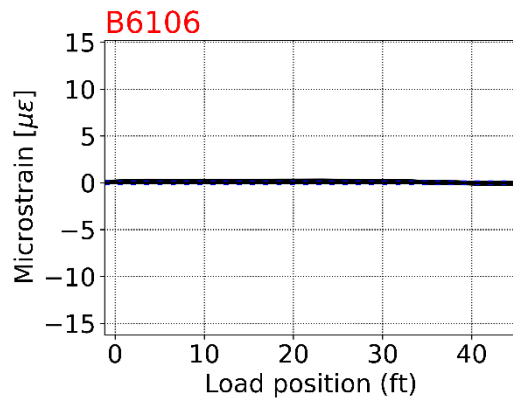
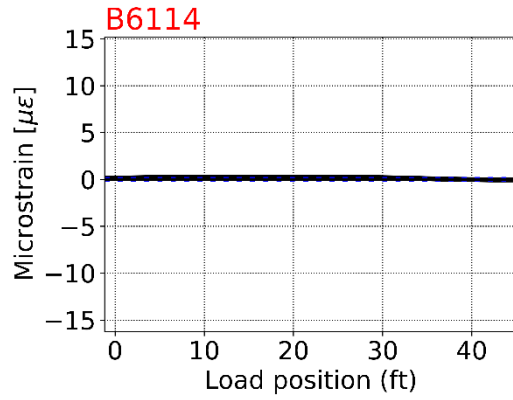


Figure B-62
Culvert #4 load path 1 calibration plots for strain sensors

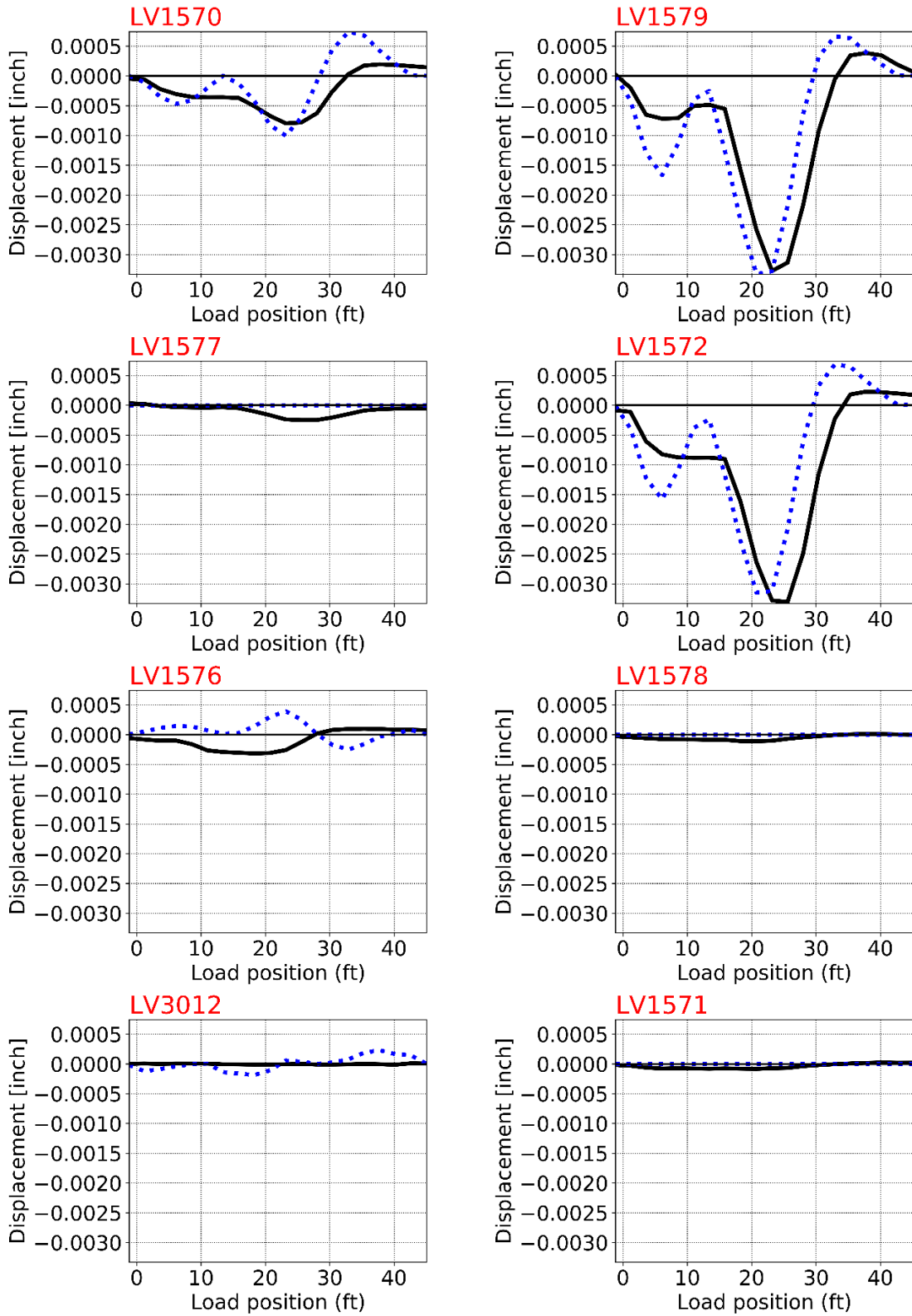


Figure B-63
Culvert #4 load path 1 calibration plots for LVDT sensors

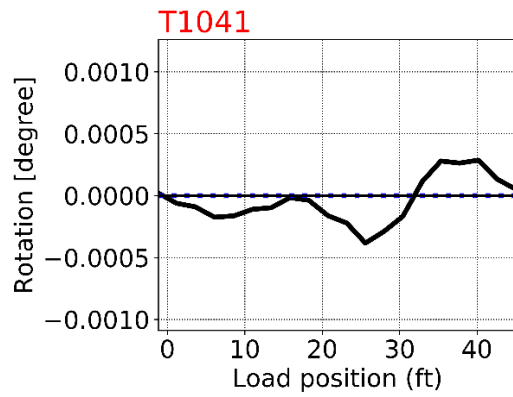
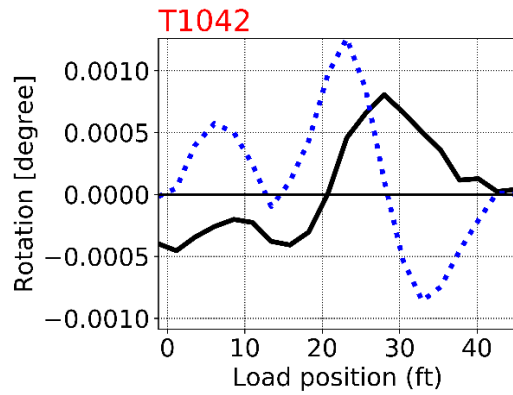
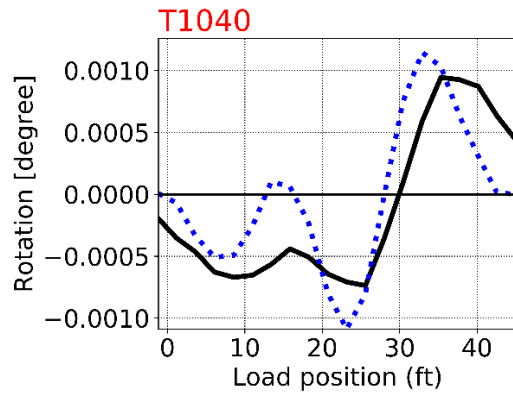
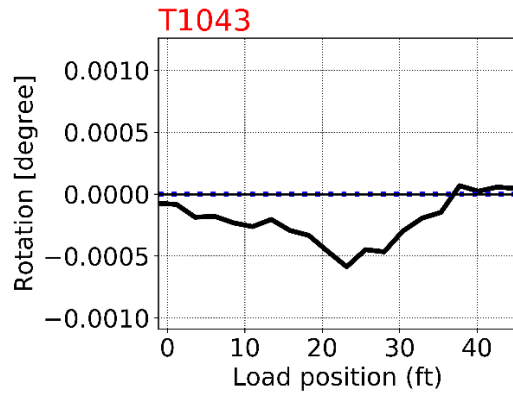


Figure B-64
Culvert #4 load path 1 calibration plots for tilt-meter sensors

Load Path 2 Sensors

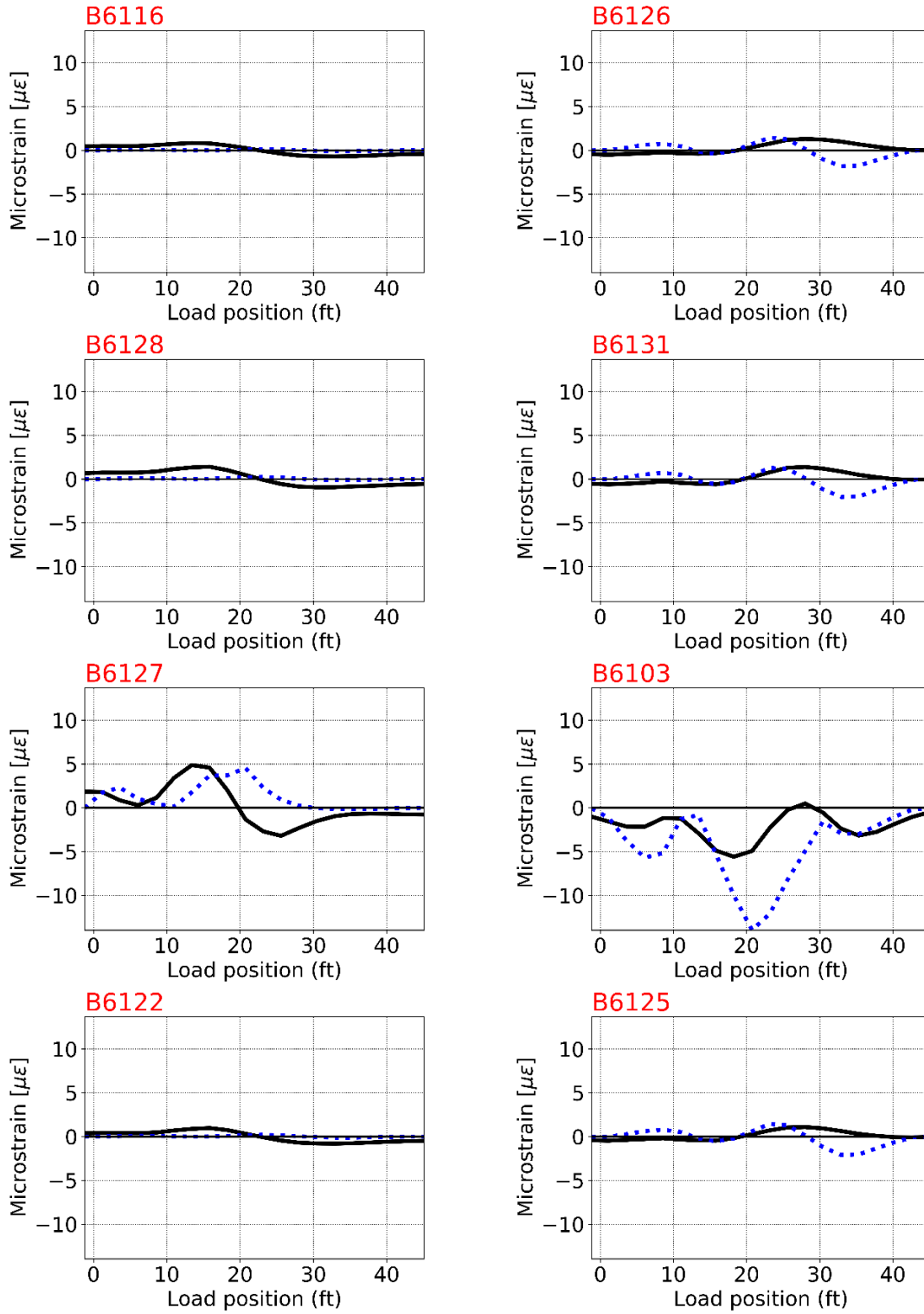


Figure B-65
Culvert #4 load path 2 calibration plots for strain sensors

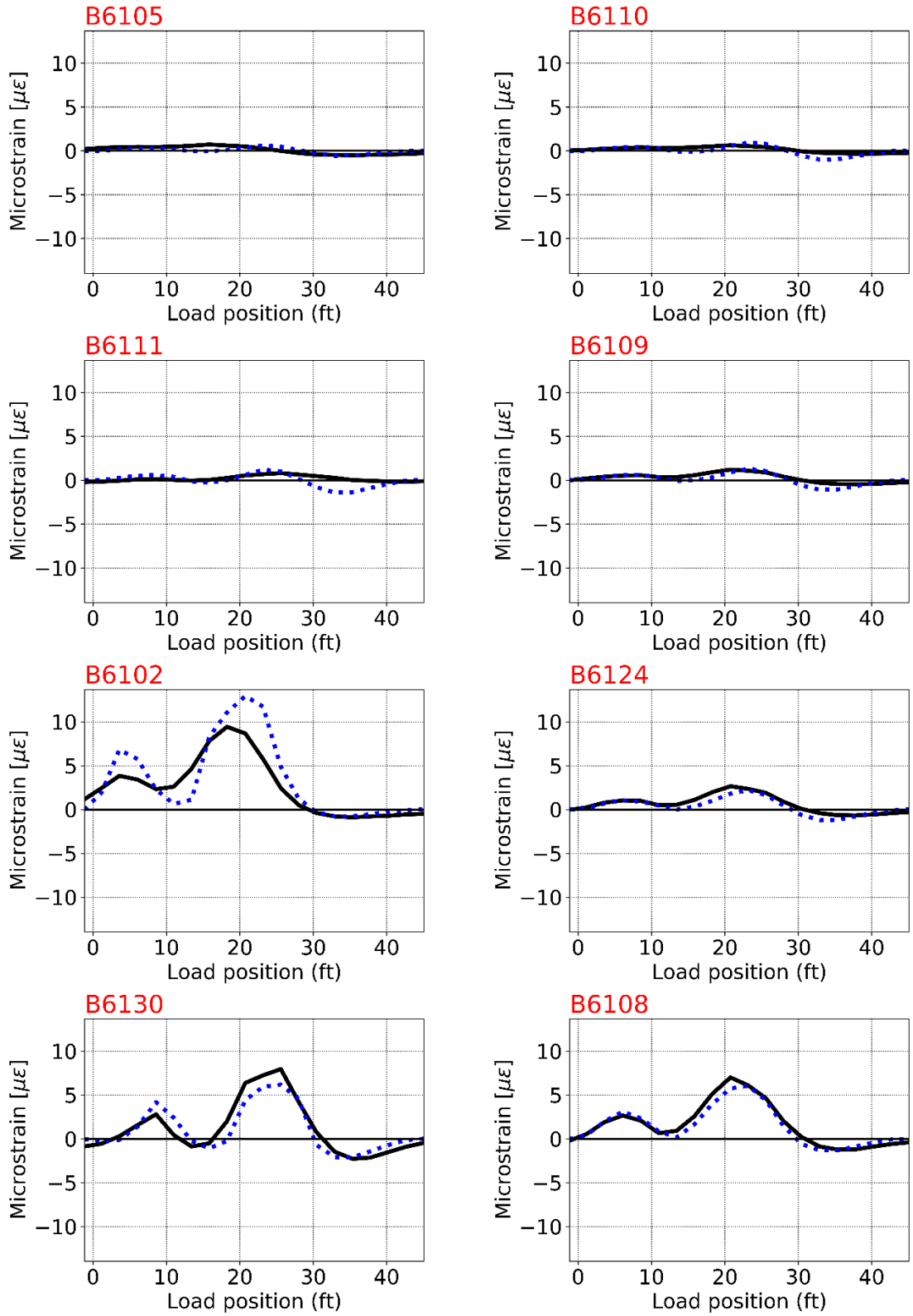


Figure B-66
Culvert #4 load path 2 calibration plots for strain sensors

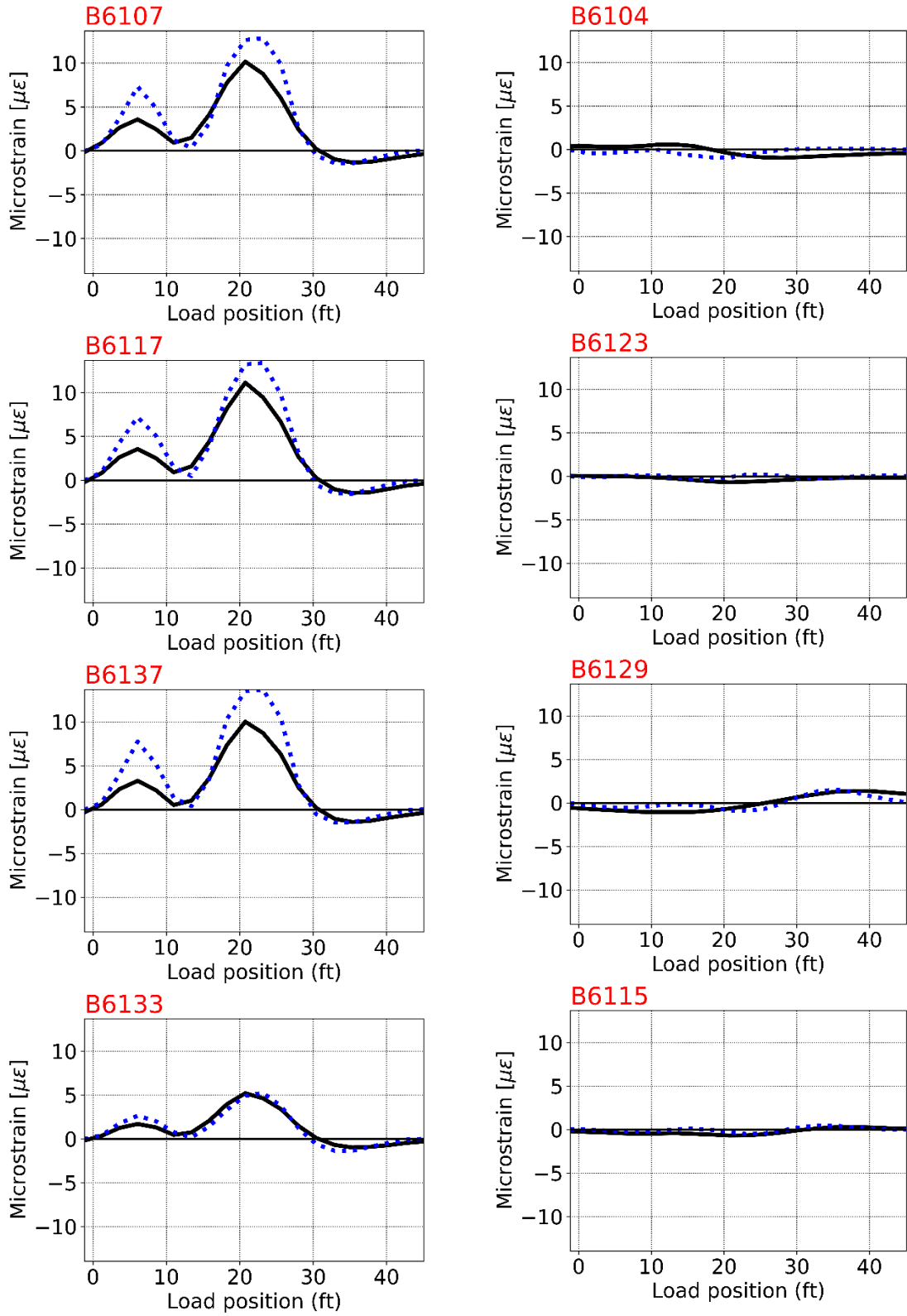


Figure B-67
Culvert #4 load path 2 calibration plots for strain sensors

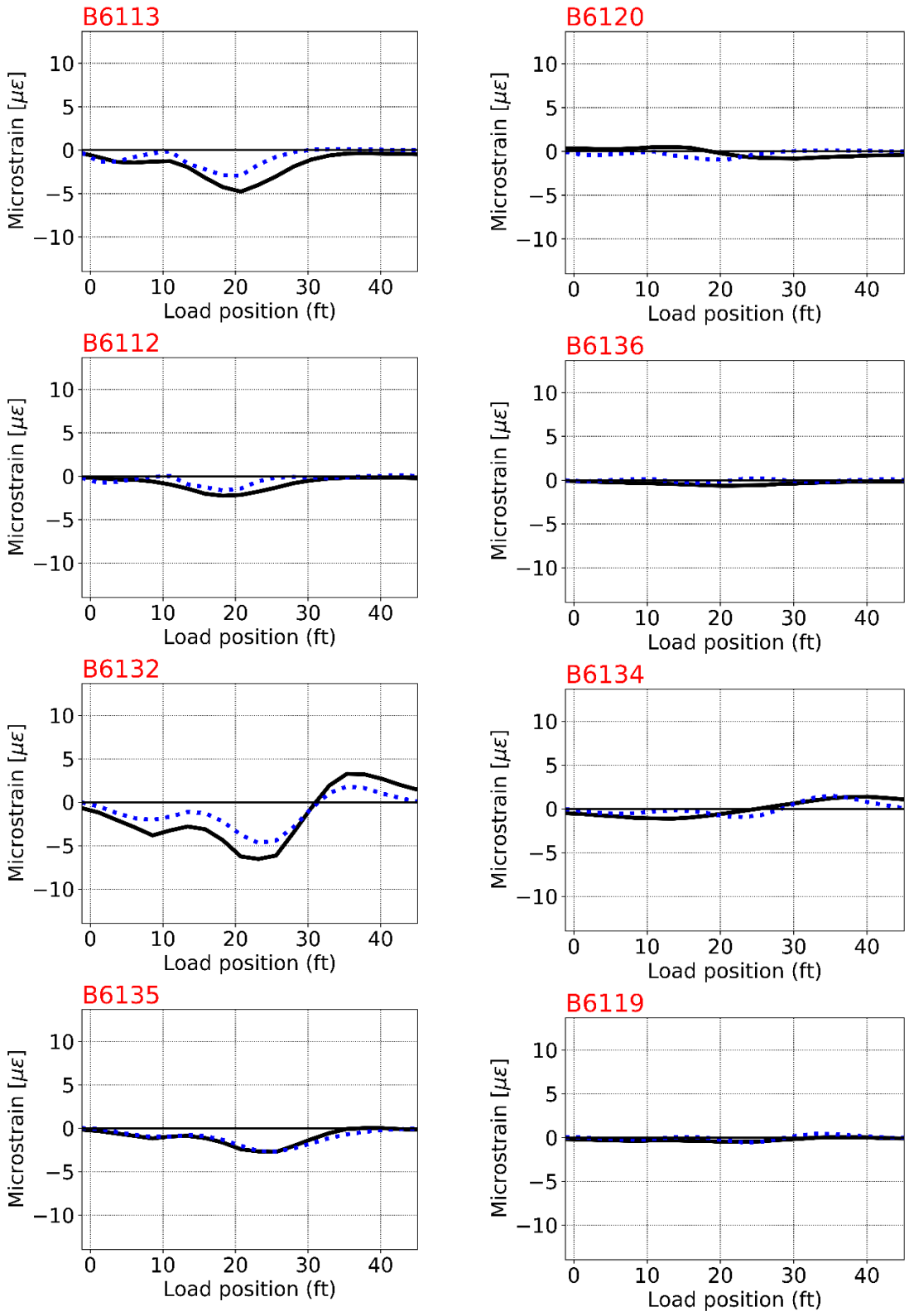


Figure B-68
Culvert #4 load path 2 calibration plots for strain sensors

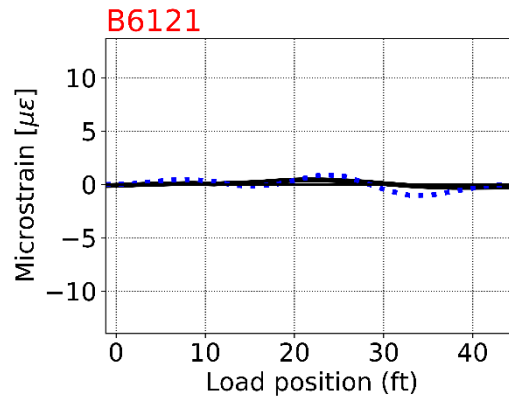
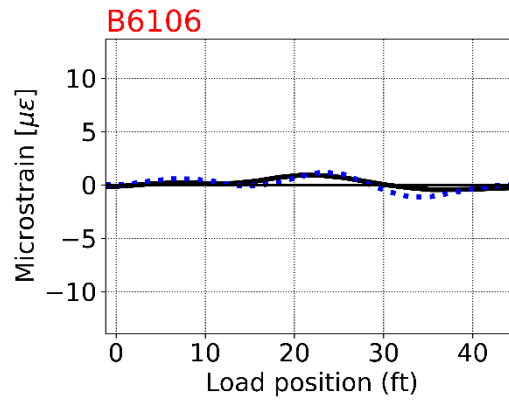
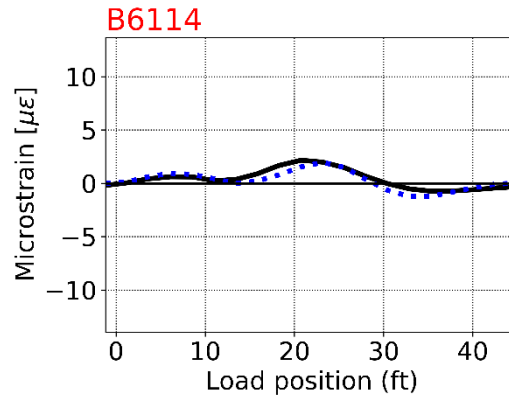


Figure B-69
Culvert #4 load path 2 calibration plots for strain sensors

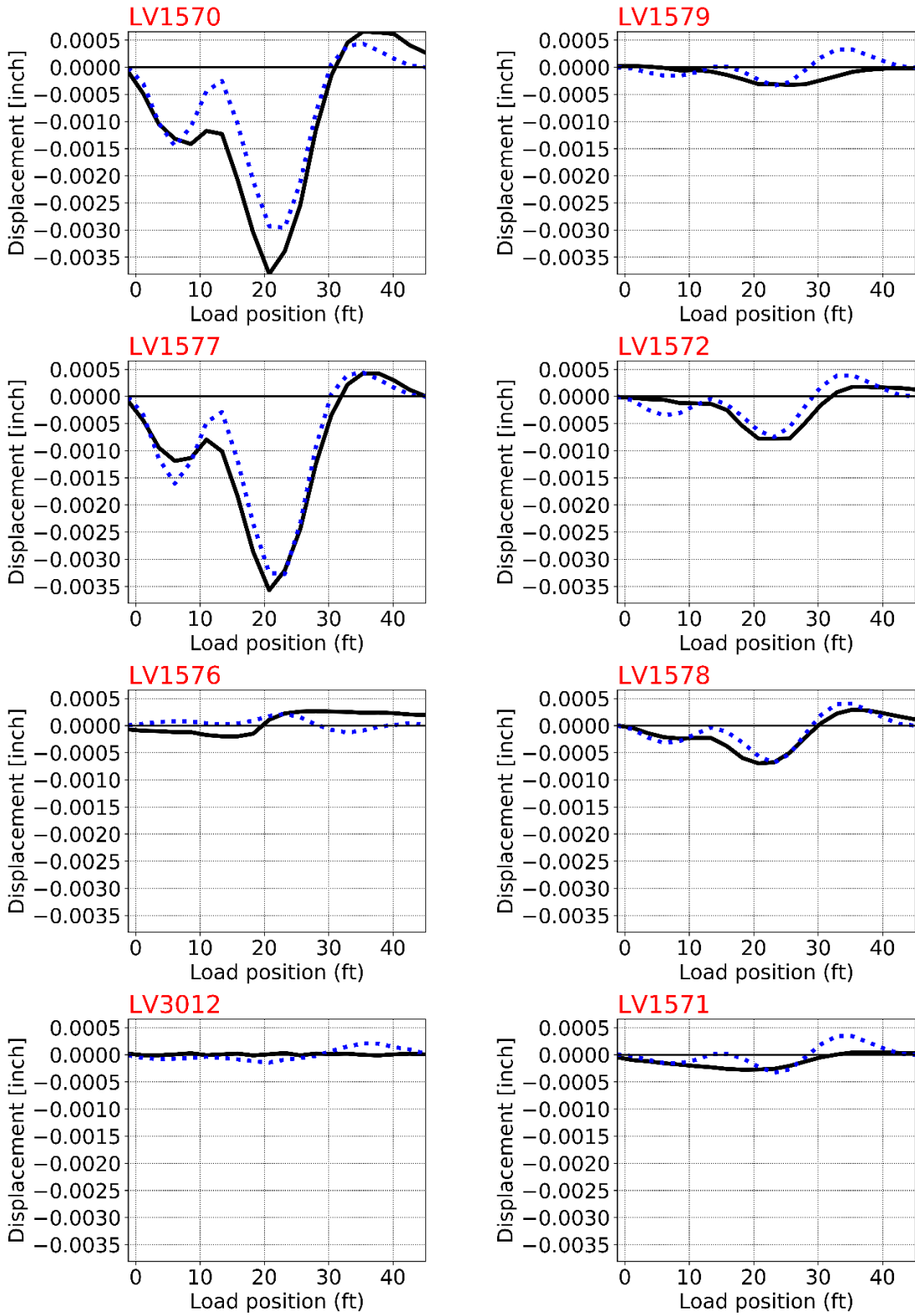


Figure B-70
Culvert #4 load path 2 calibration plots for LVDT sensors

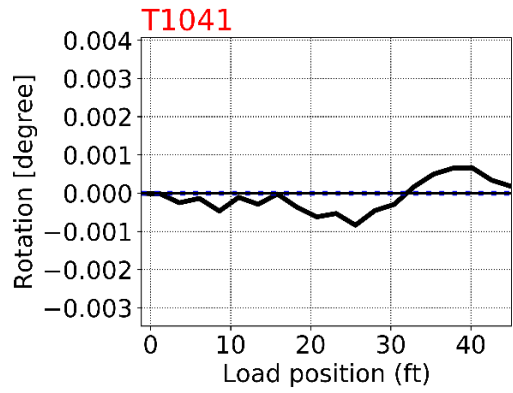
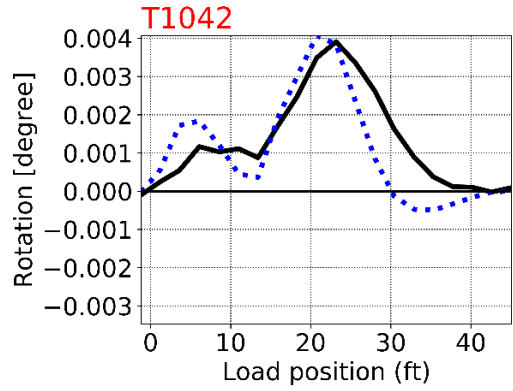
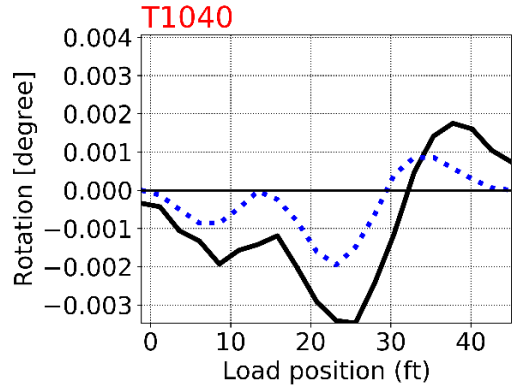
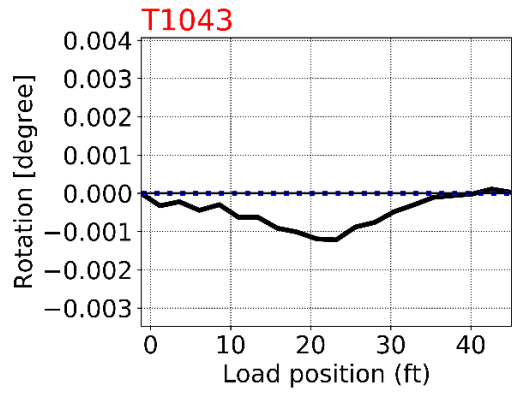


Figure B-71
Culvert #4 load path 2 calibration plots for tilt-meter sensors

Load Path 3 Sensors

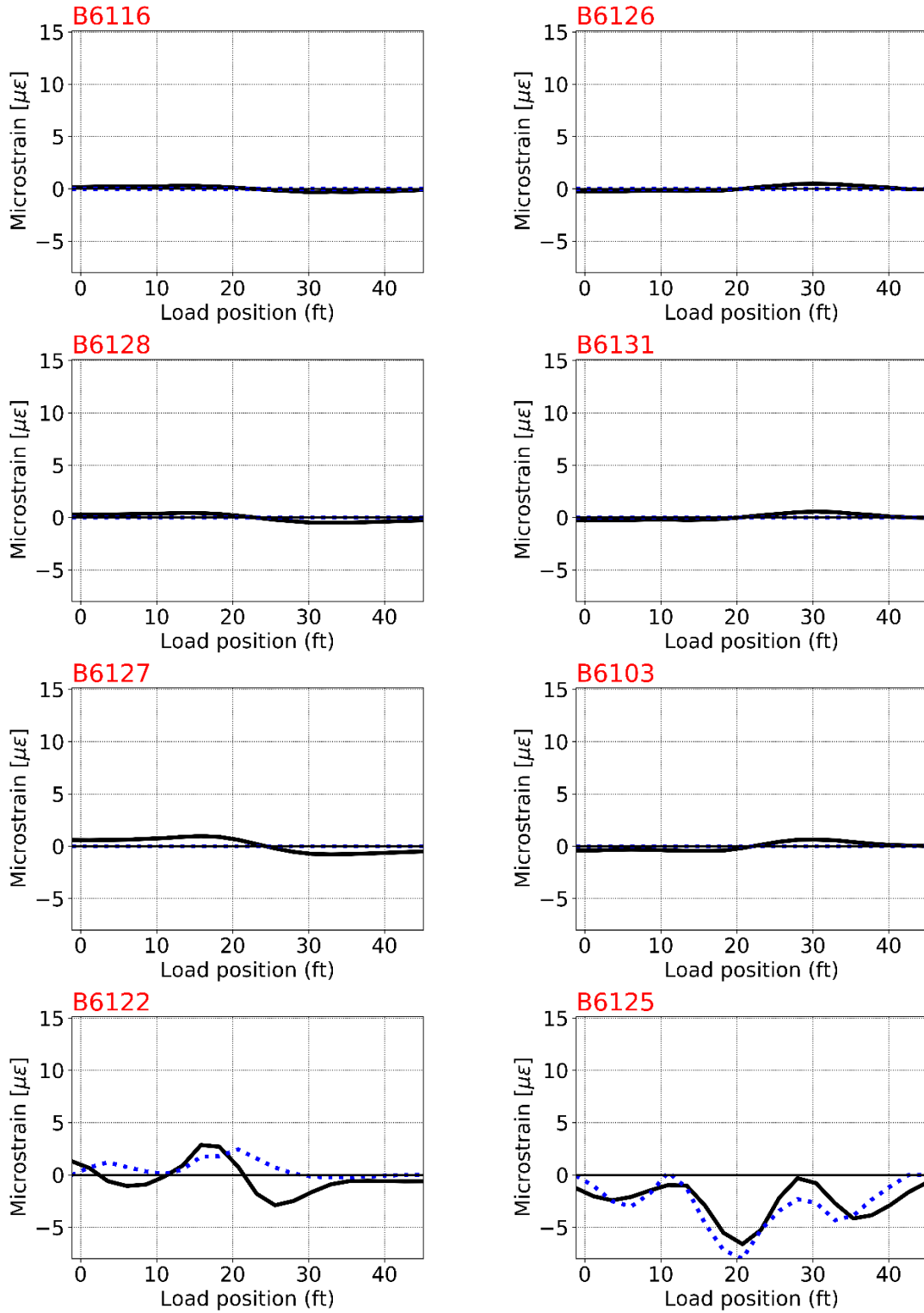


Figure B-72
Culvert #4 load path 3 calibration plots for strain sensors

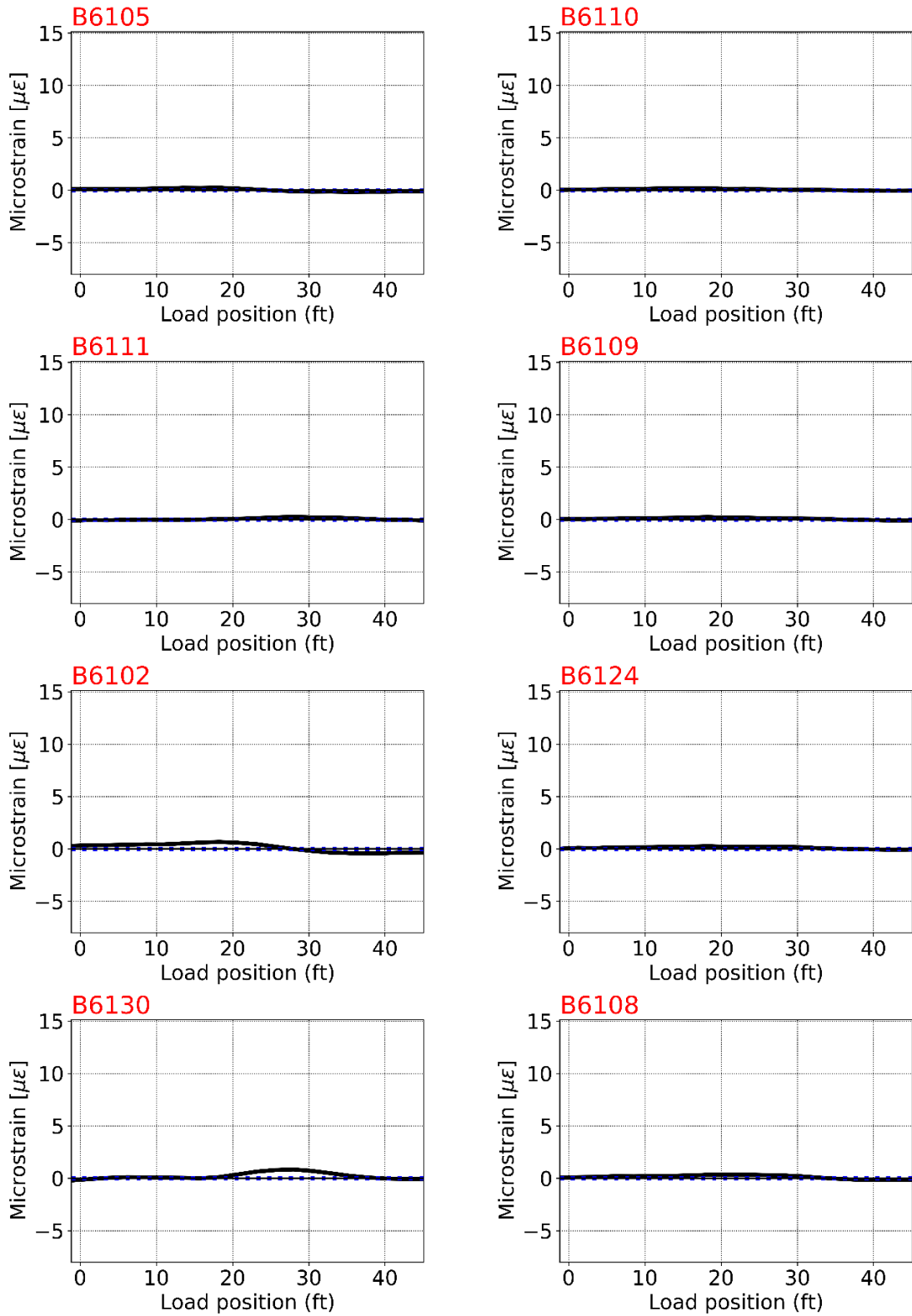


Figure B-73
Culvert #4 load path 3 calibration plots for strain sensors

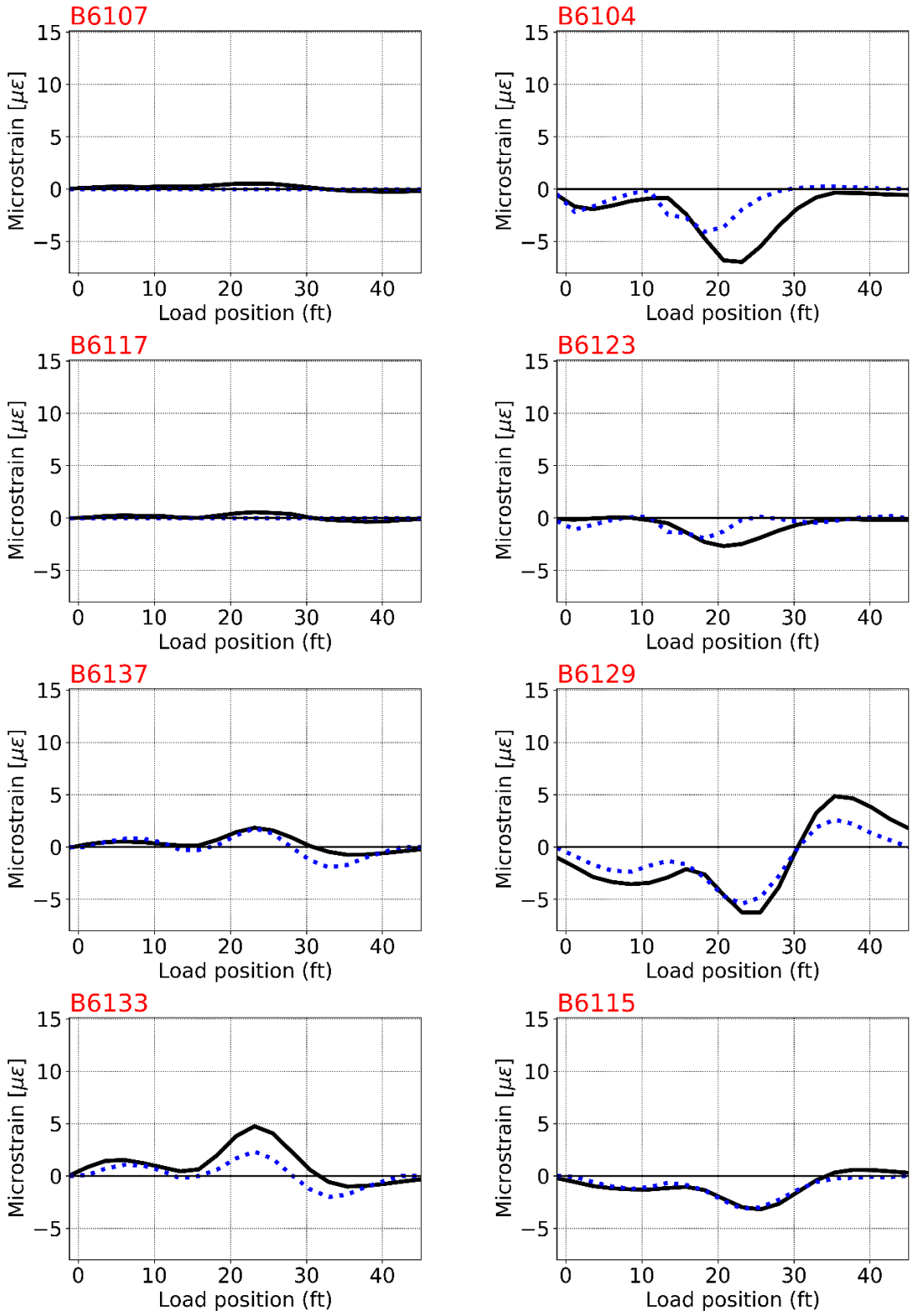


Figure B-74
Culvert #4 load path 3 calibration plots for strain sensors

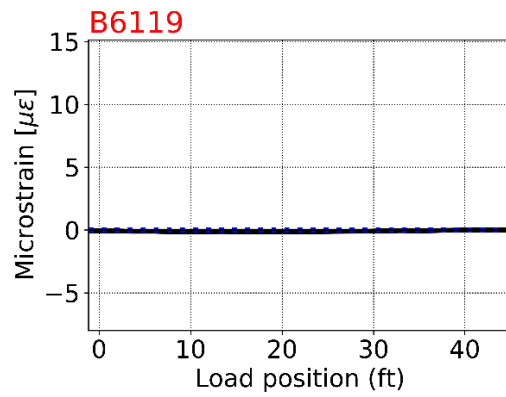
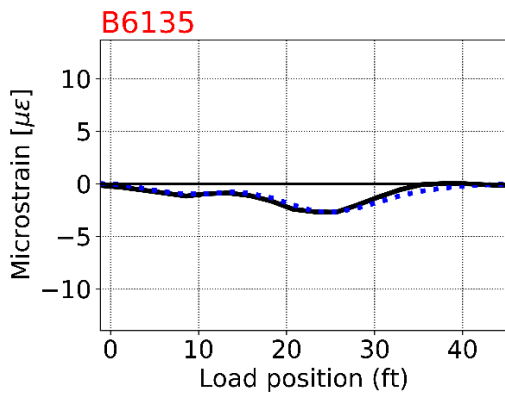
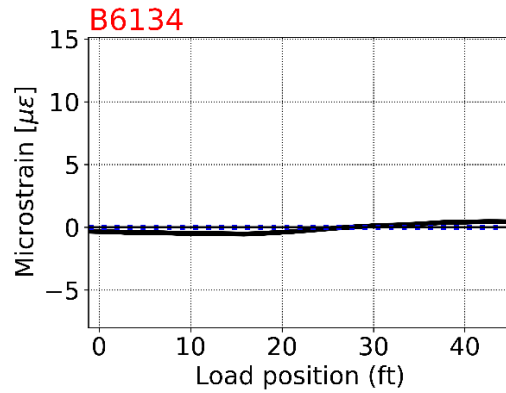
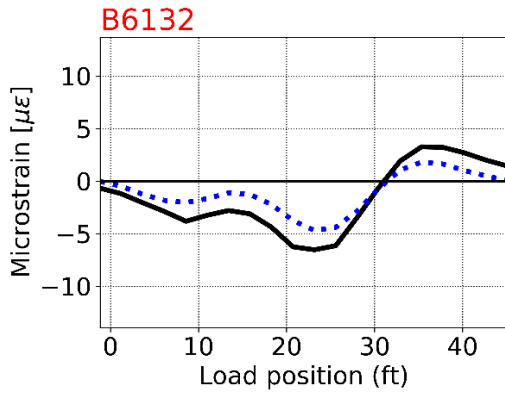
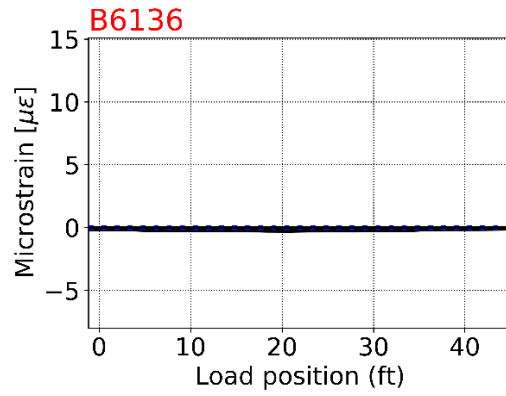
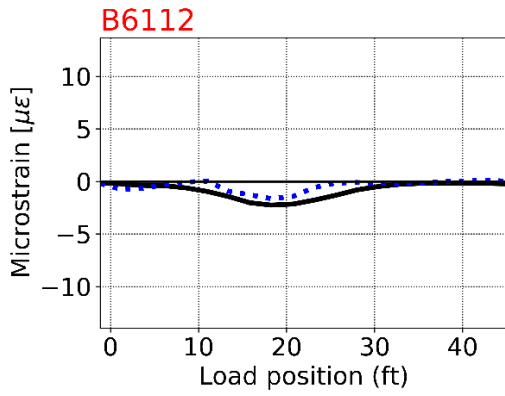
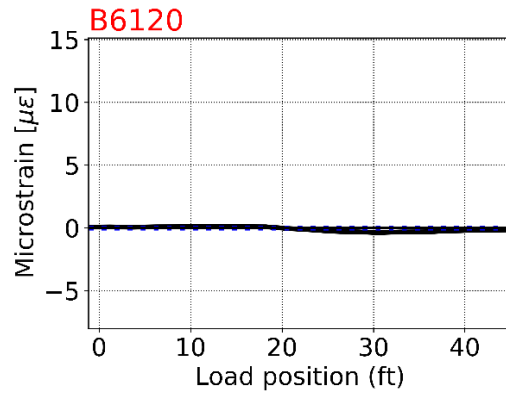
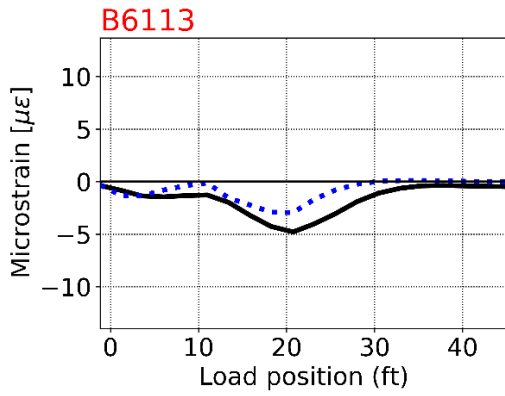


Figure B-75
Culvert #4 load path 3 calibration plots for strain sensors

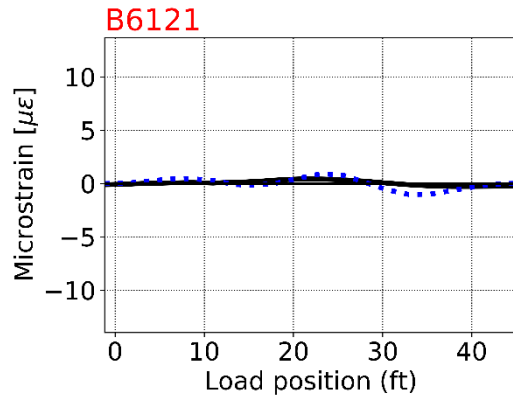
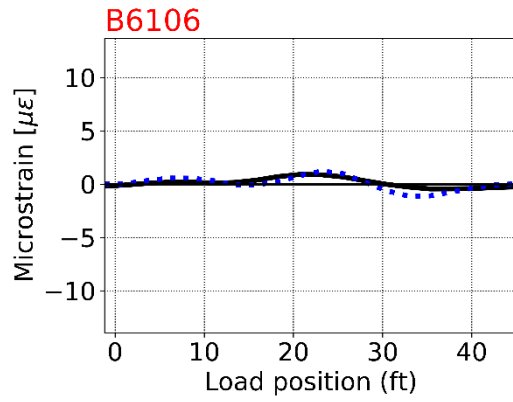
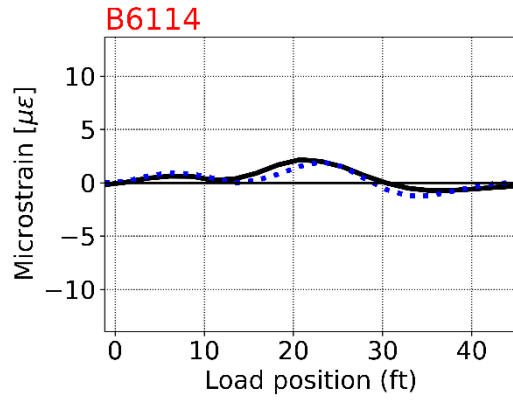


Figure B-76
Culvert #4 load path 3 calibration plots for strain sensors

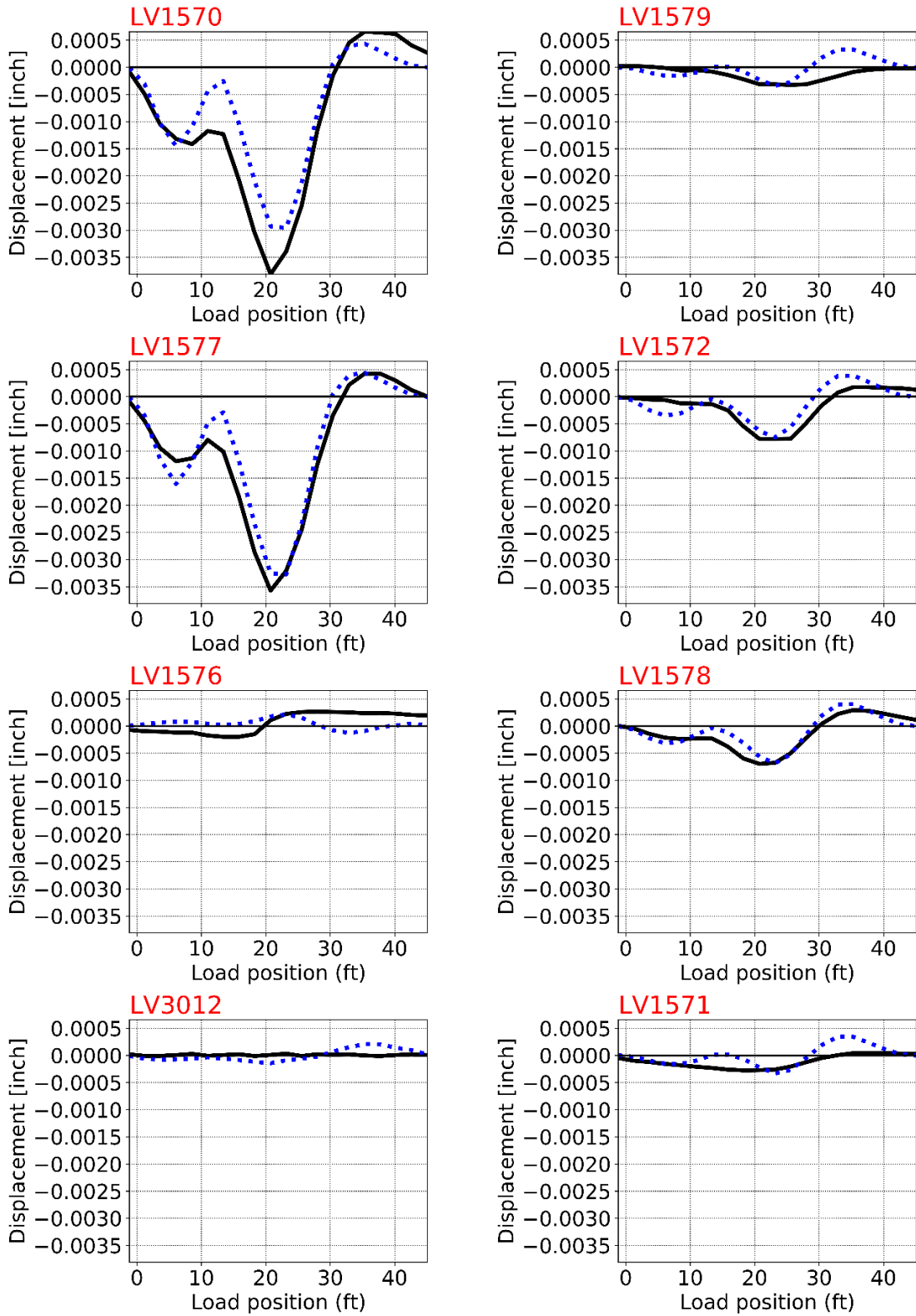


Figure B-77
Culvert #4 load path 3 calibration plots for LVDT sensors

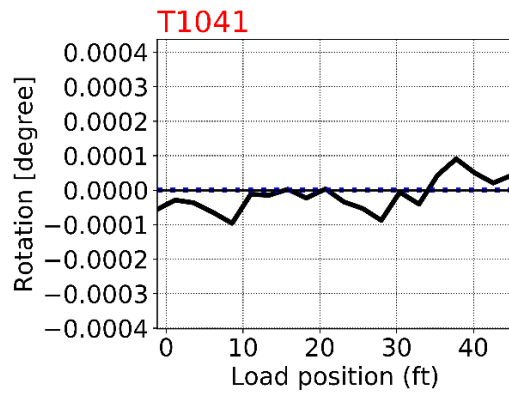
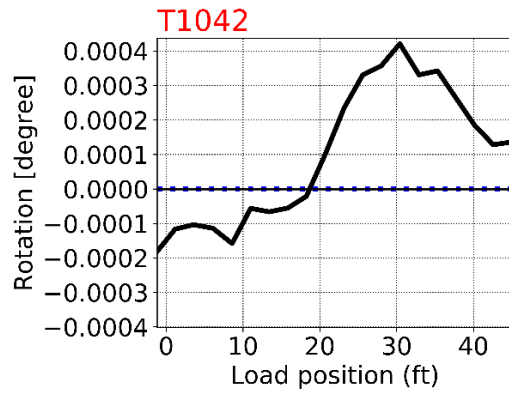
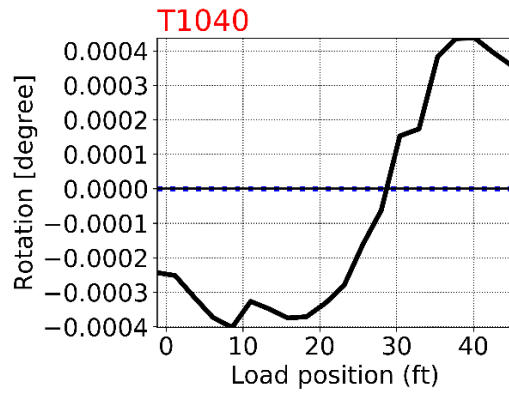
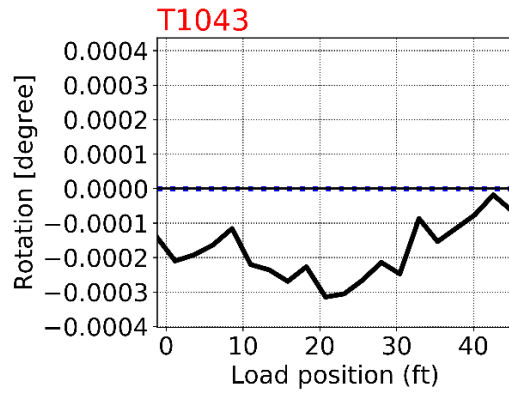


Figure B-78
Culvert #4 load path 3 calibration plots for tilt-meter sensors

Culvert #5

Load Path 1 Sensors

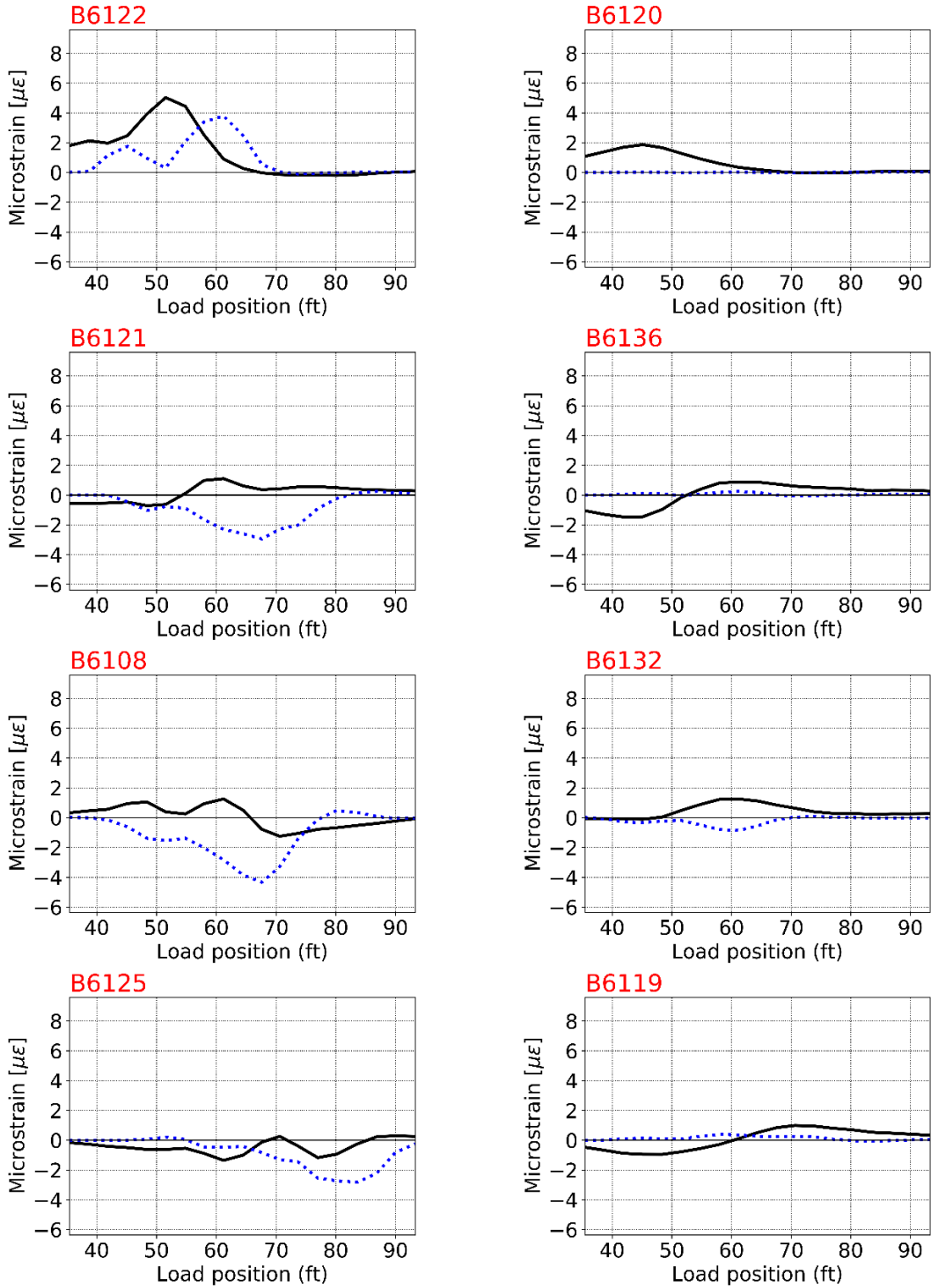


Figure B-79
Culvert #5 load path 1 calibration plots for strain sensors

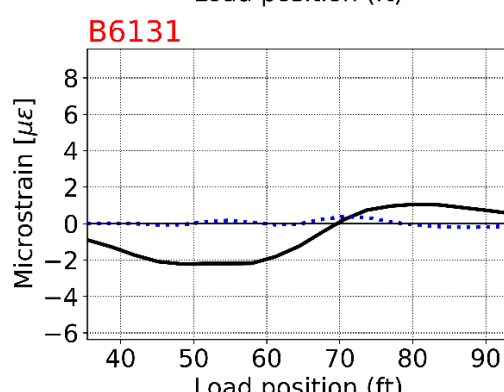
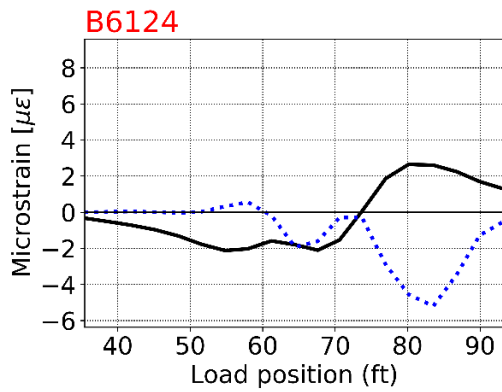
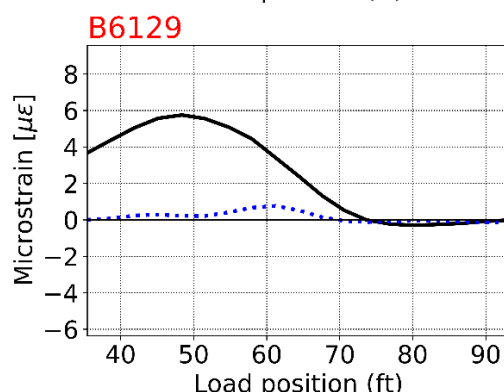
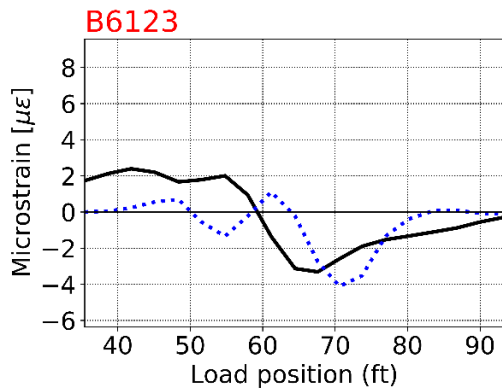
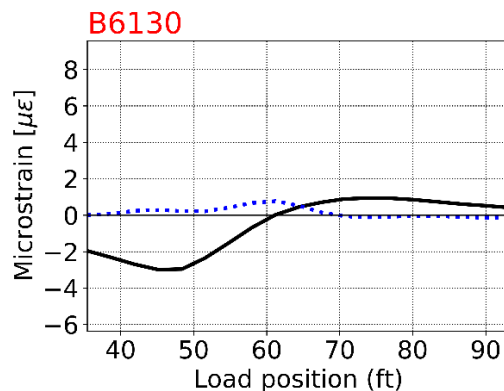
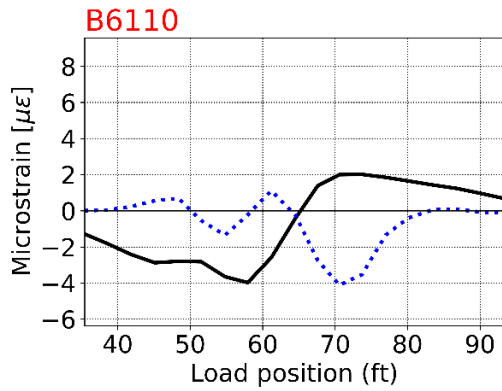
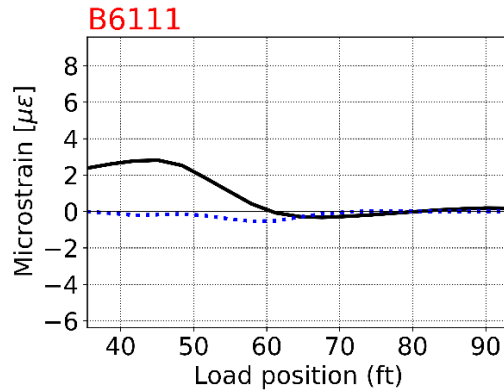
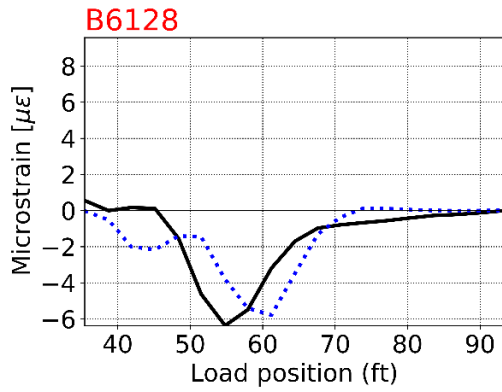


Figure B-80
Culvert #5 load path 1 calibration plots for strain sensors

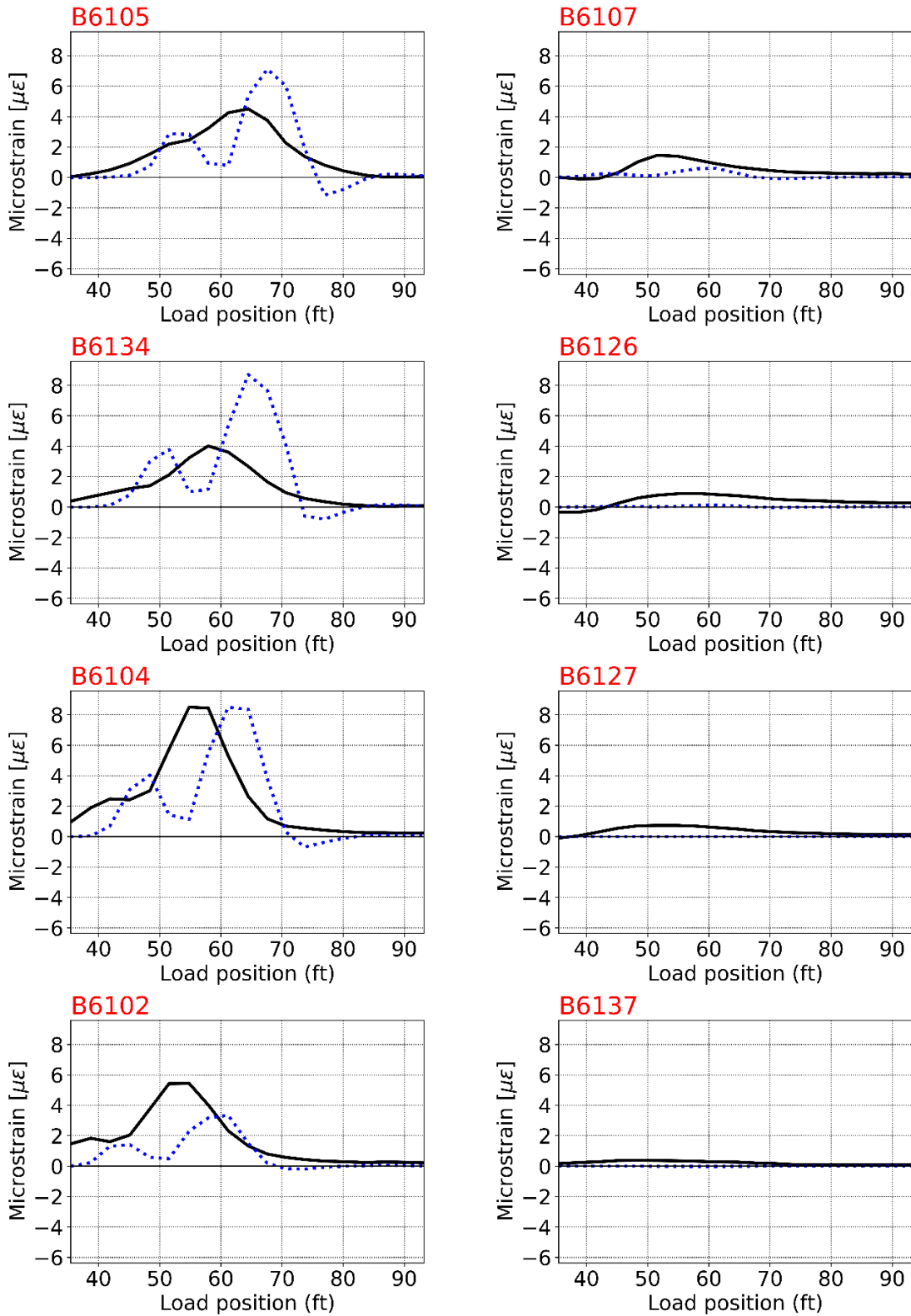


Figure B-81
Culvert #5 load path 1 calibration plots for strain sensors

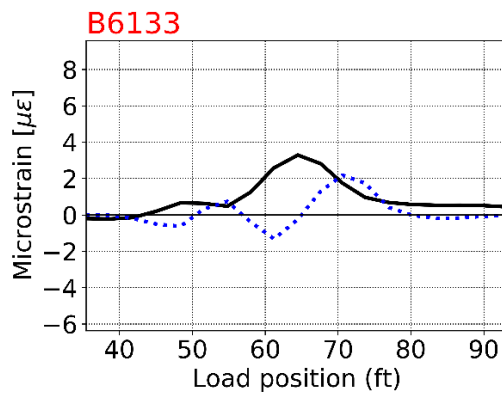
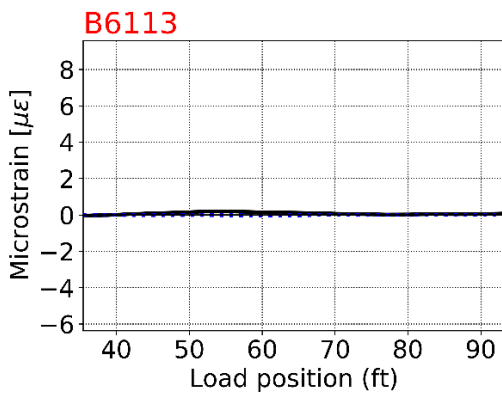
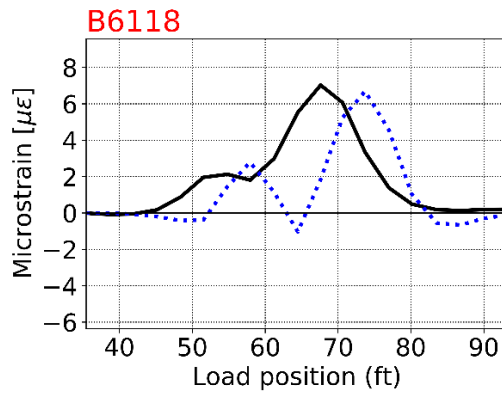
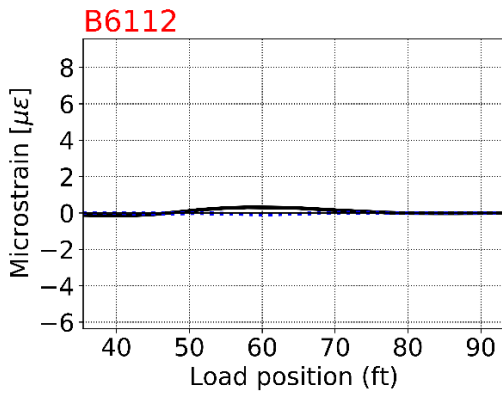
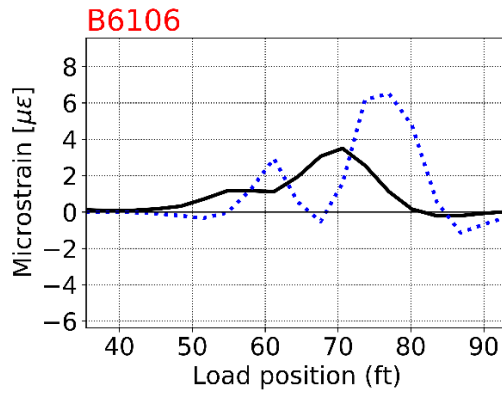
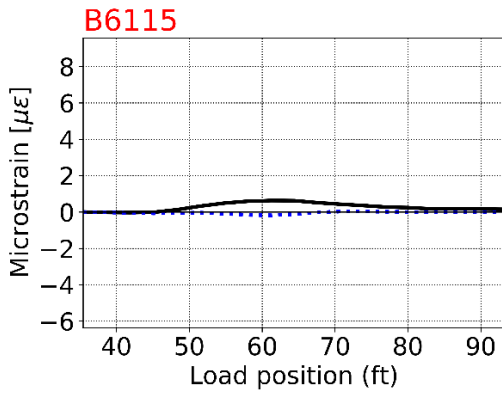
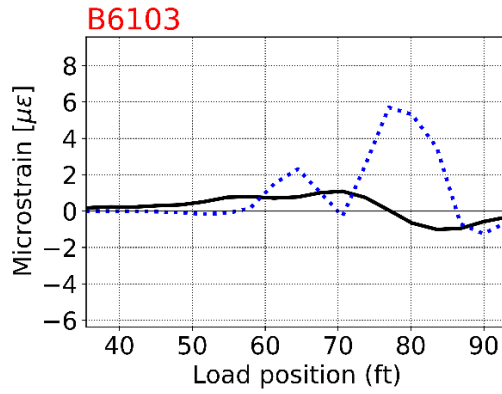
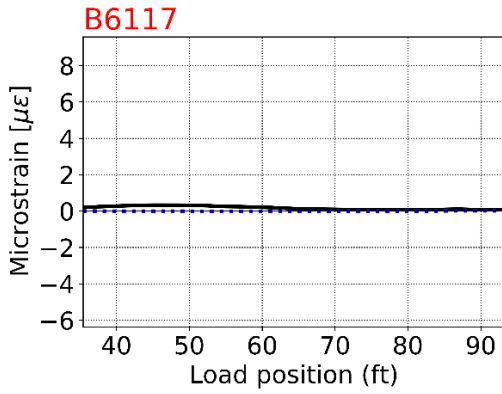


Figure B-82
Culvert #5 load path 1 calibration plots for strain sensors

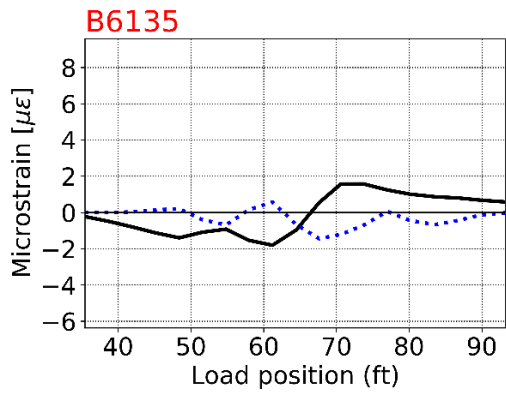
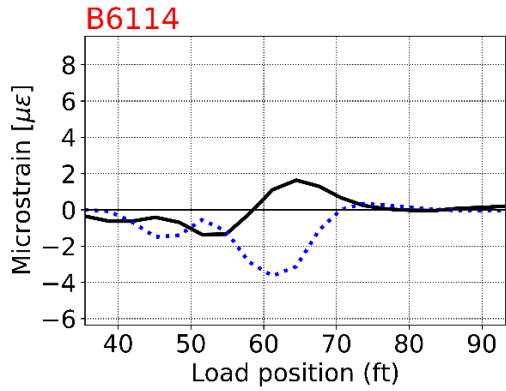
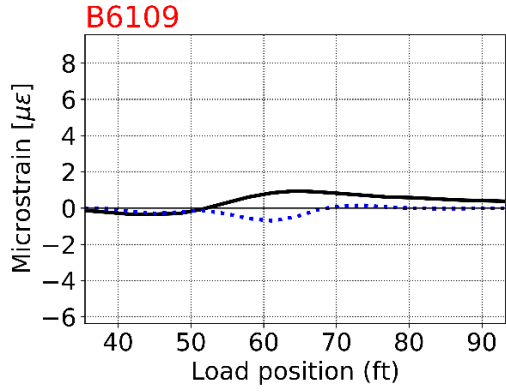
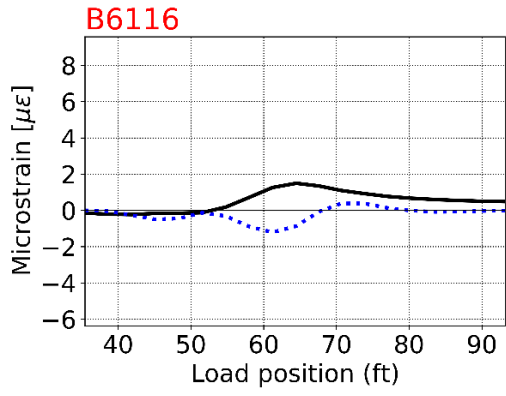


Figure B-83
Culvert #5 load path 1 calibration plots for strain sensors

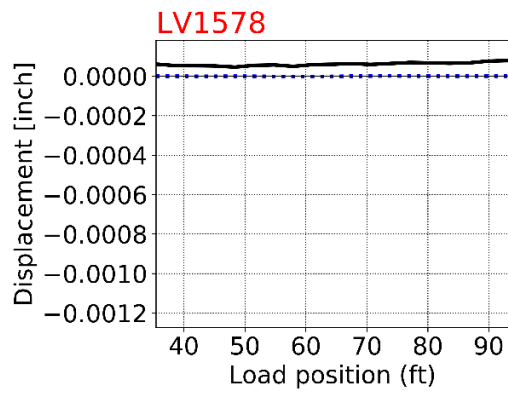
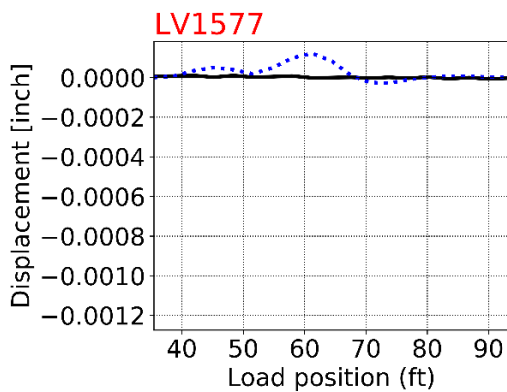
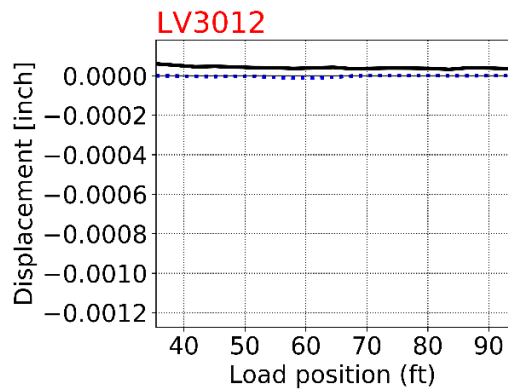
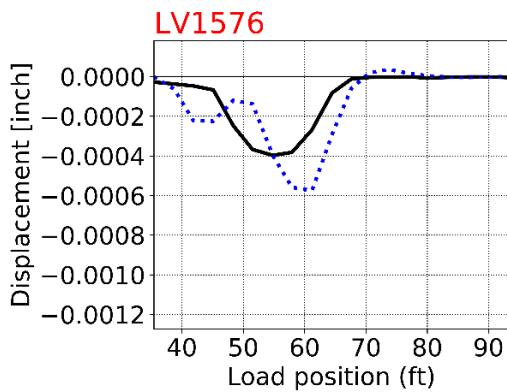
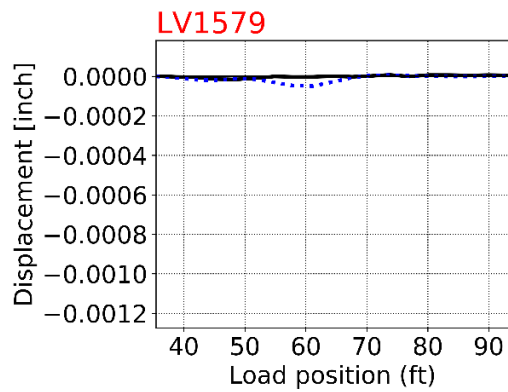
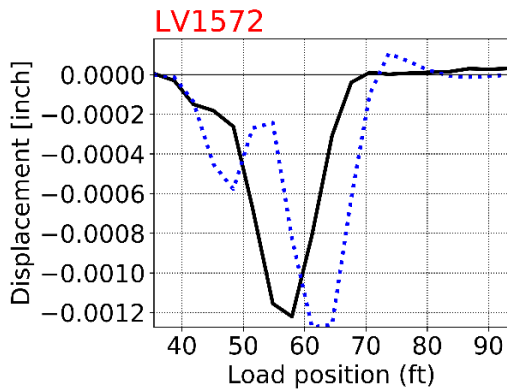
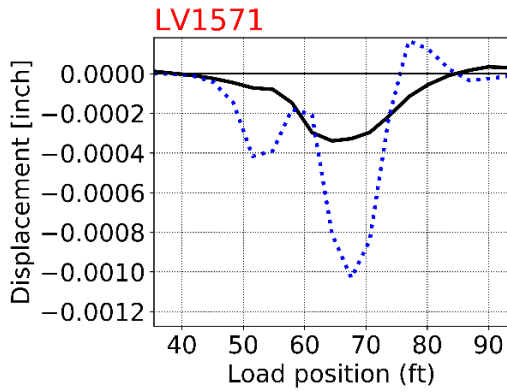


Figure B-84
Culvert #5 load path 1 calibration plots for LVDT sensors

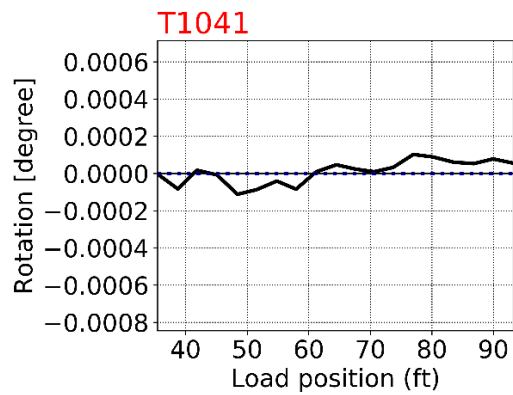
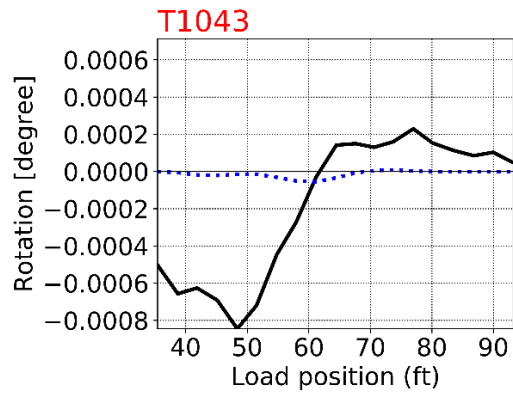
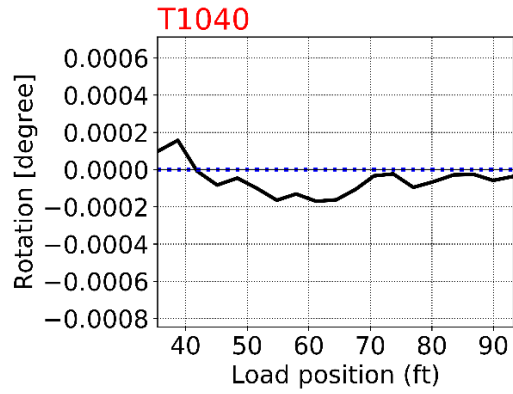


Figure B-85
Culvert #5 load path 1 calibration plots for tilt-meter sensors

Load Path 2 Sensors

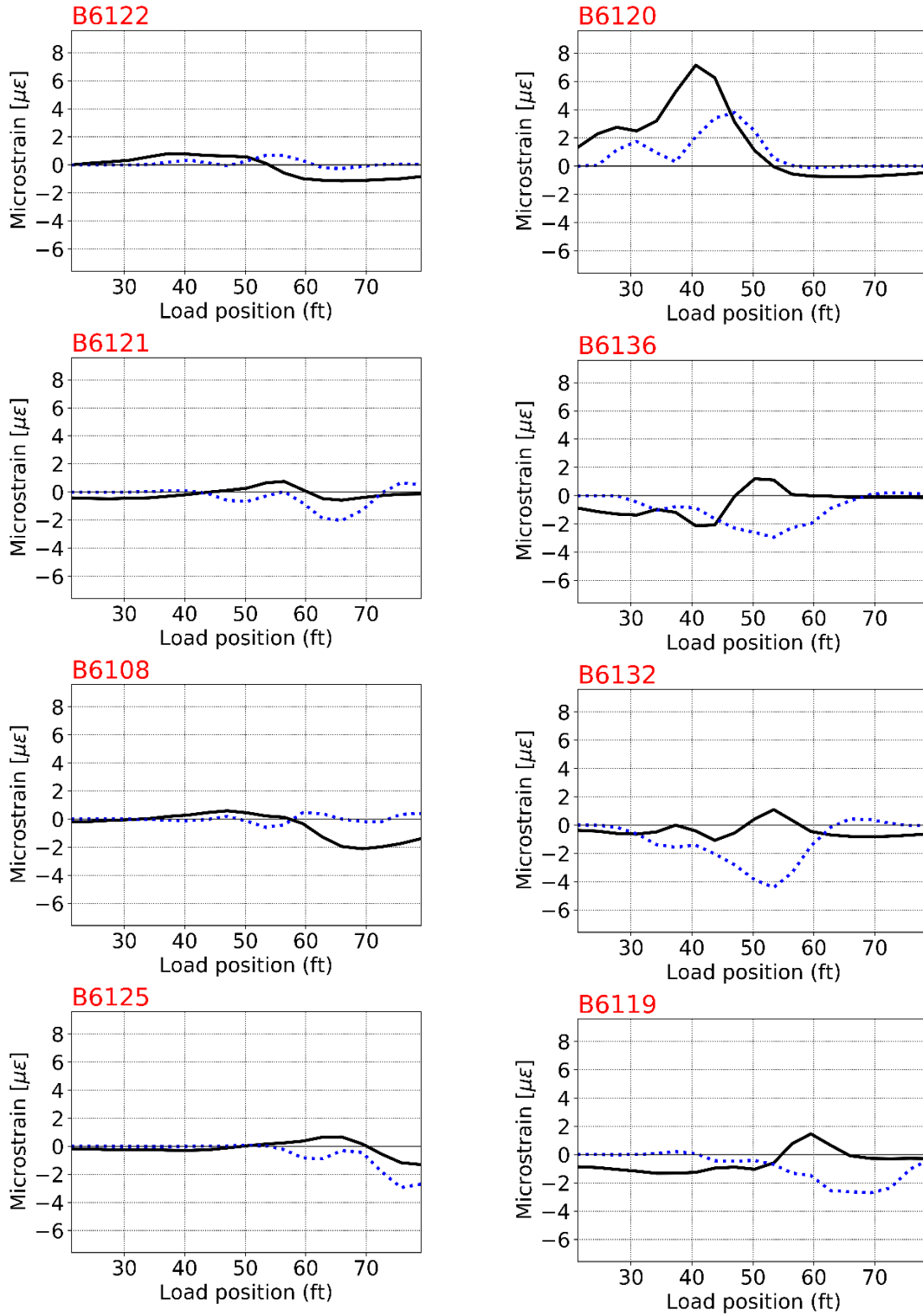


Figure B-86
Culvert #5 load path 2 calibration plots for strain sensors

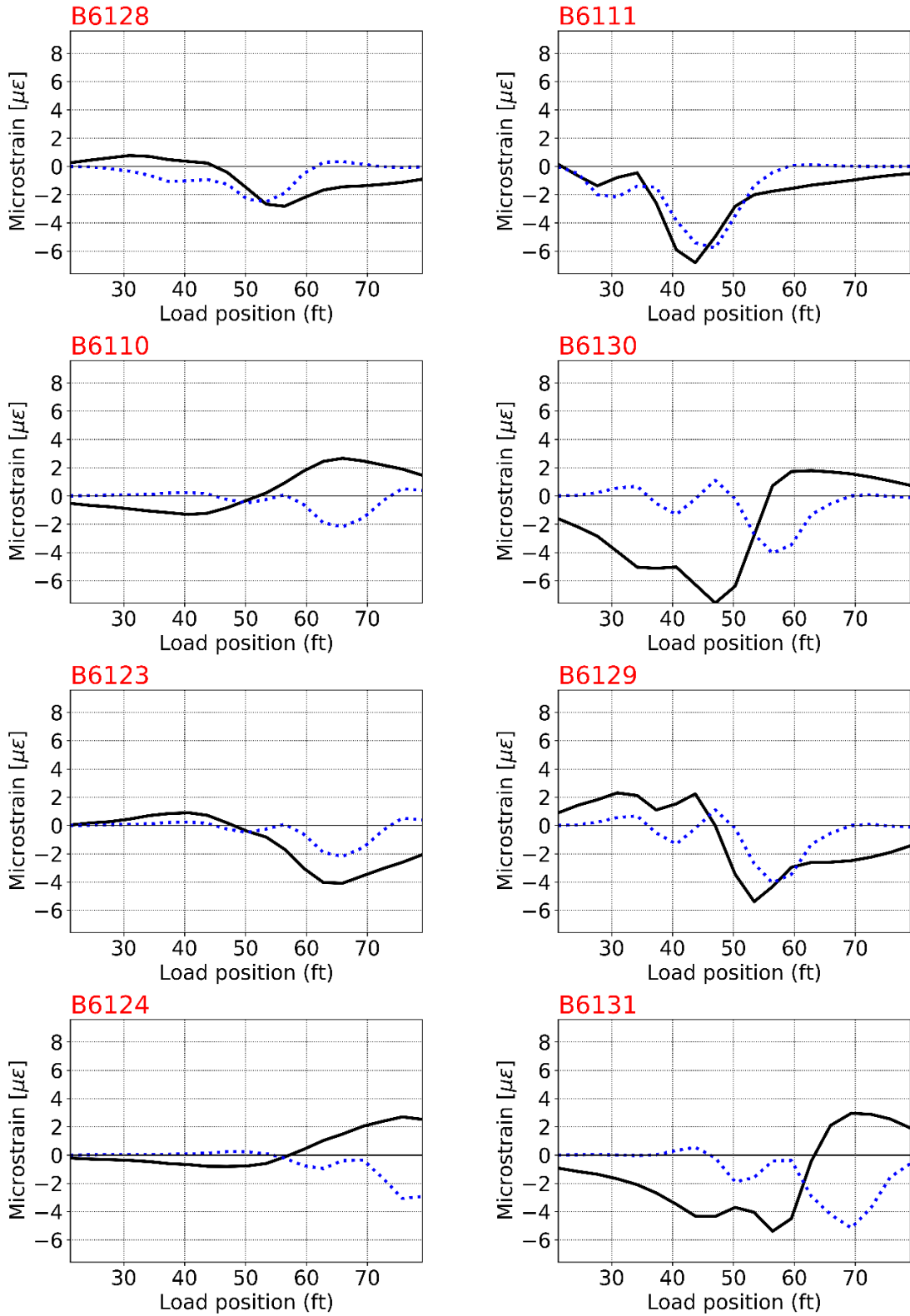


Figure B-87
Culvert #5 load path 2 calibration plots for strain sensors

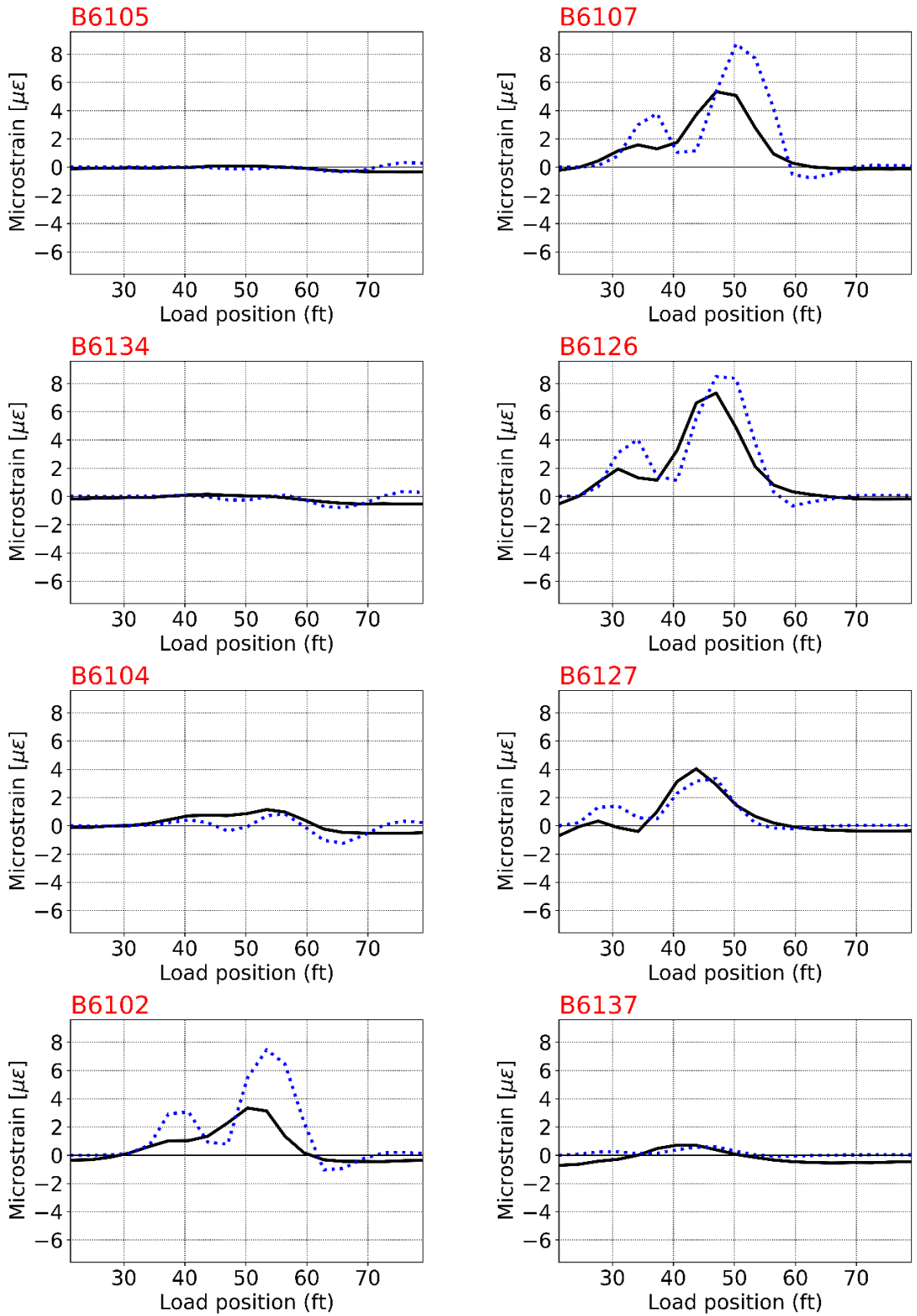


Figure B-88
Culvert #5 load path 2 calibration plots for strain sensors

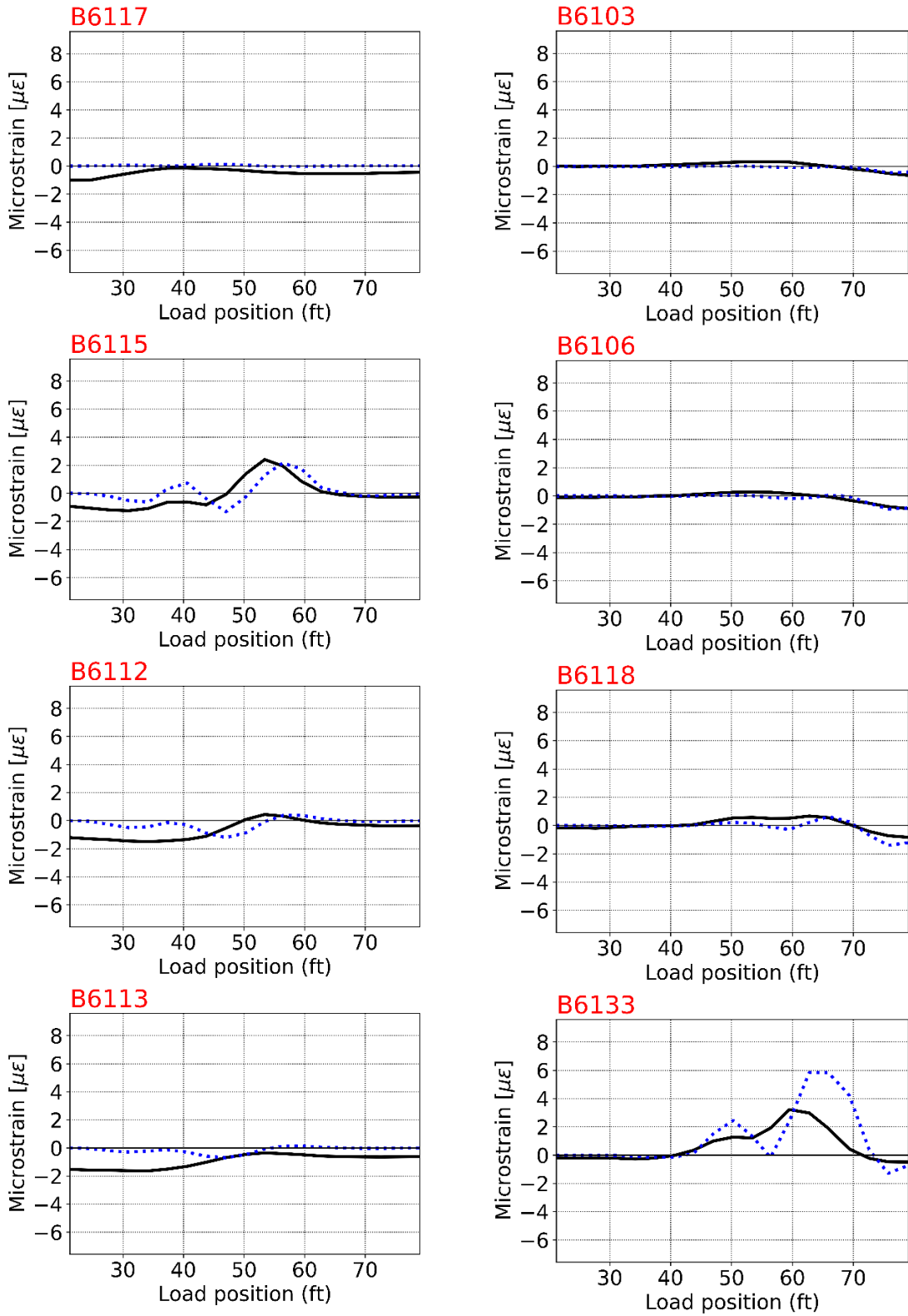


Figure B-89
Culvert #5 load path 2 calibration plots for strain sensors

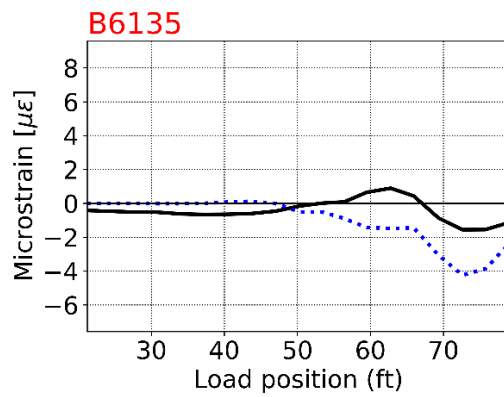
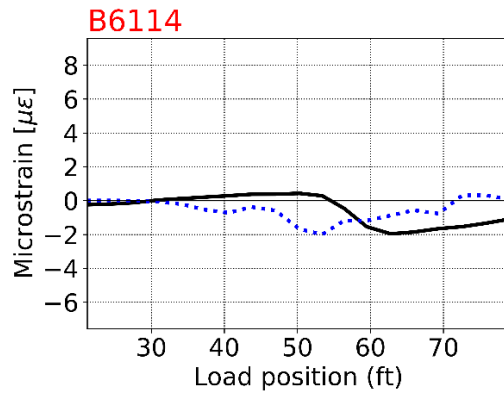
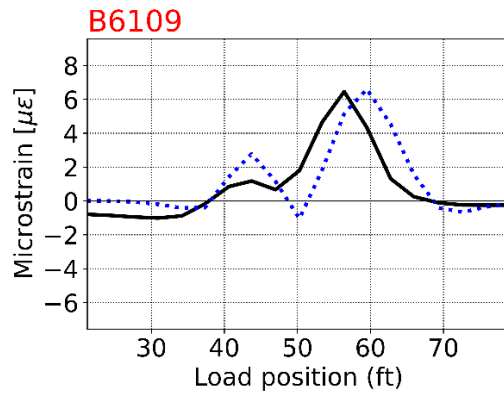
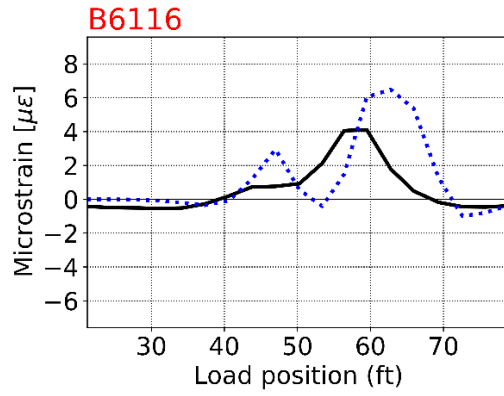


Figure B-90
Culvert #5 load path 2 calibration plots for strain sensors

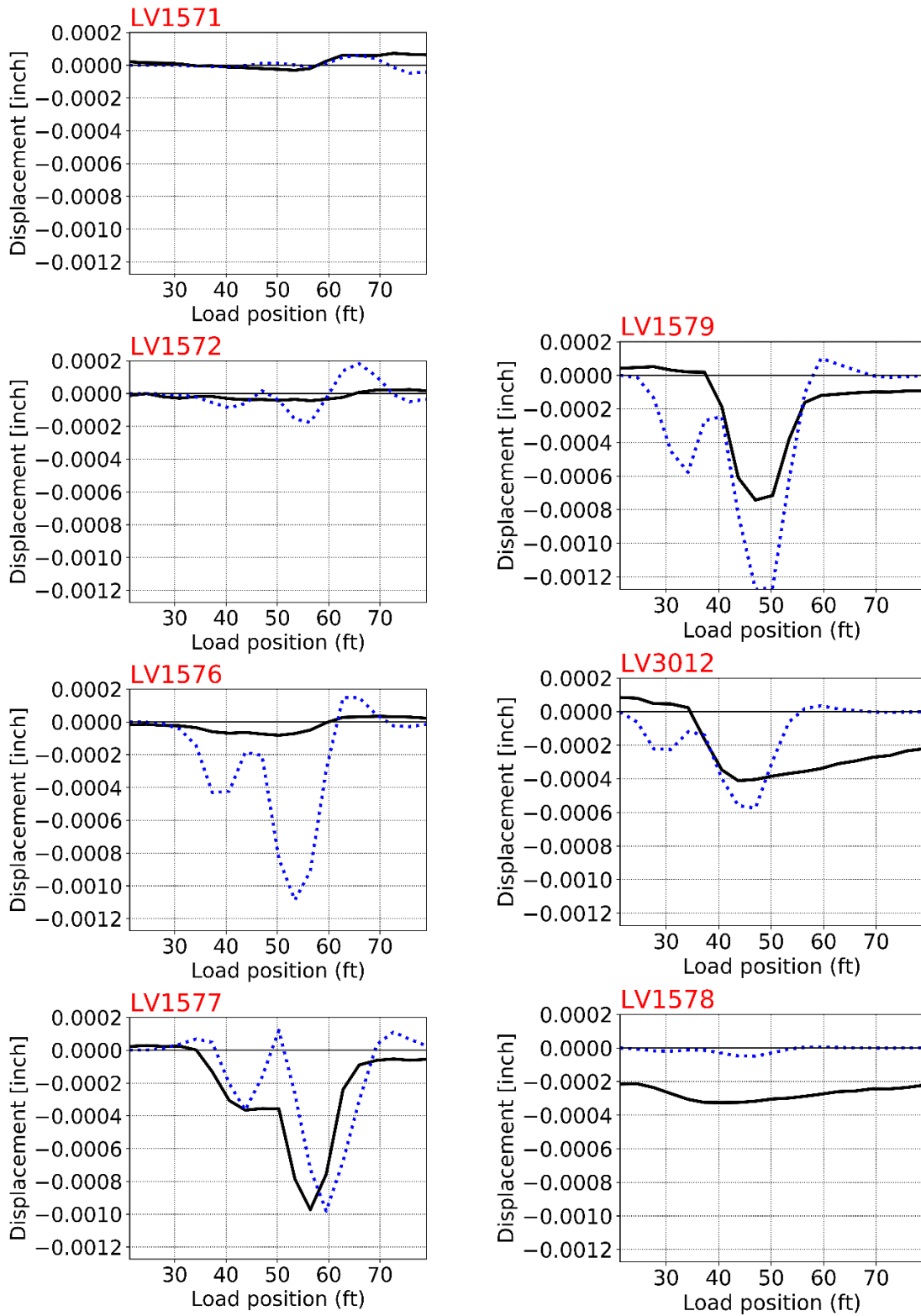


Figure B-91
Culvert #5 load path 2 calibration plots for LVDT sensors

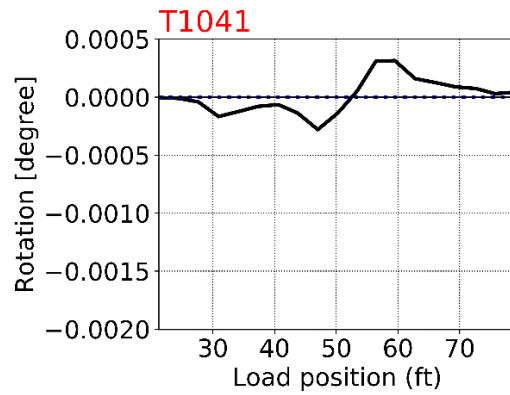
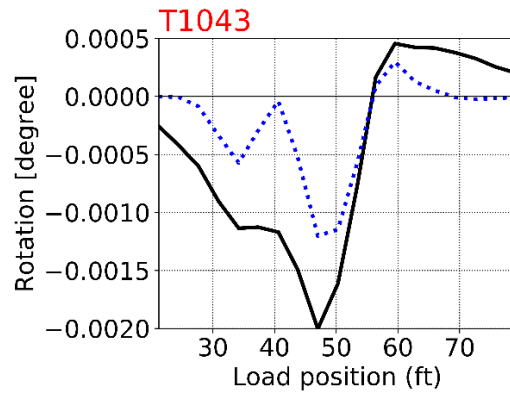
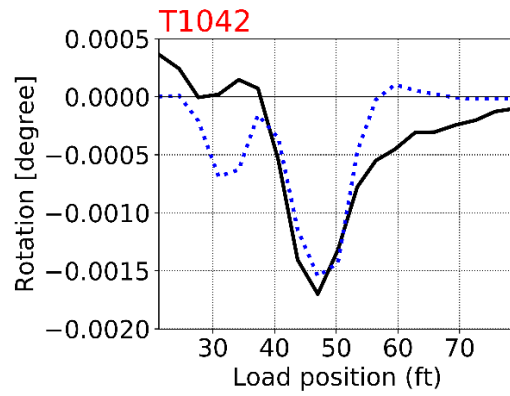
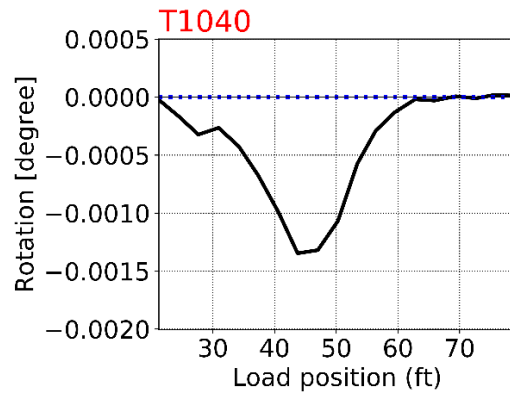


Figure B-92
Culvert #5 load path 2 calibration plots for tilt-meter sensors

Load Path 3 Sensors

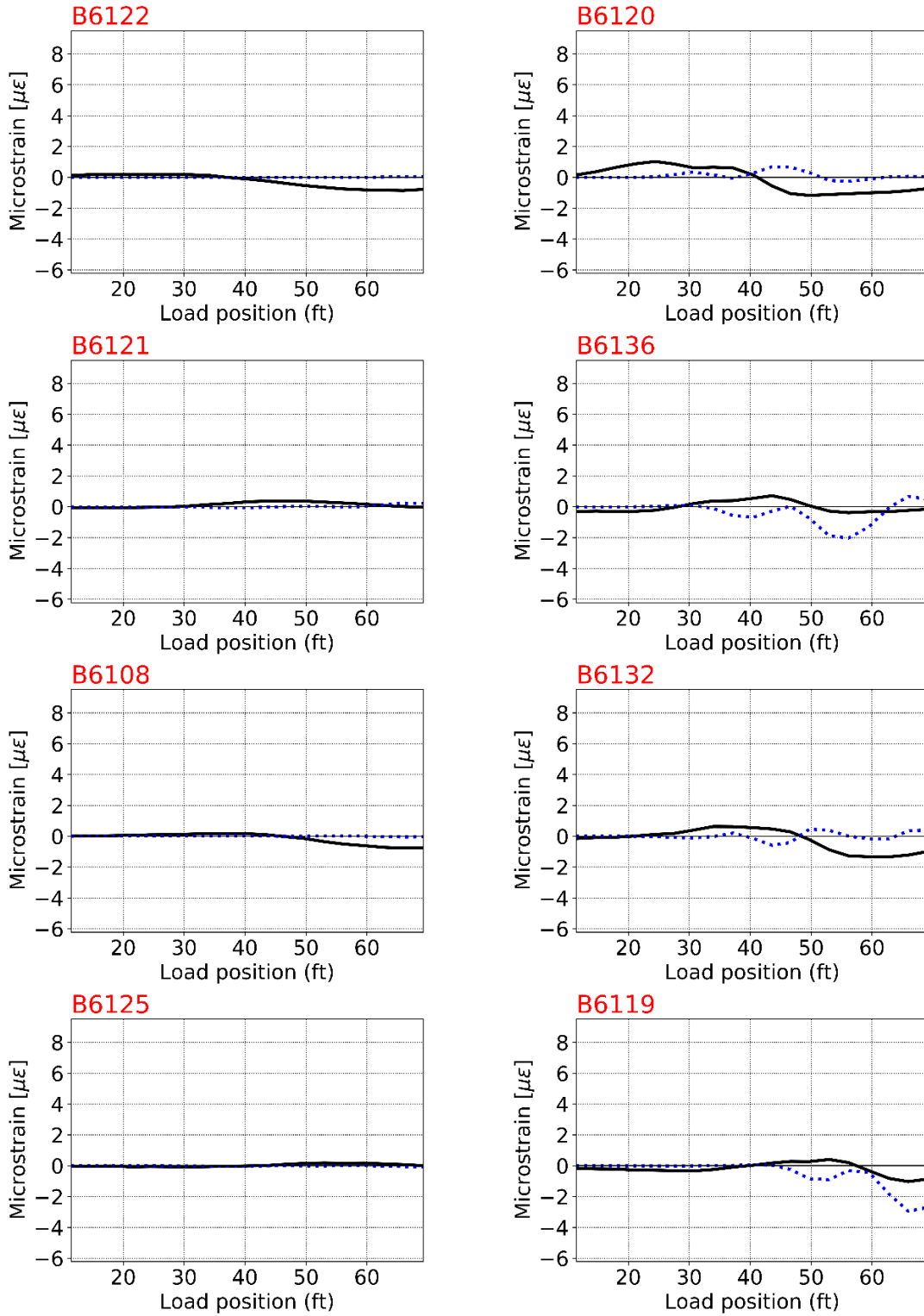


Figure B-93
Culvert #5 load path 3 calibration plots for strain sensors

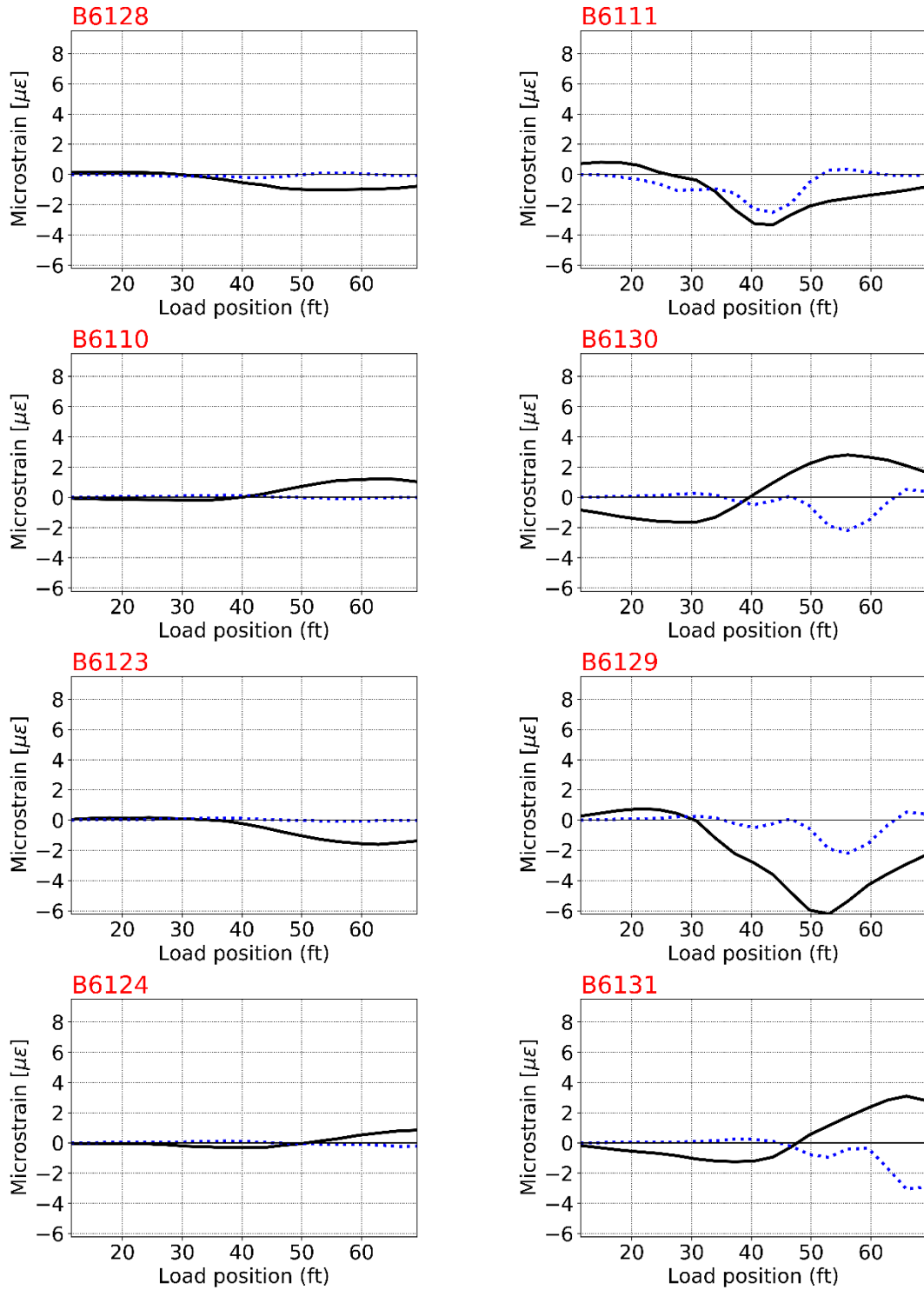


Figure B-94
Culvert #5 load path 3 calibration plots for strain sensors

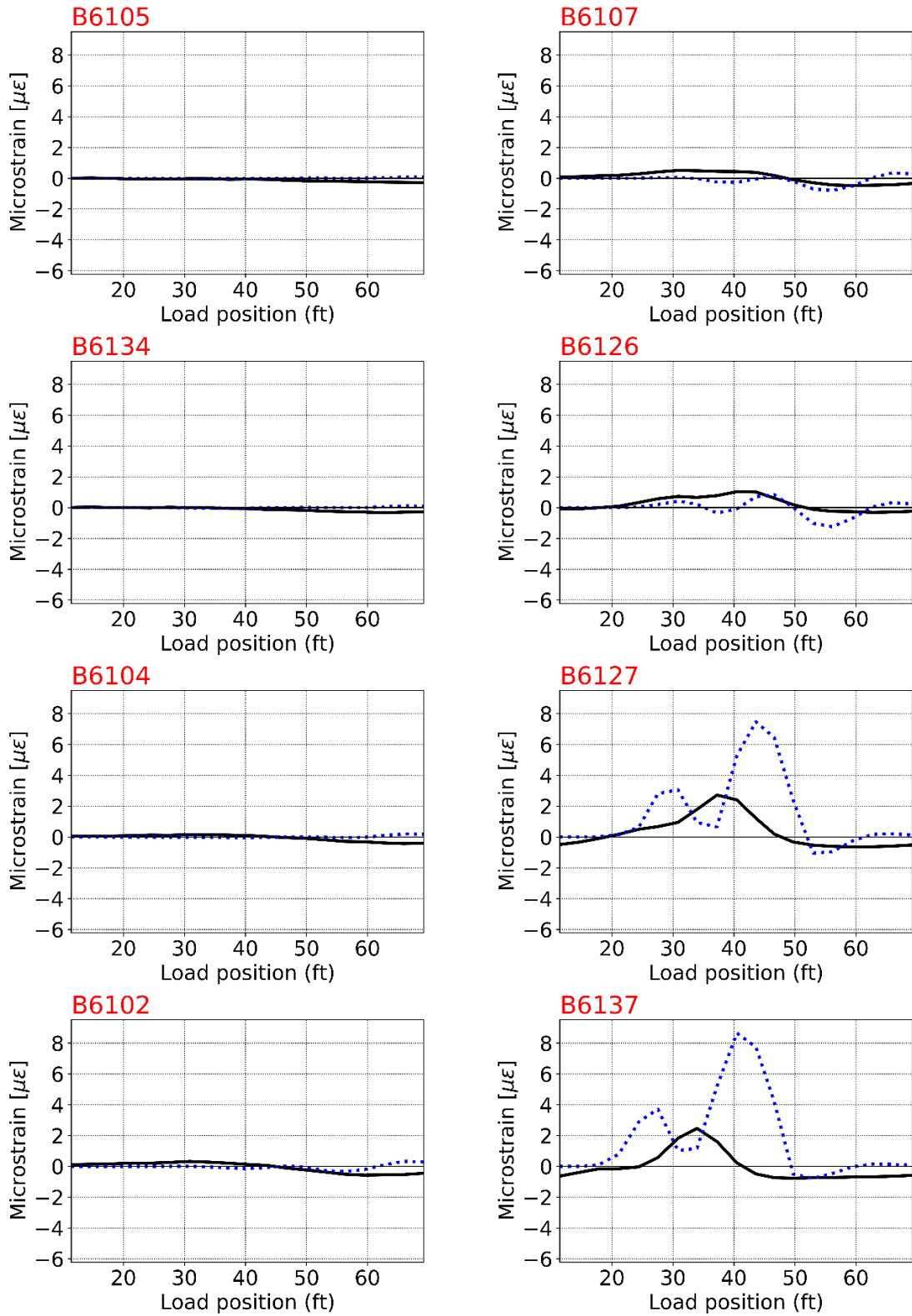


Figure B-95
Culvert #5 load path 3 calibration plots for strain sensors

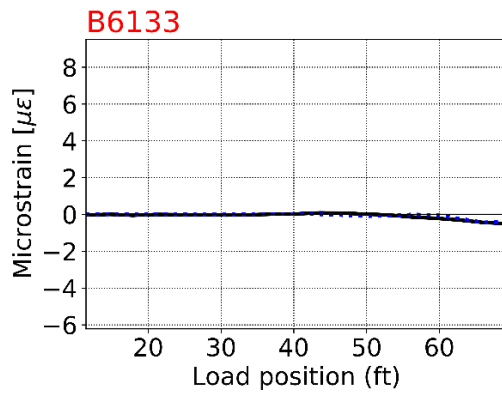
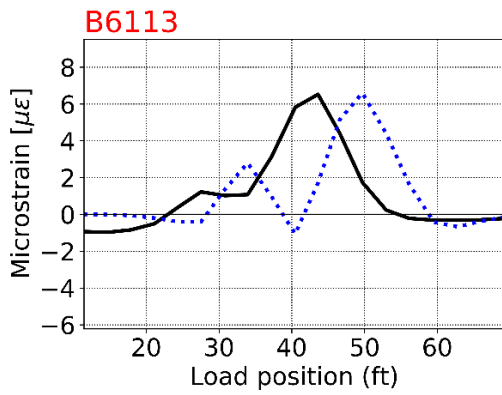
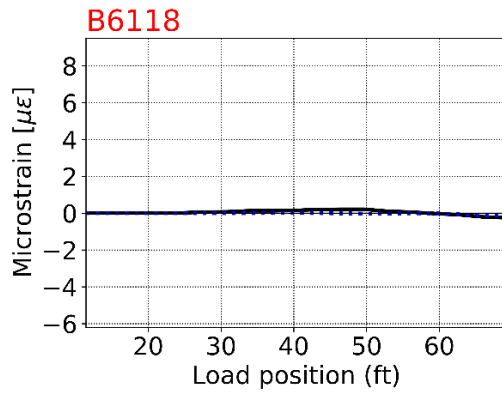
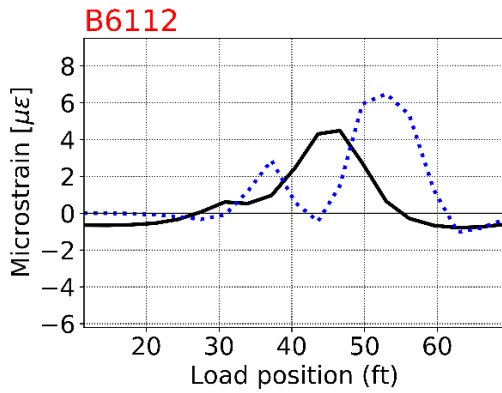
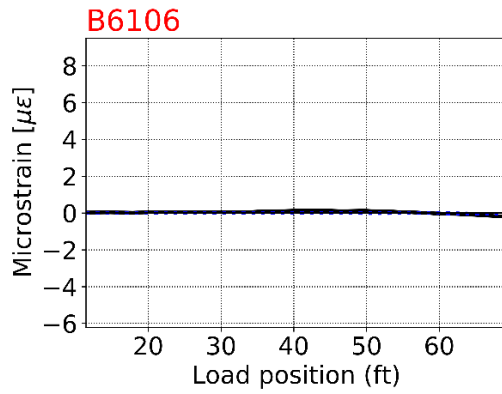
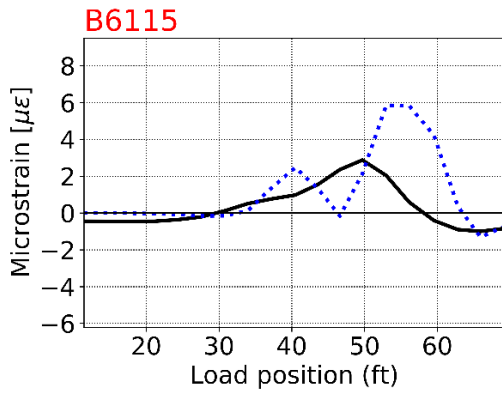
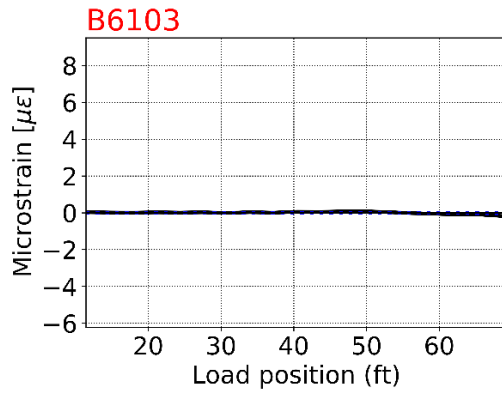
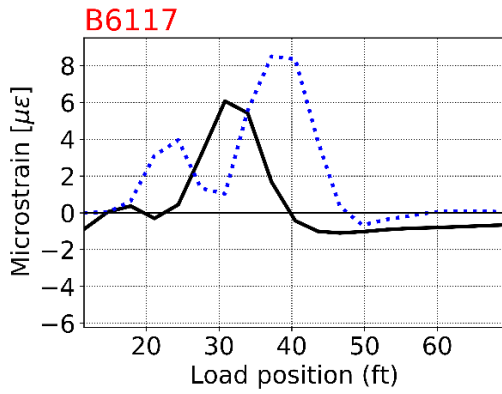


Figure B-96
Culvert #5 load path 3 calibration plots for strain sensors

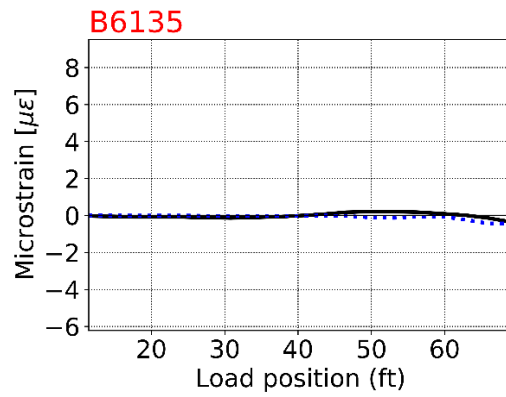
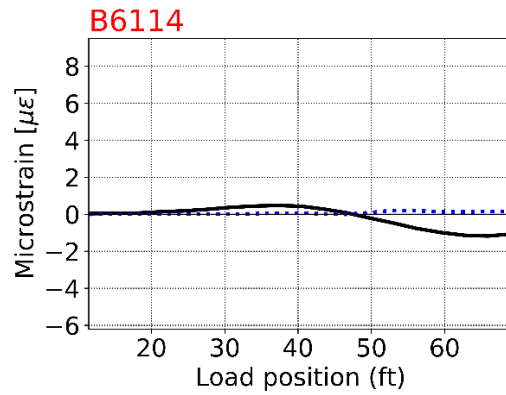
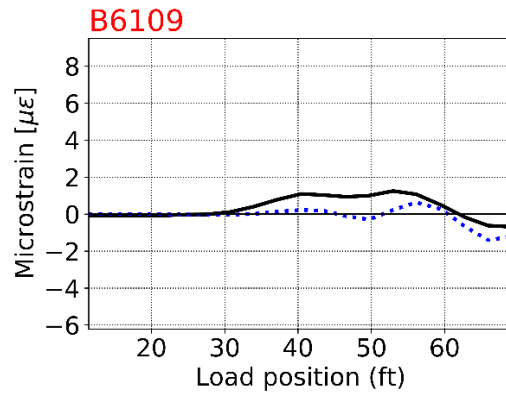
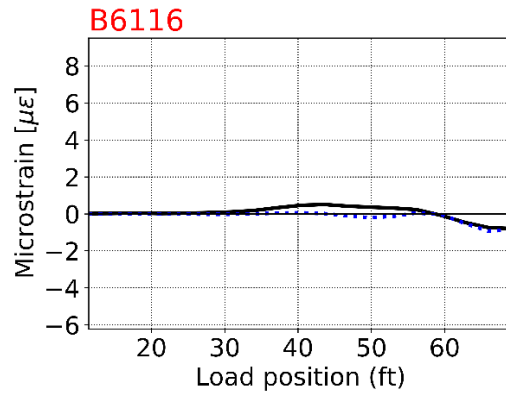


Figure B-97
Culvert #5 load path 3 calibration plots for strain sensors

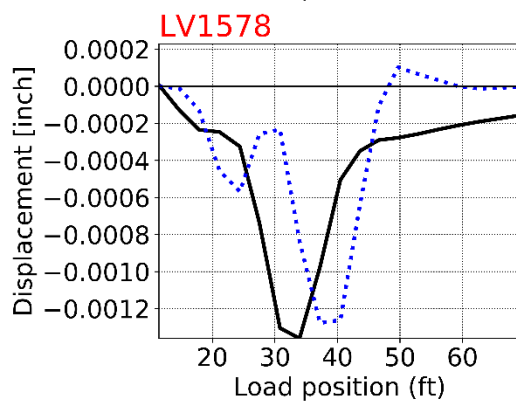
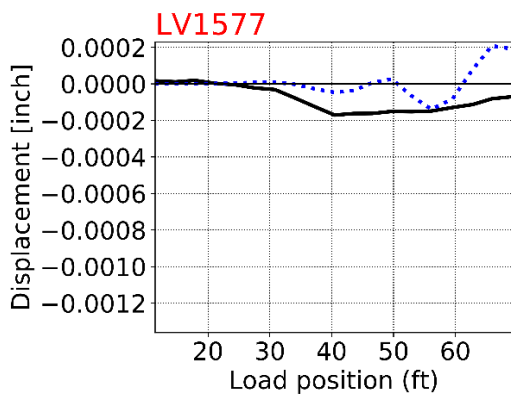
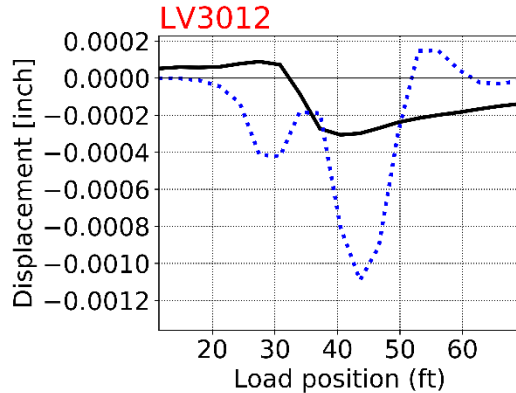
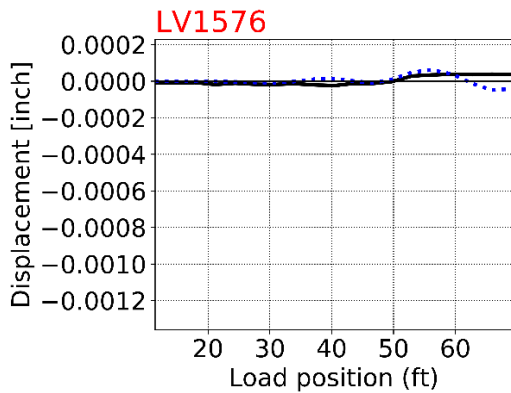
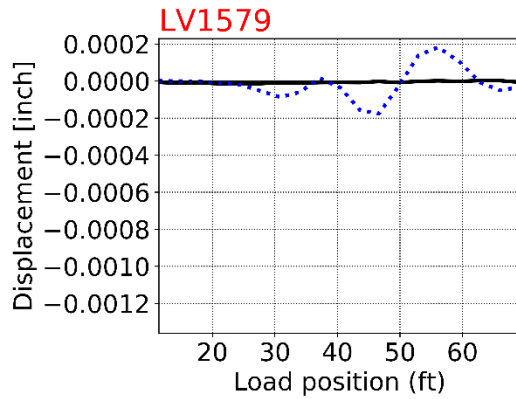
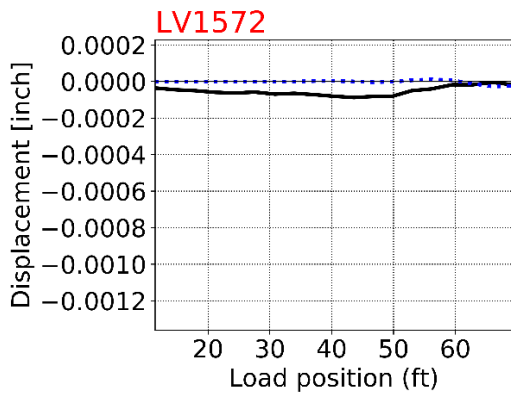
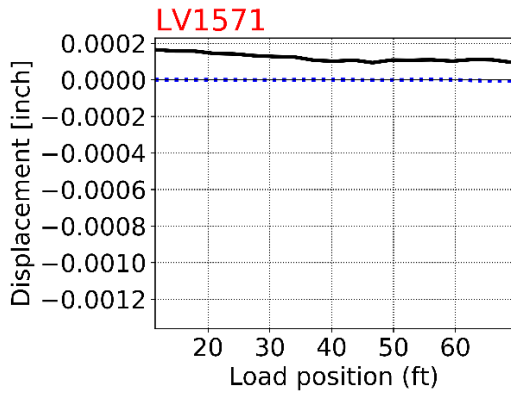


Figure B-98
Culvert #5 load path 3 calibration plots for LVDT sensors

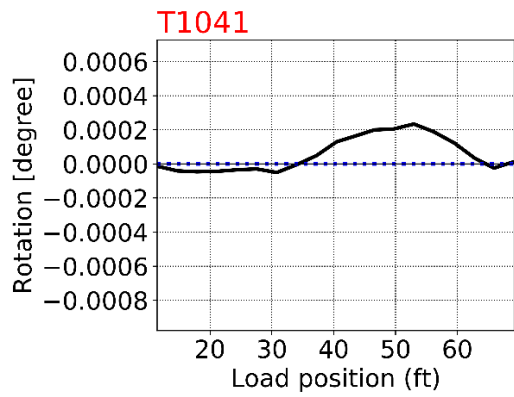
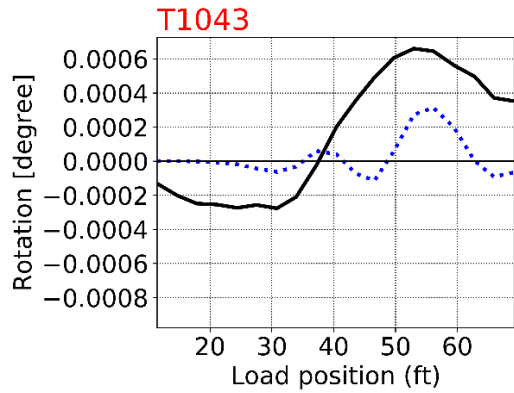
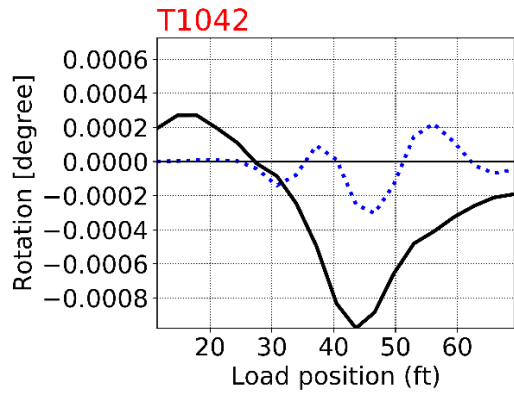
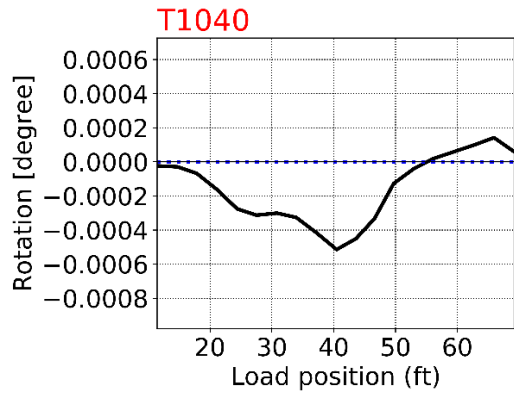


Figure B-99
Culvert #5 load path 3 calibration plots for tilt-meter sensors

Culvert #6

Load Path 1 Sensors

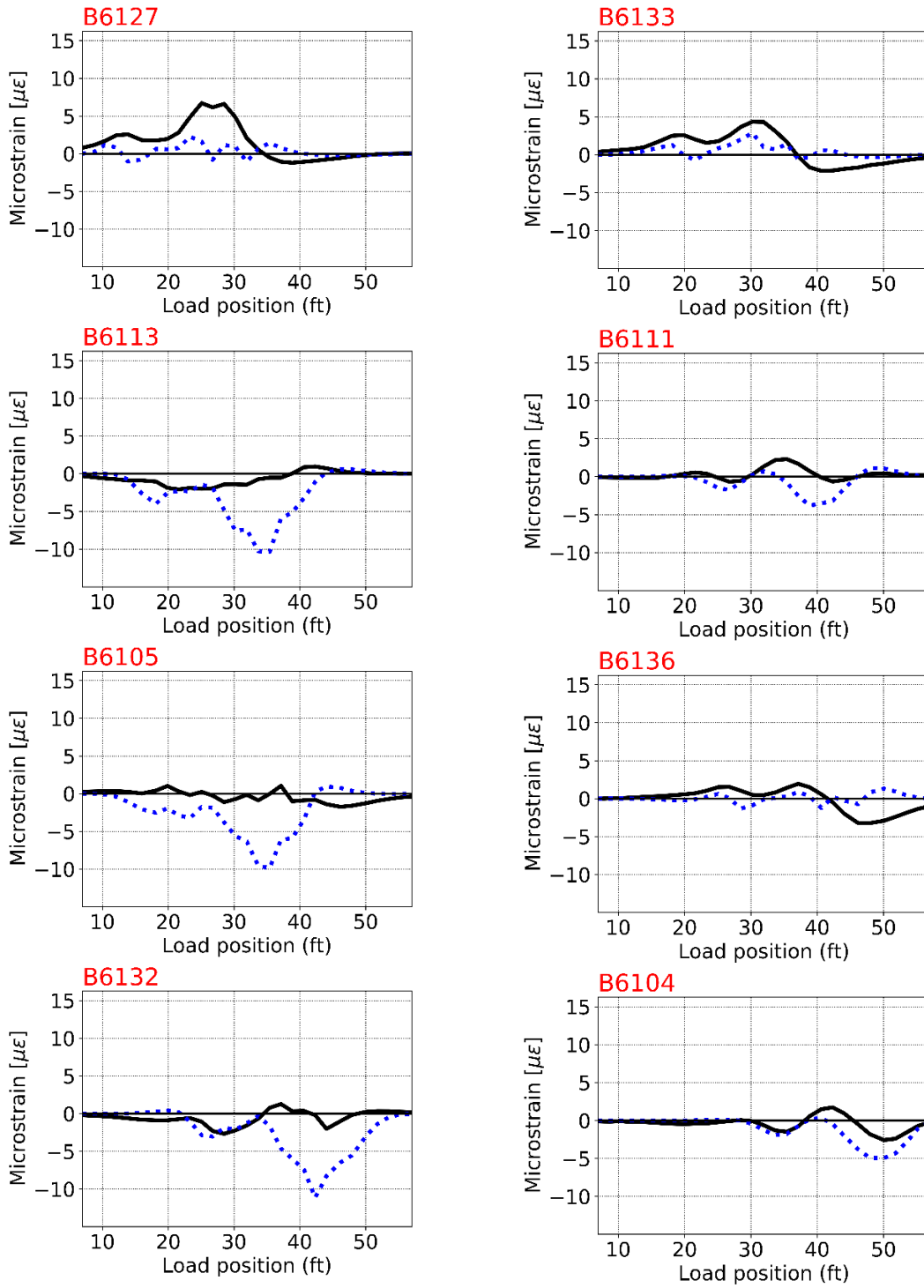


Figure B-100
Culvert #6 load path 1 calibration plots for strain sensors

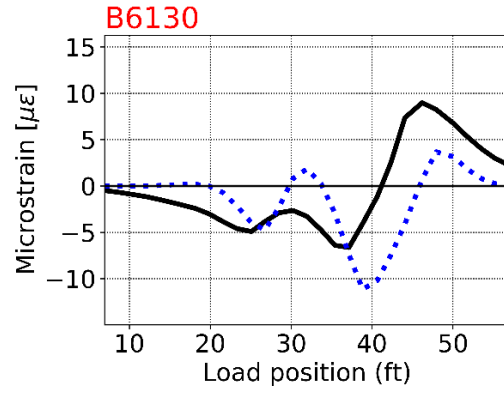
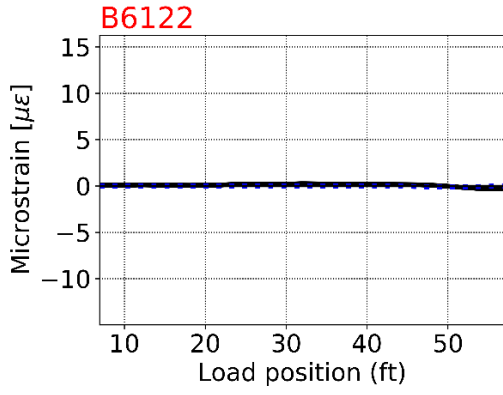
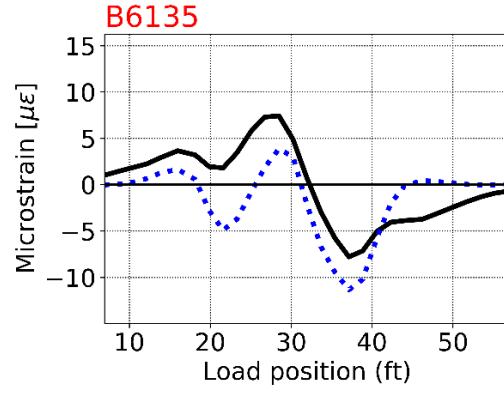
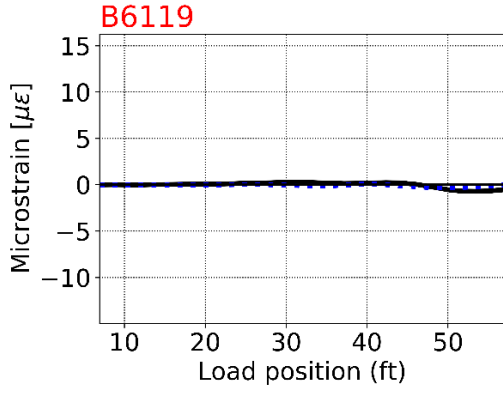
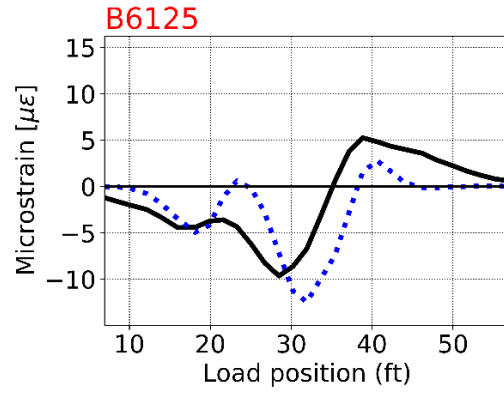
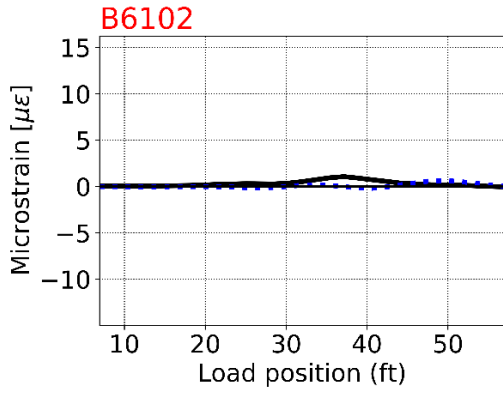
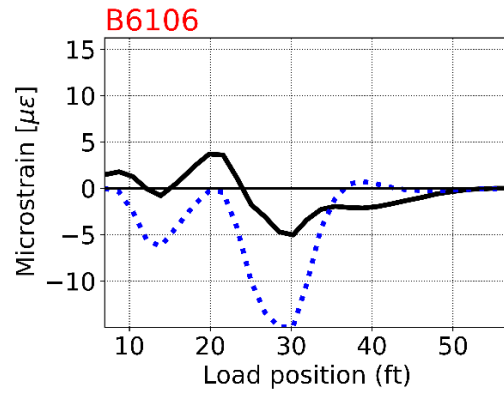
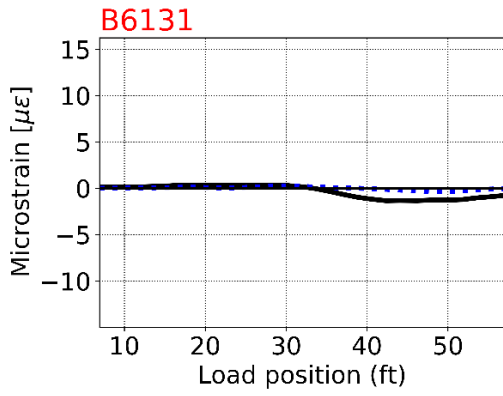


Figure B-101
Culvert #6 load path 1 calibration plots for strain sensors

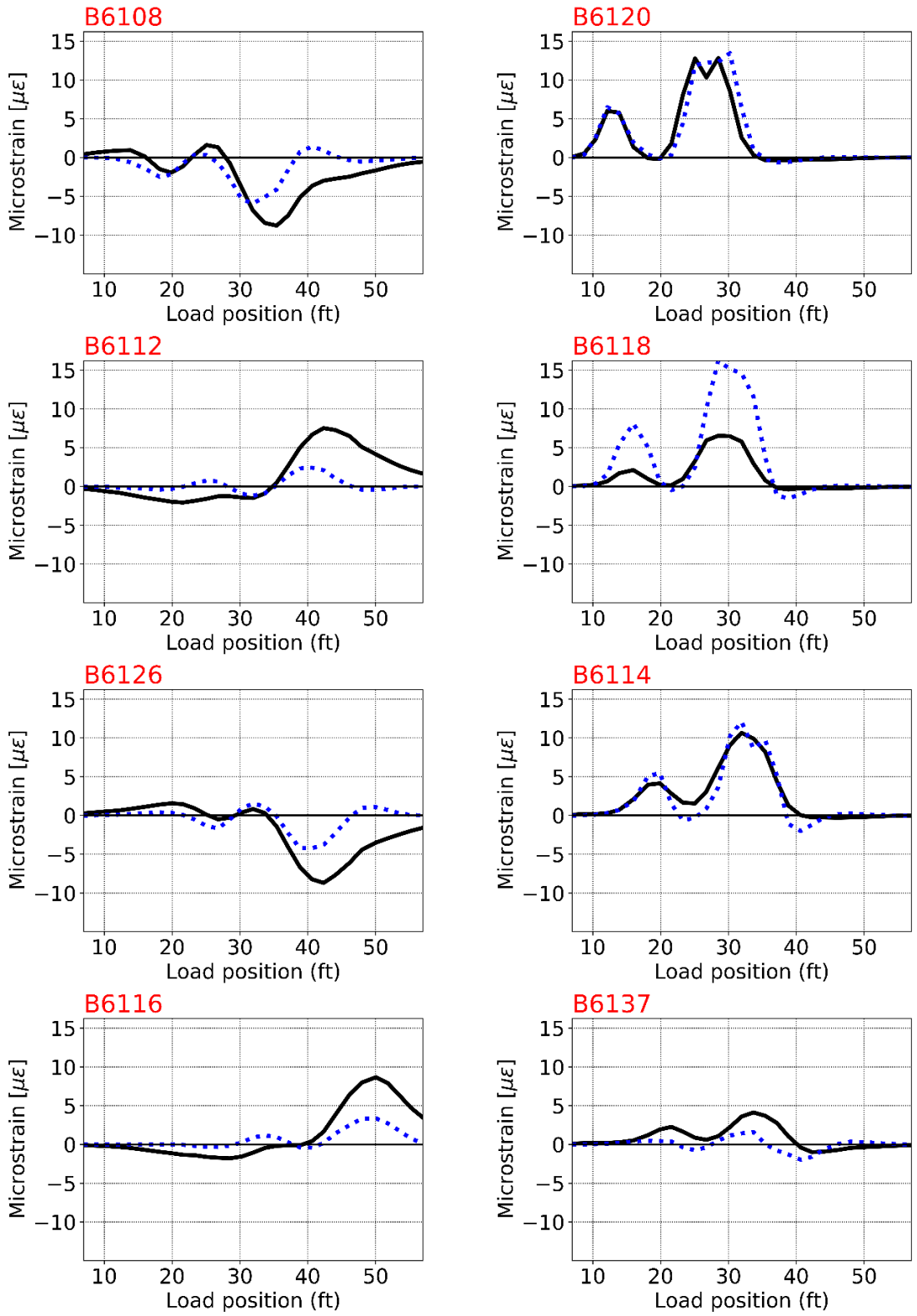


Figure B-102
Culvert #6 load path 1 calibration plots for strain sensors

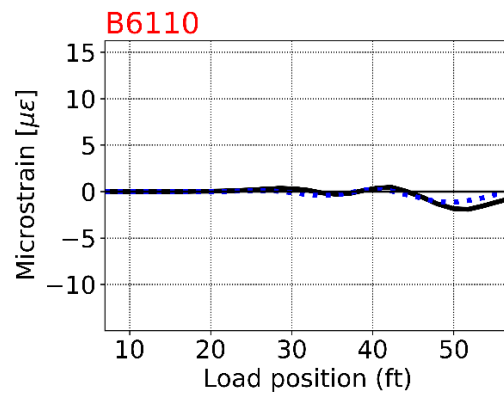
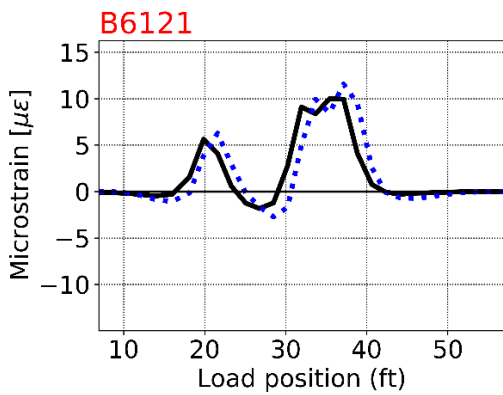
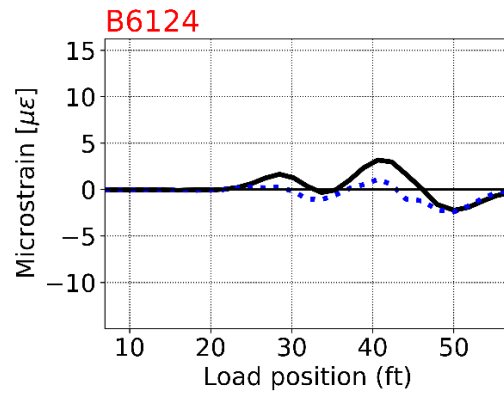
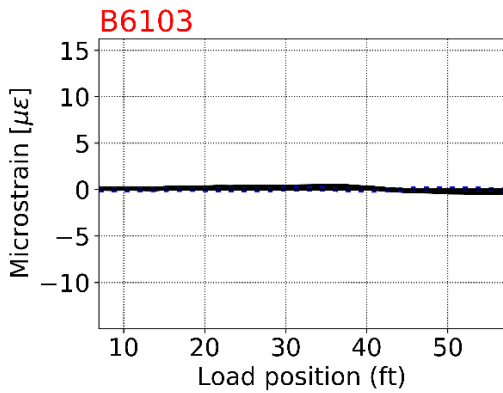
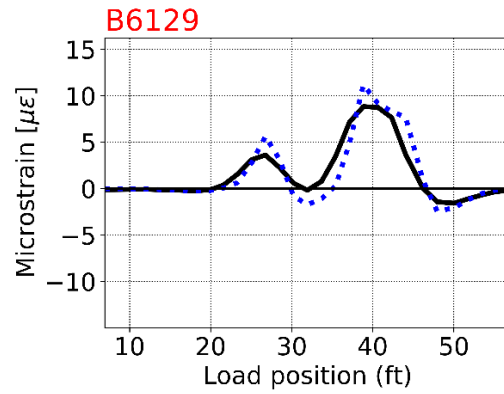
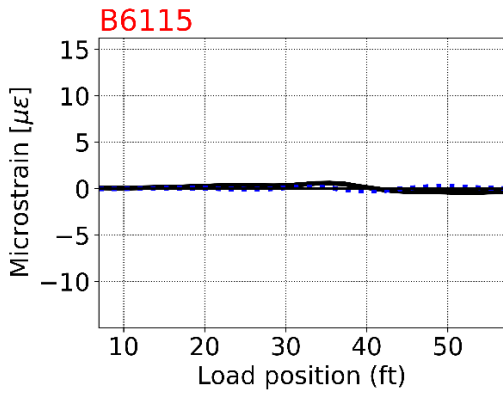
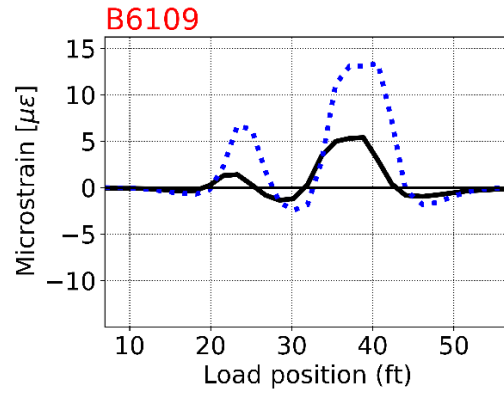
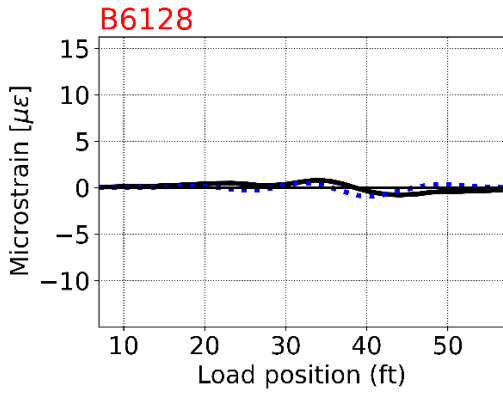


Figure B-103
Culvert #6 load path 1 calibration plots for strain sensors

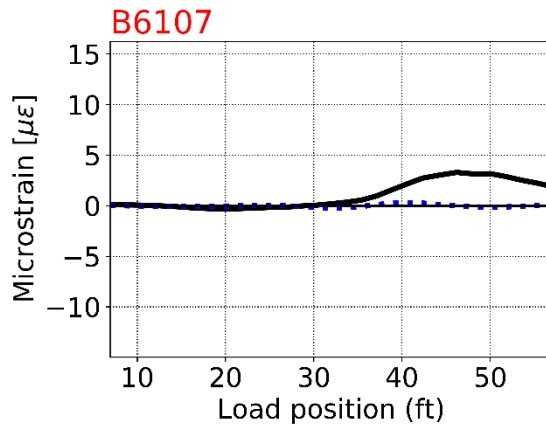
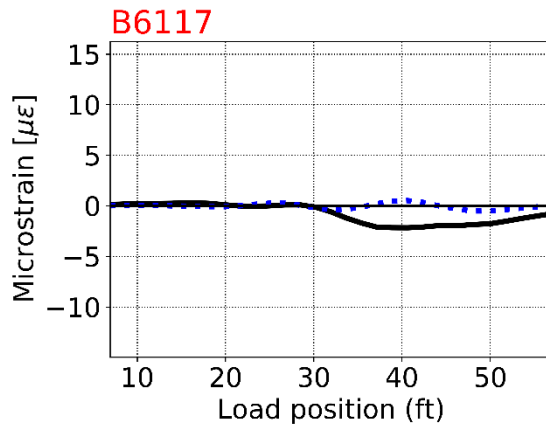


Figure B-104
Culvert #6 load path 1 calibration plots for strain sensors

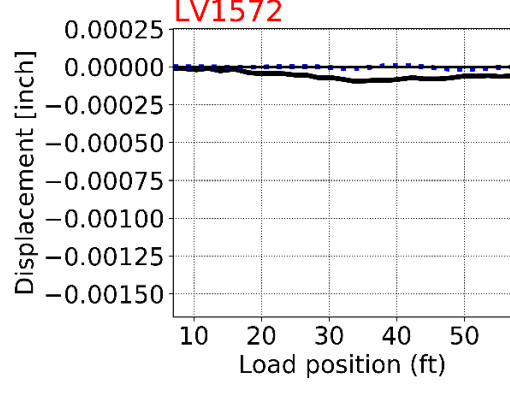
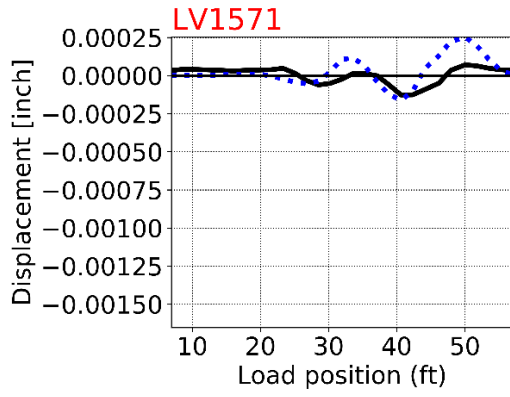
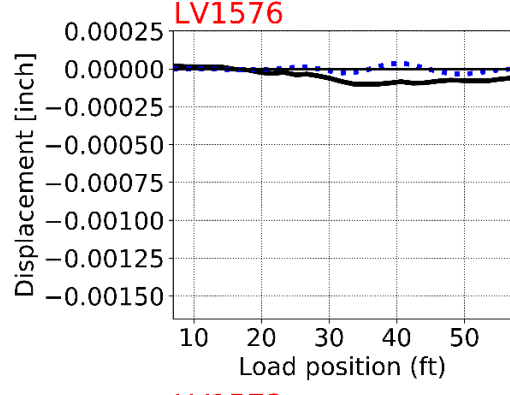
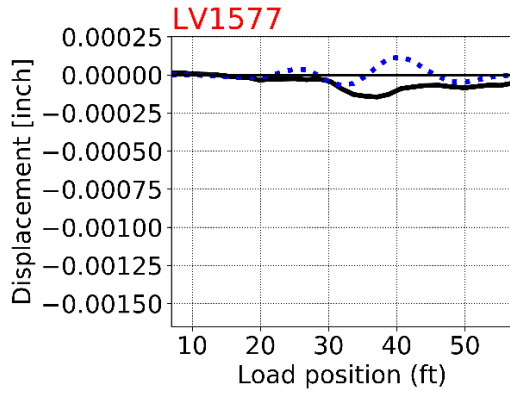
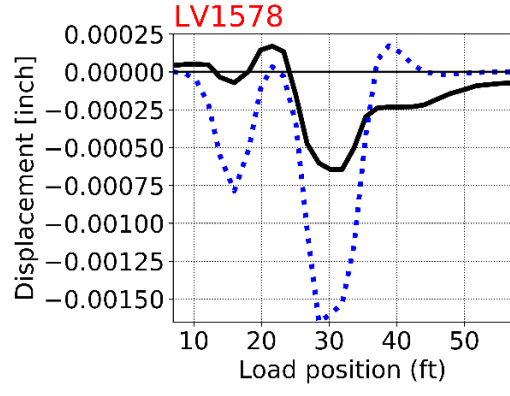
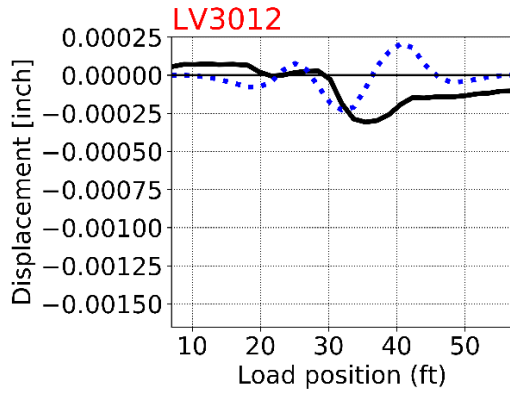
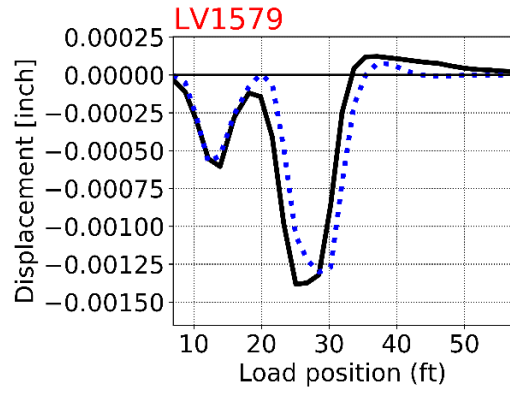
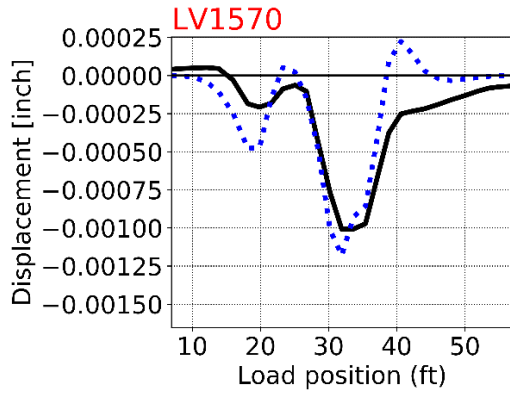


Figure B-105
Culvert #6 load path 1 calibration plots for LVDT sensors

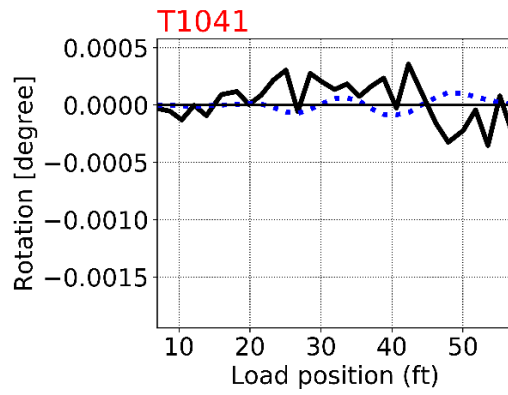
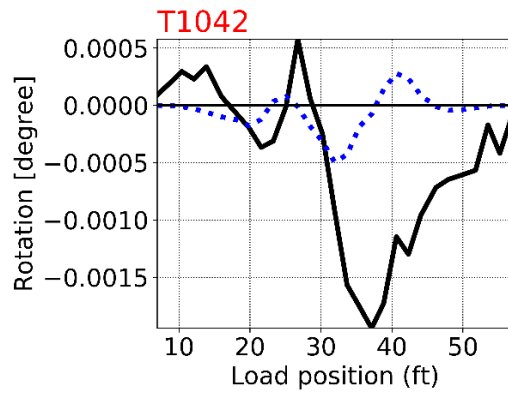
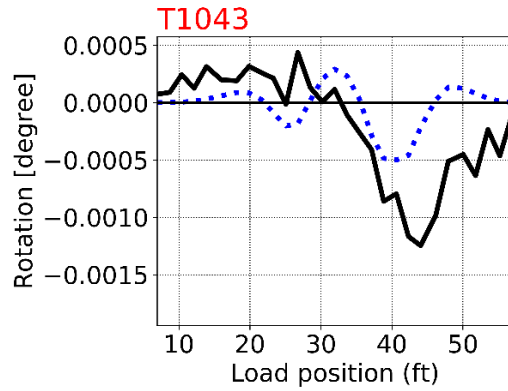
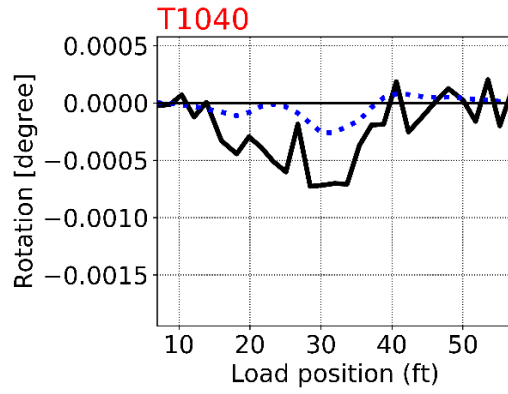


Figure B-106
Culvert #6 load path 1 calibration plots for tilt-meter sensors

Load Path 2 Sensors

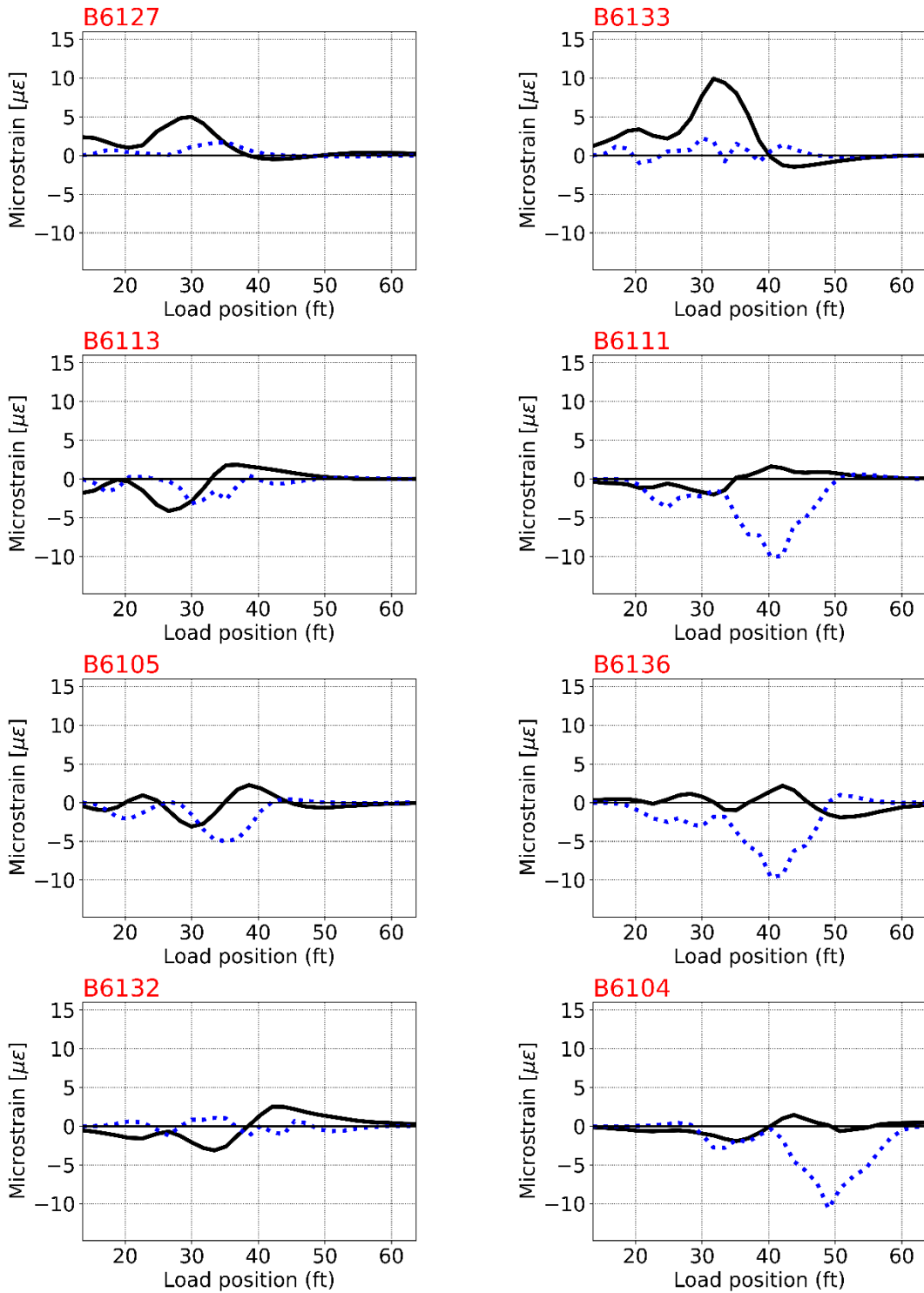


Figure B-107
Culvert #6 load path 2 calibration plots for strain sensors

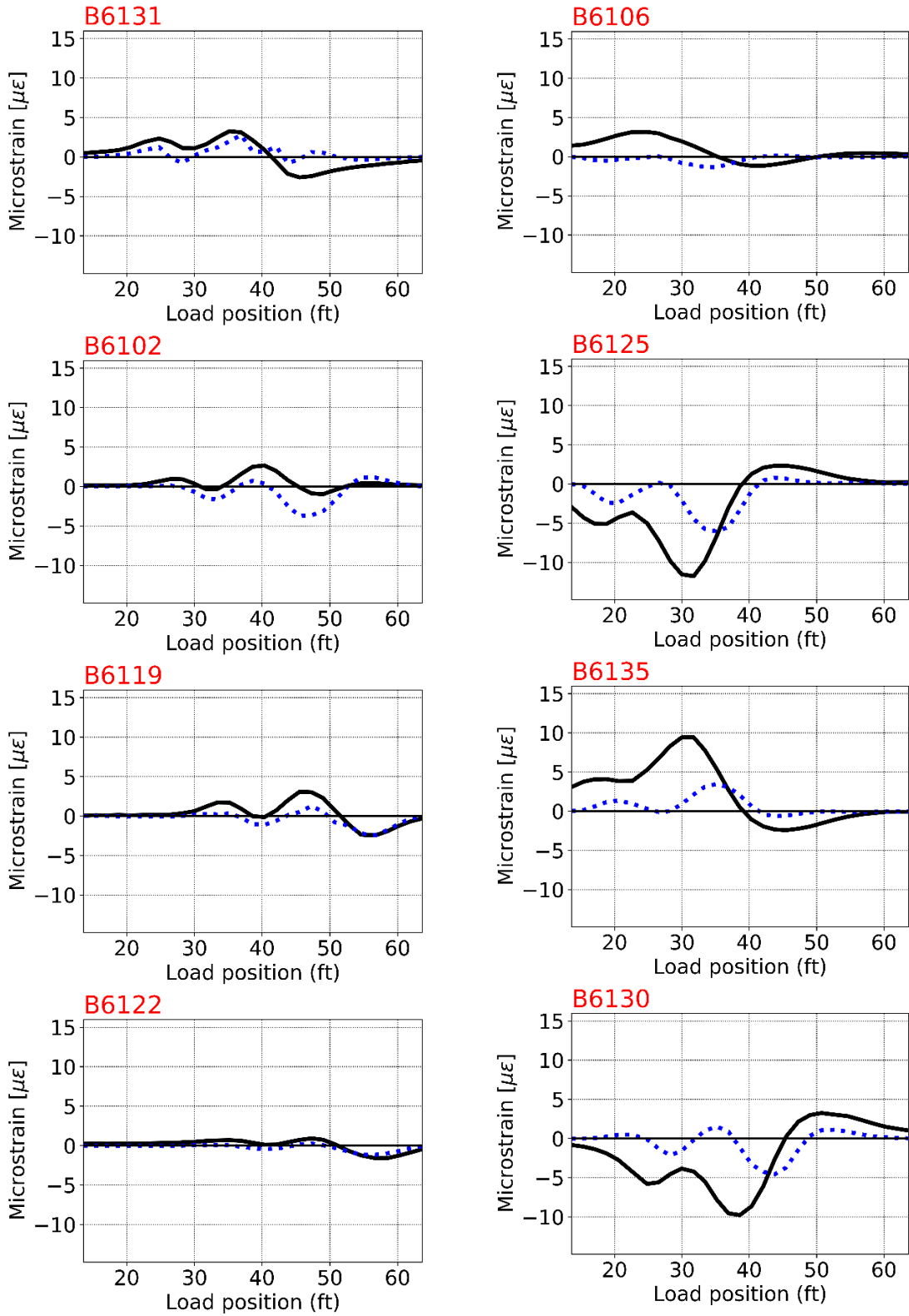


Figure B-108
Culvert #6 load path 2 calibration plots for strain sensors

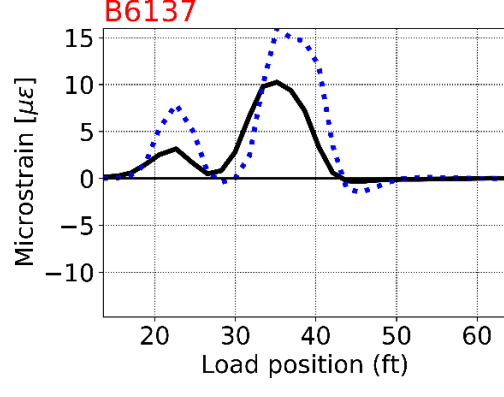
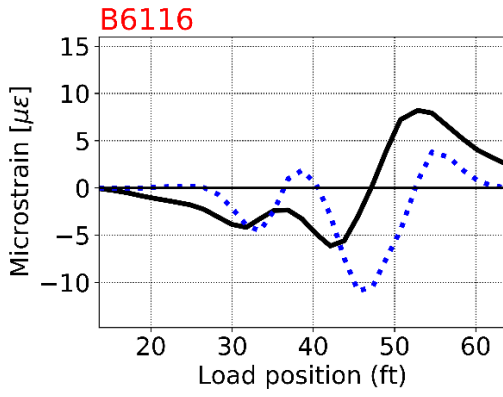
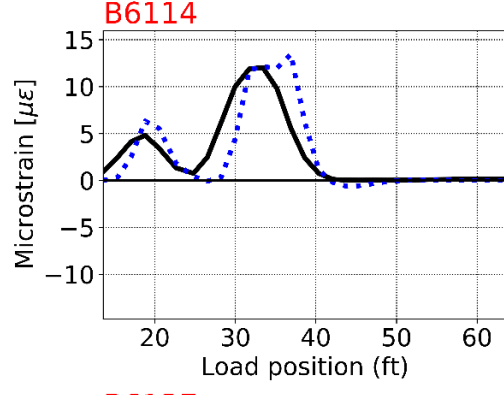
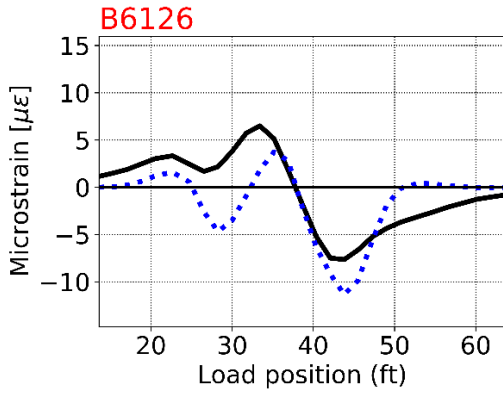
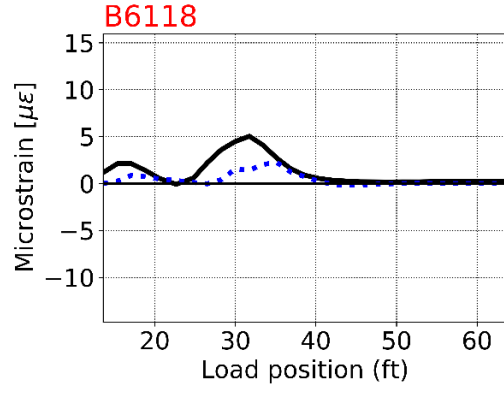
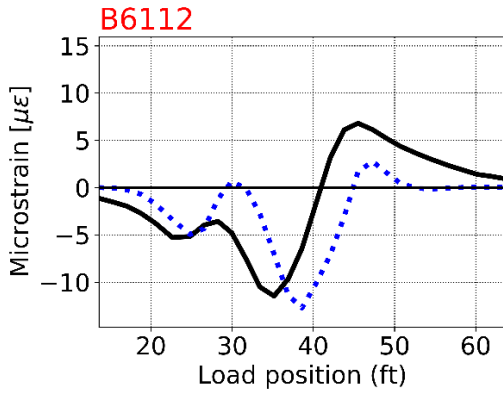
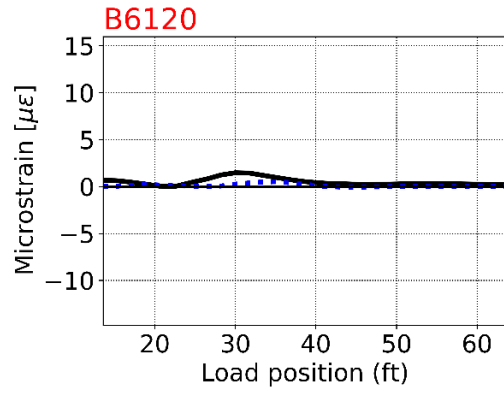
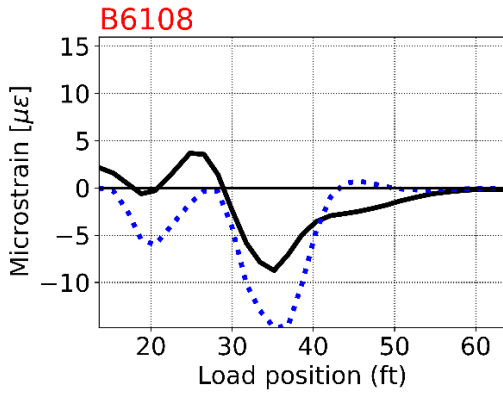


Figure B-109
Culvert #6 load path 2 calibration plots for strain sensors

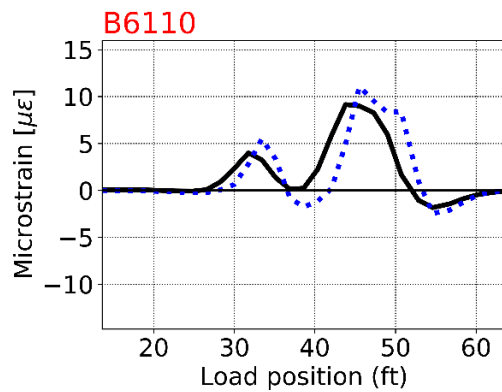
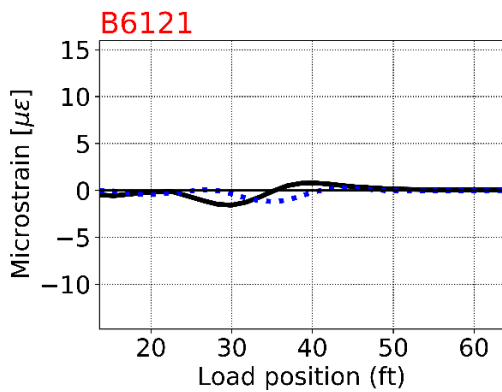
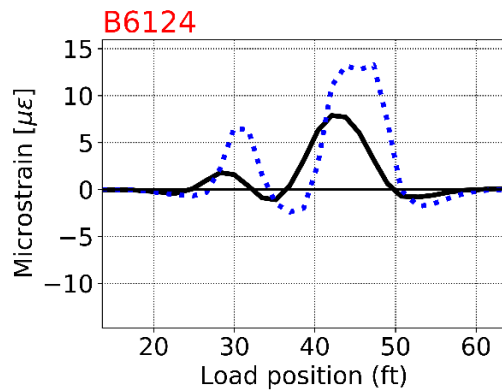
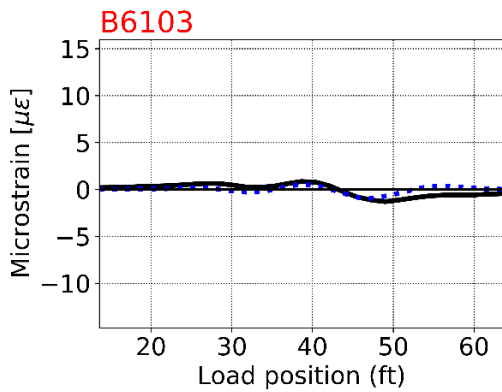
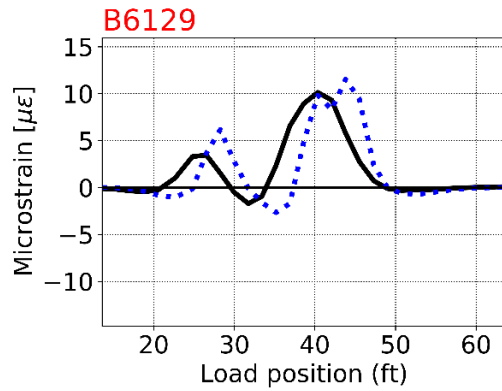
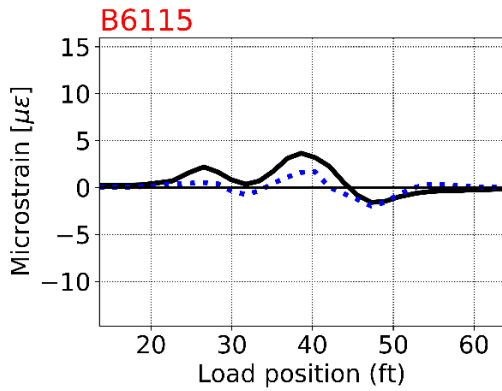
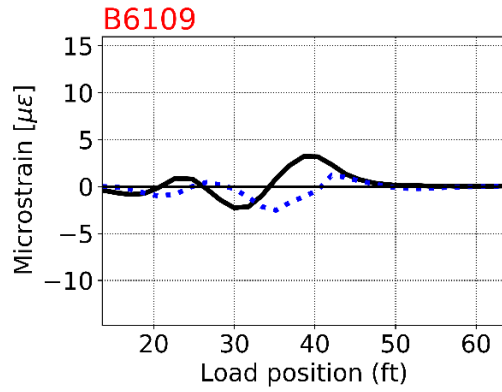
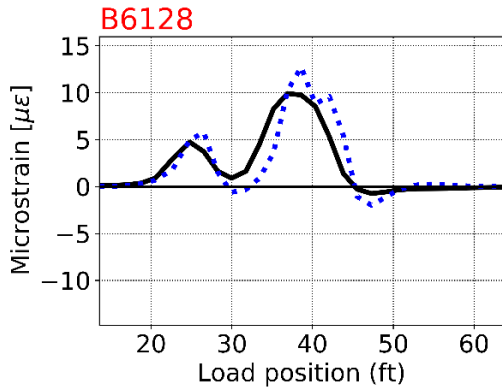


Figure B-110
Culvert #6 load path 2 calibration plots for strain sensors

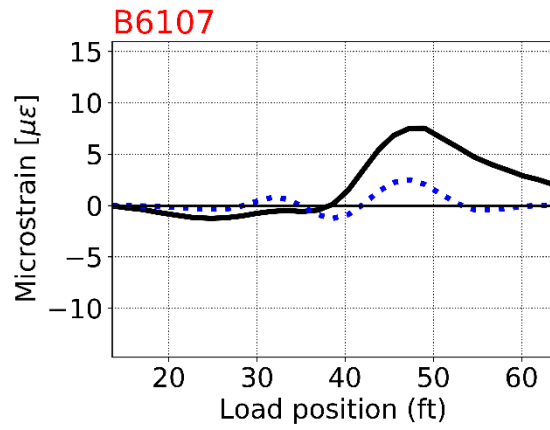
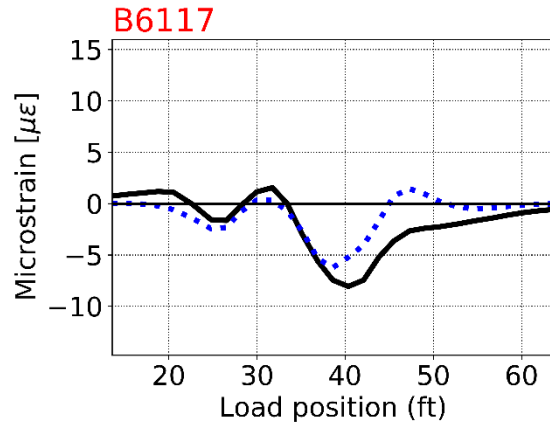


Figure B-111
Culvert #6 load path 2 calibration plots for strain sensors

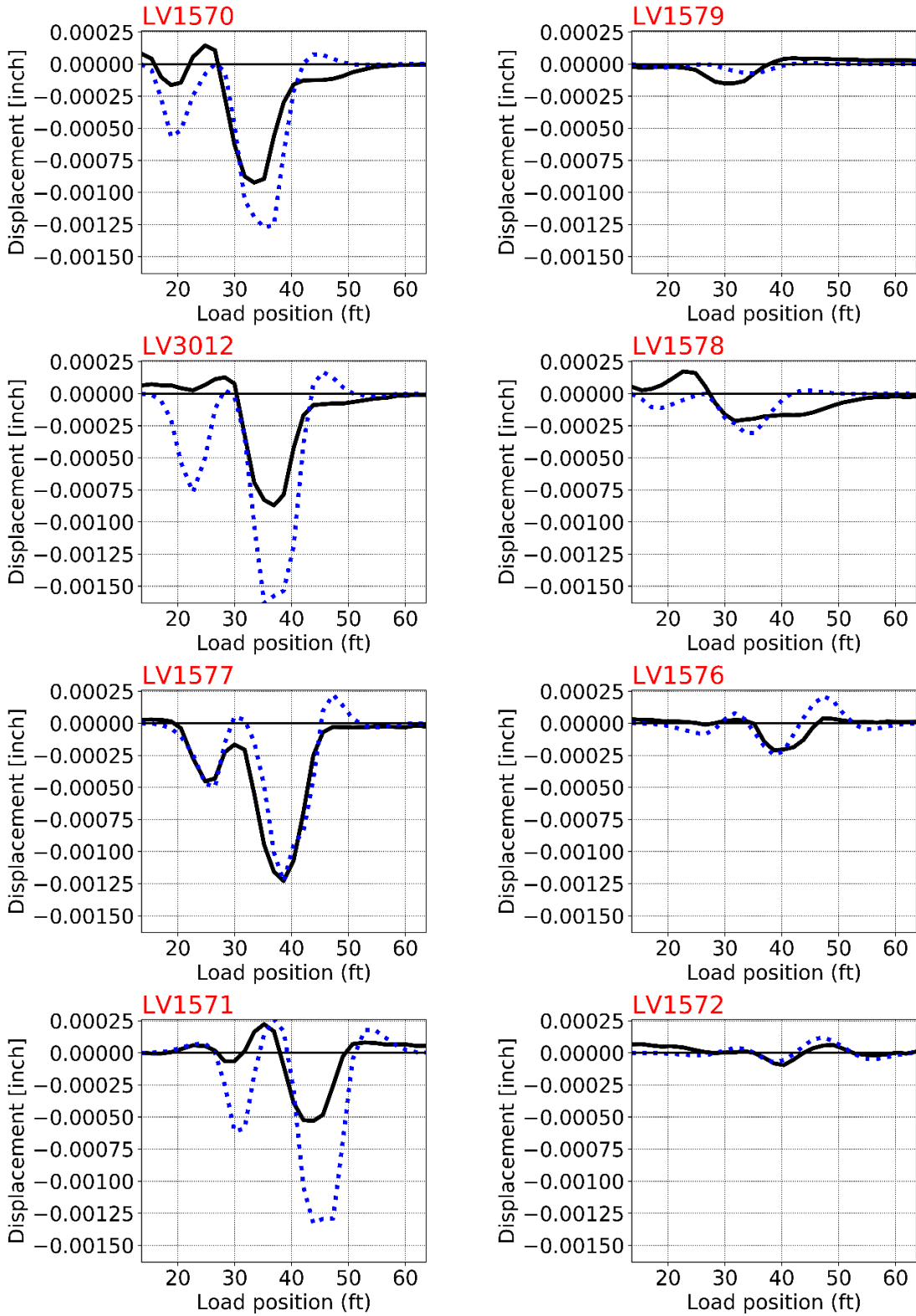


Figure B-112
Culvert #6 load path 2 calibration plots for LVDT sensors

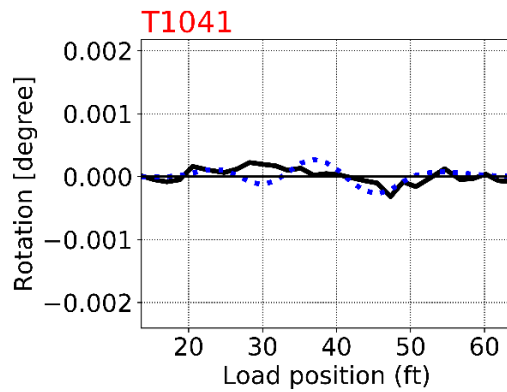
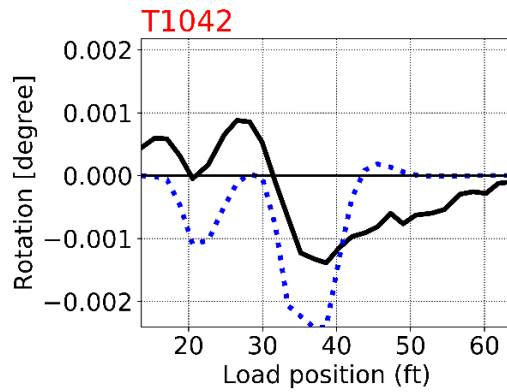
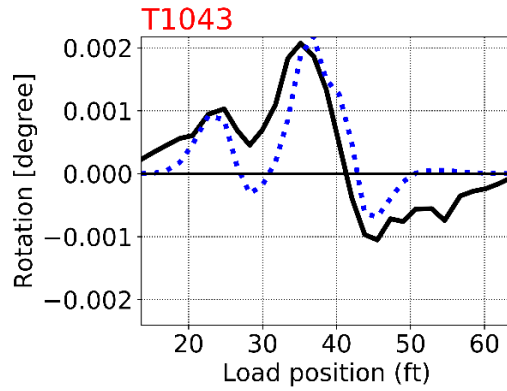
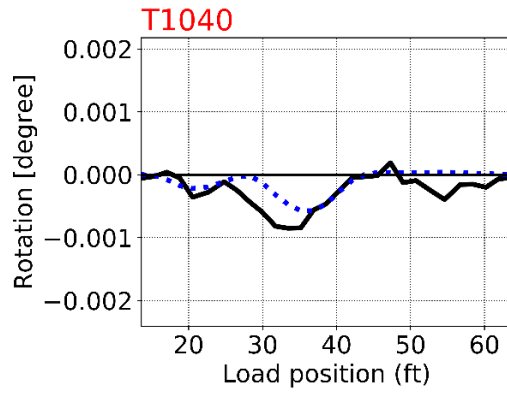


Figure B-113
Culvert #6 load path 2 calibration plots for tilt-meter sensors

Load Path 3 Sensors

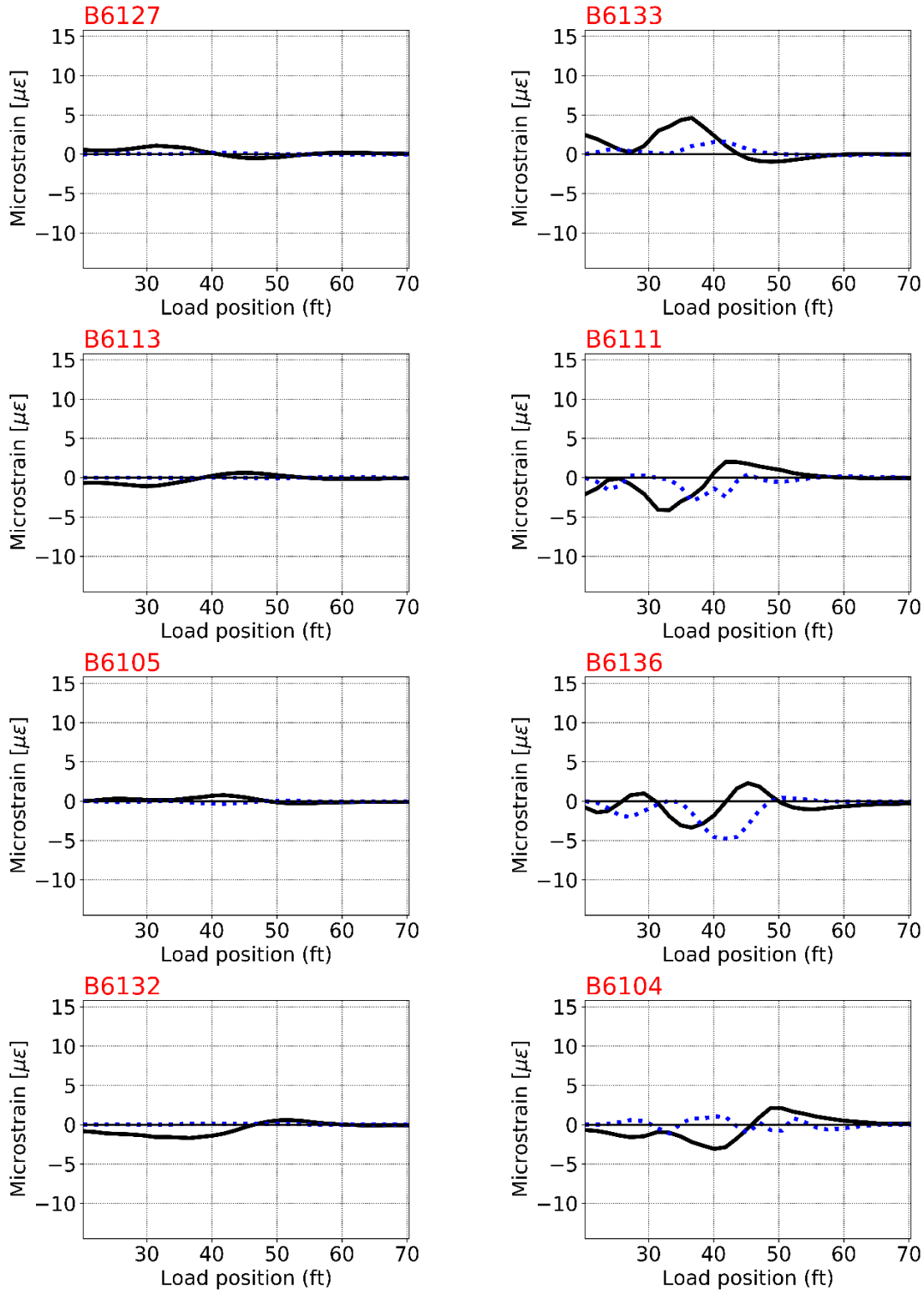


Figure B-114
Culvert #6 load path 3 calibration plots for strain sensors

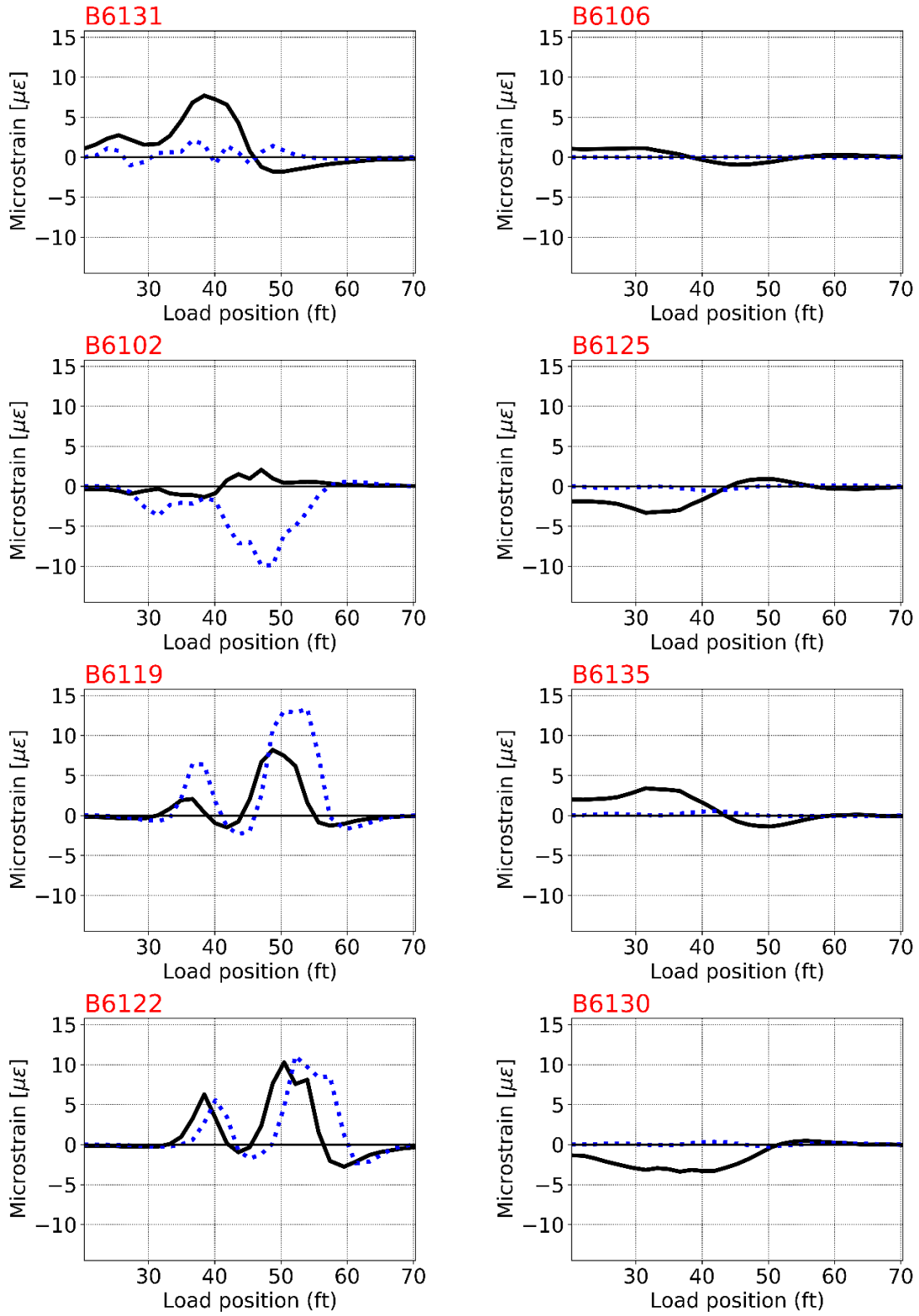


Figure B-115
Culvert #6 load path 3 calibration plots for strain sensors

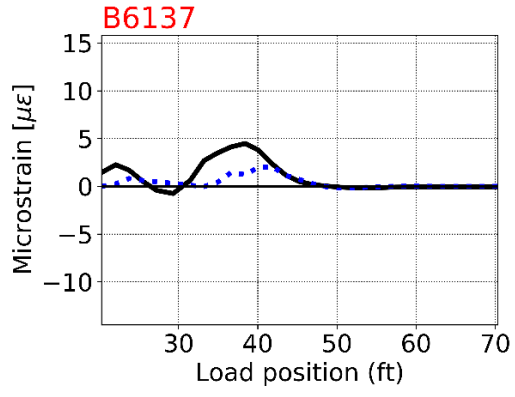
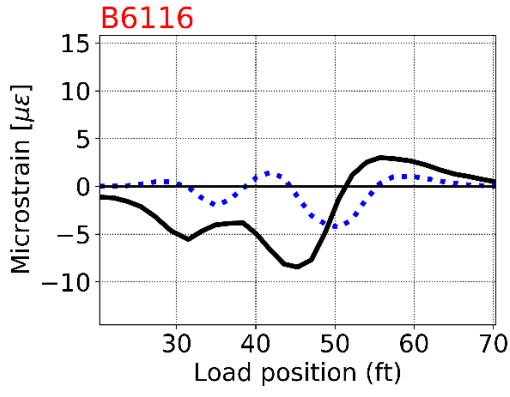
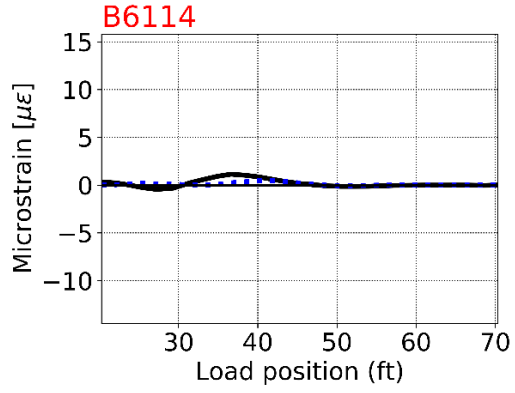
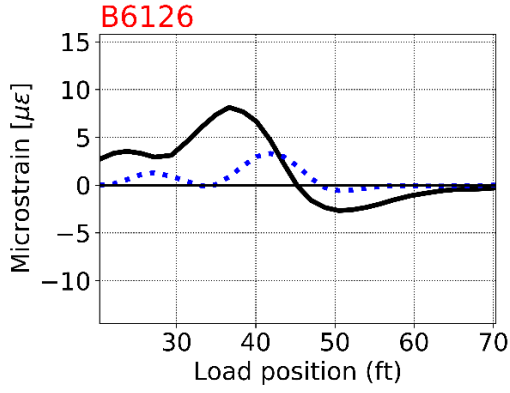
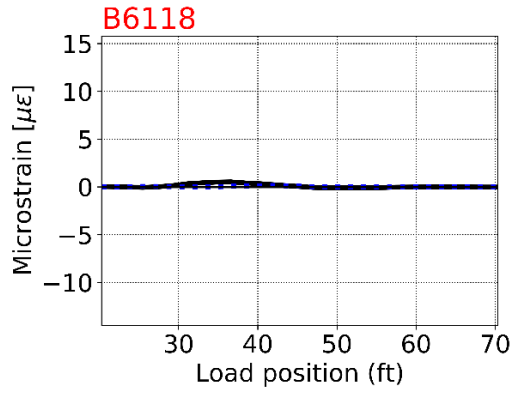
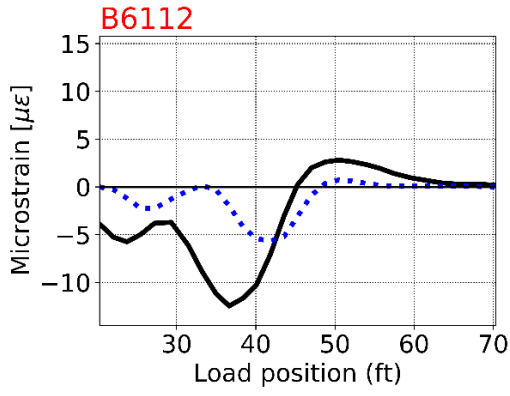
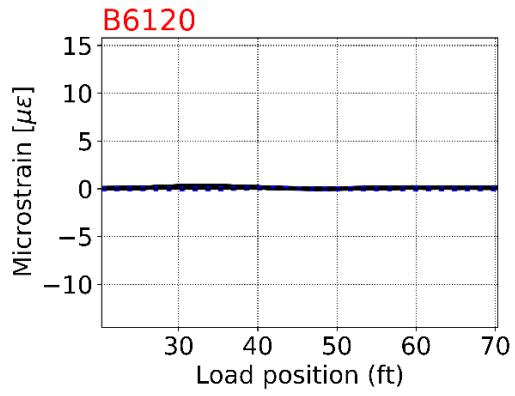
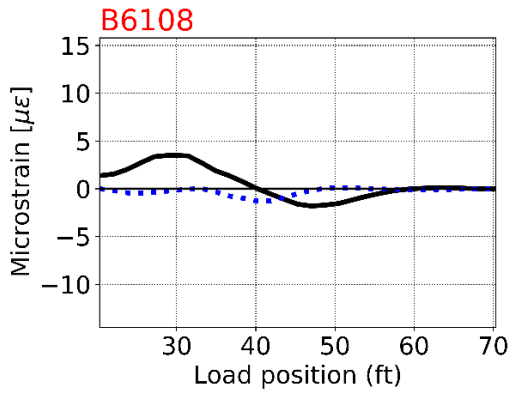


Figure B-116
Culvert #6 load path 3 calibration plots for strain sensors

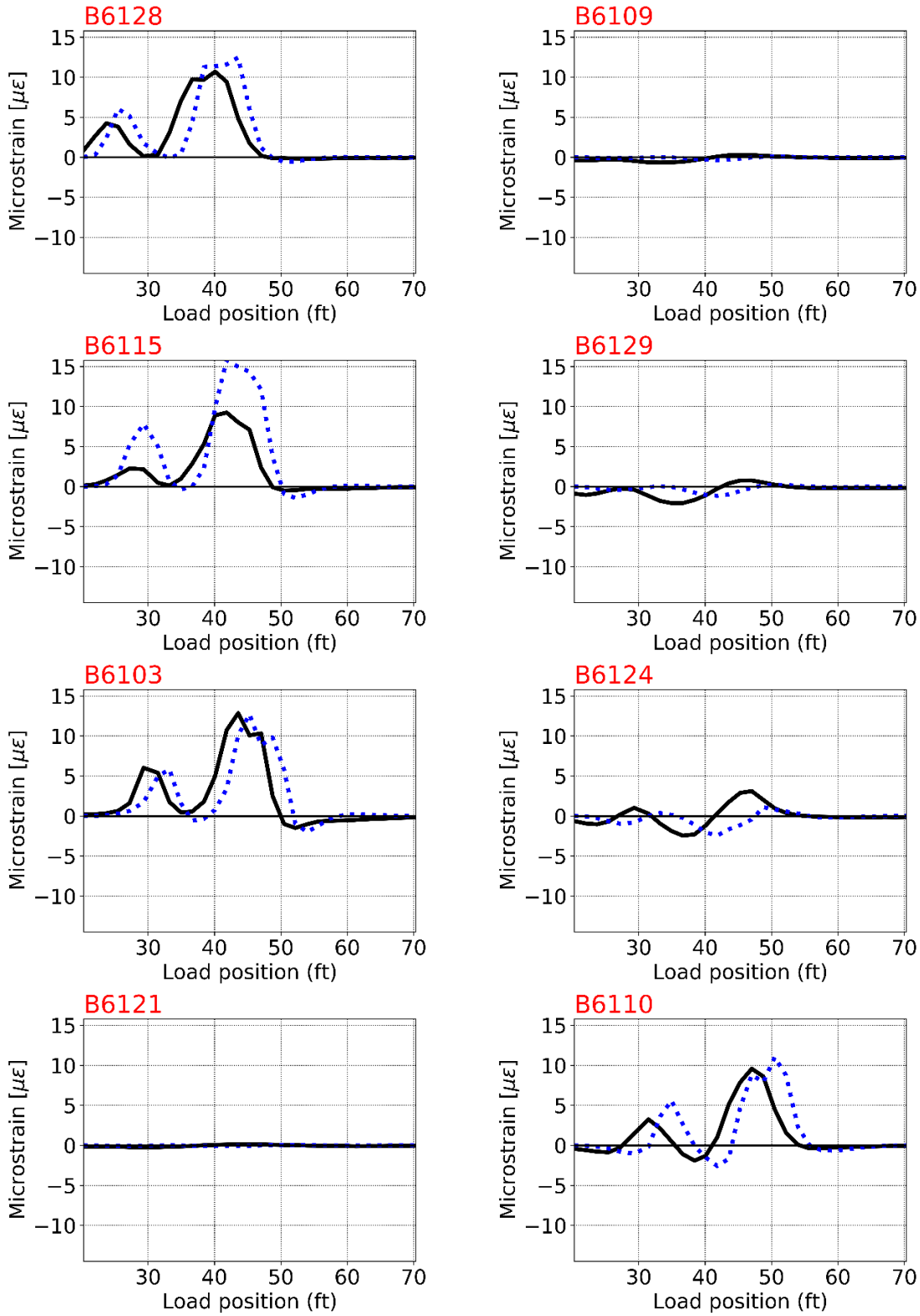


Figure B-117
Culvert #6 load path 3 calibration plots for strain sensors

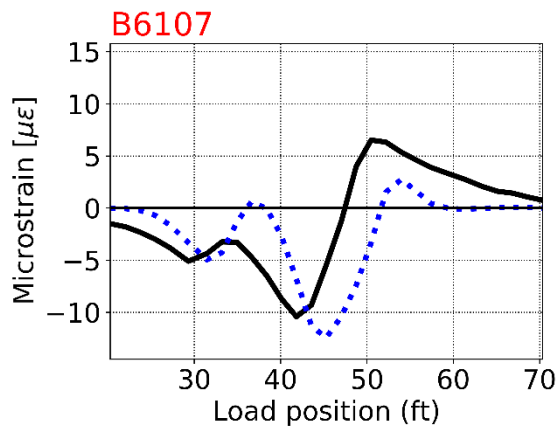
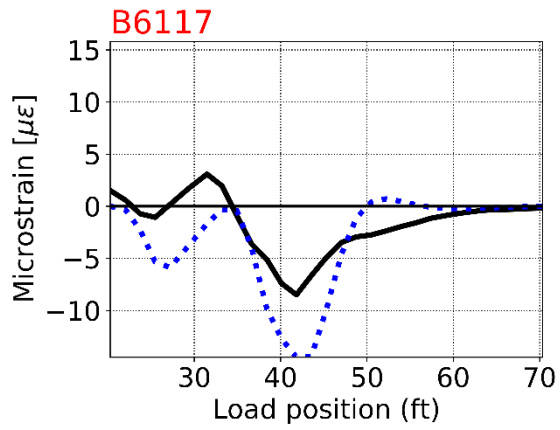


Figure B-118
Culvert #6 load path 3 calibration plots for strain sensors

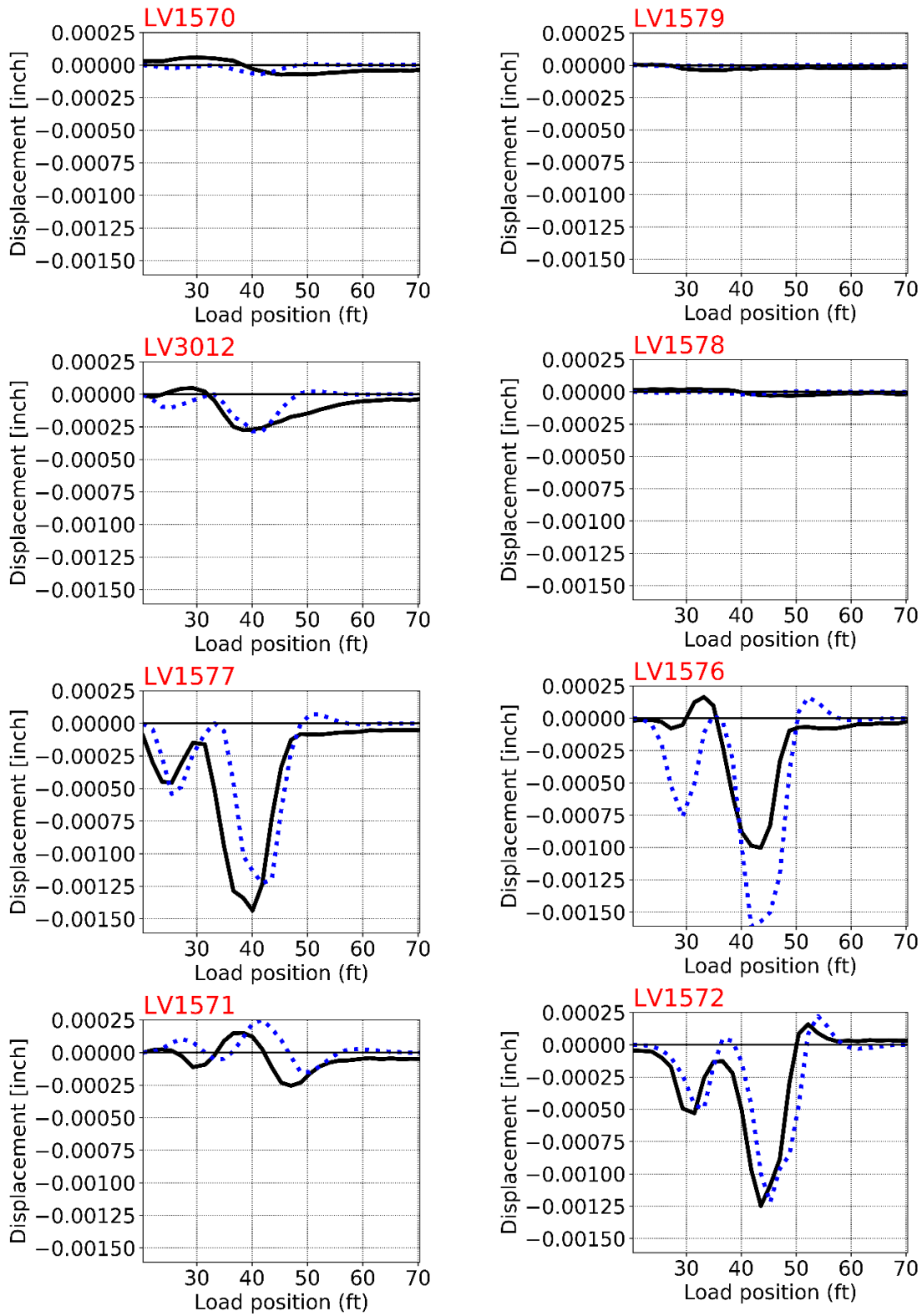


Figure B-119
Culvert #6 load path 3 calibration plots for LVDT sensors

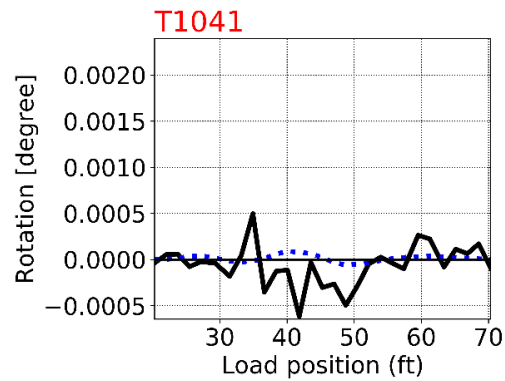
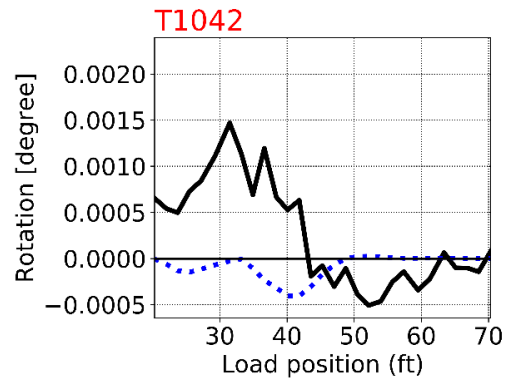
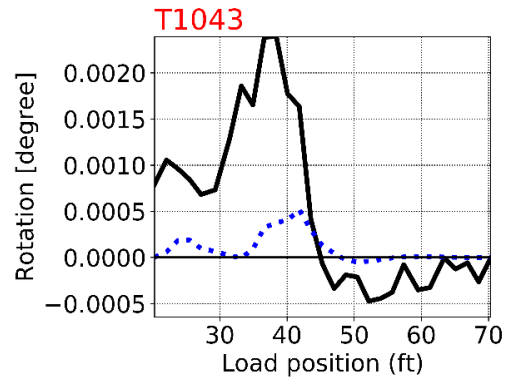
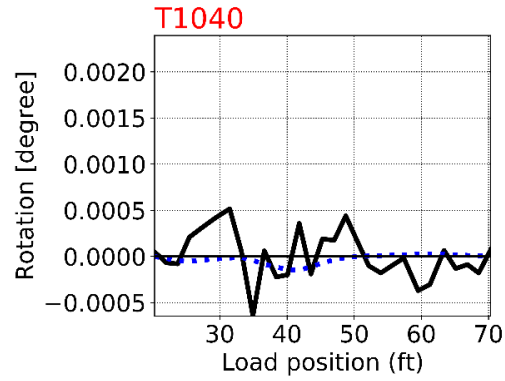


Figure B-120
Culvert #7 load path 1 calibration plots for tilt-meter sensors

Culvert #7

Load Path 1 Sensors

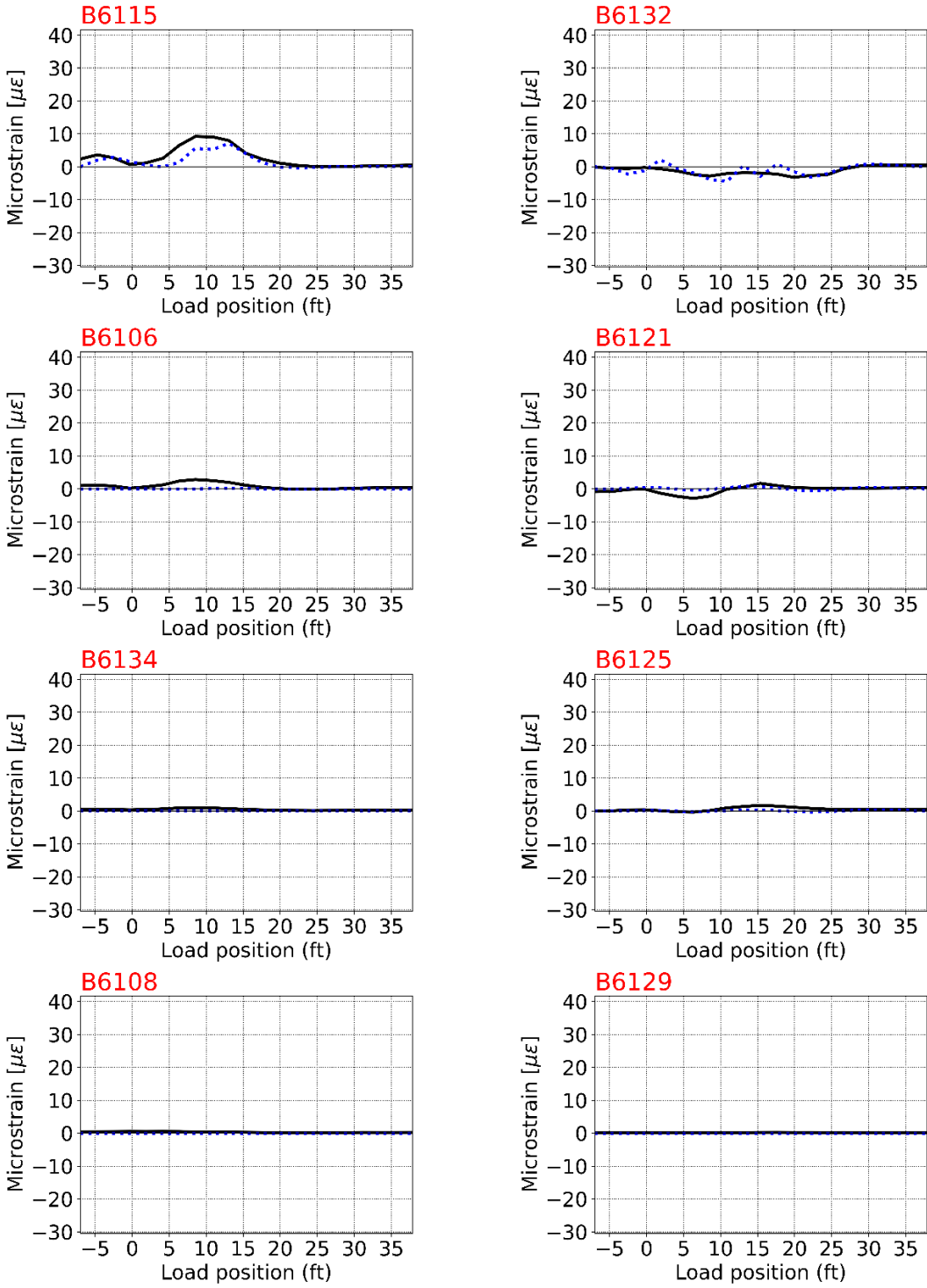


Figure B-121
Culvert #7 load path 1 calibration plots for strain sensors

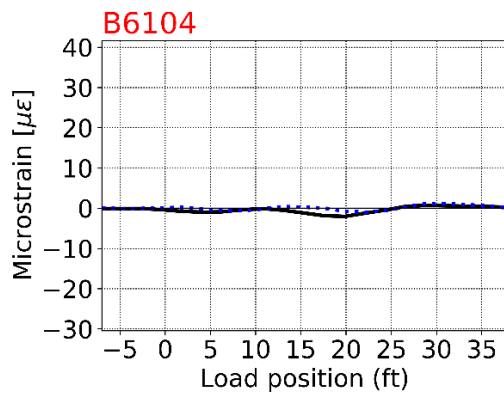
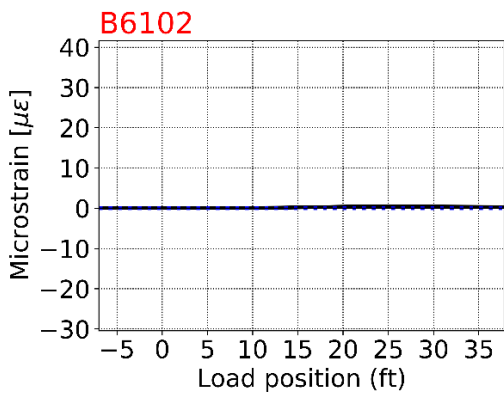
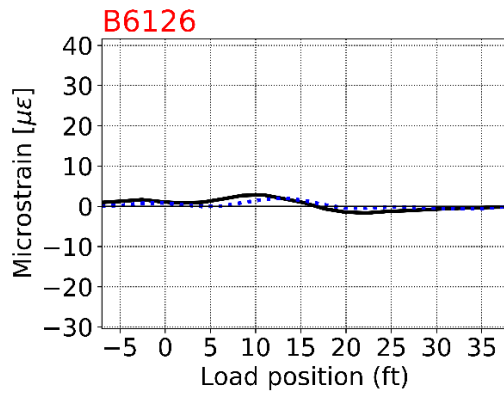
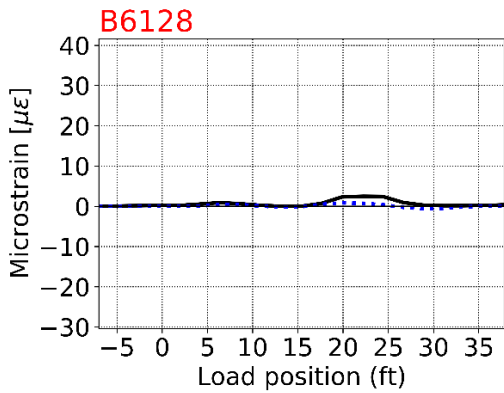
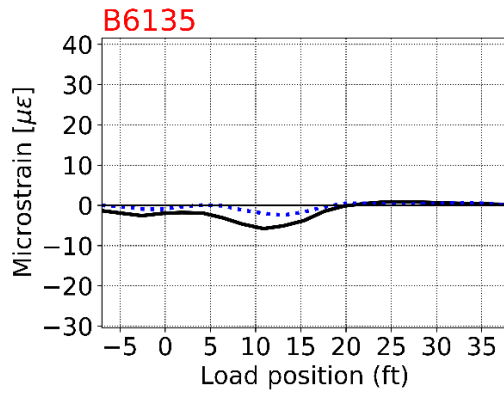
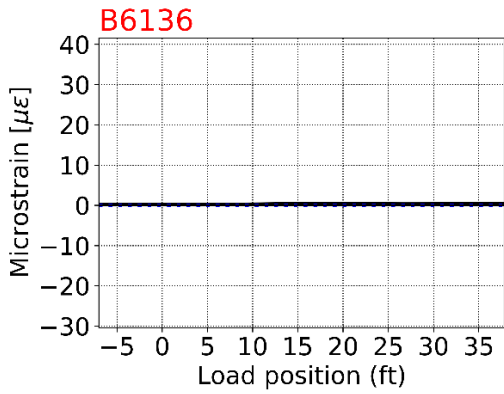
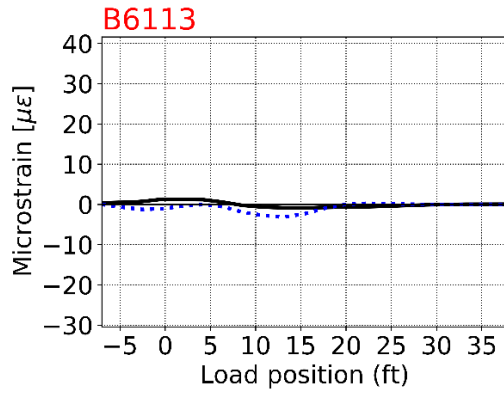
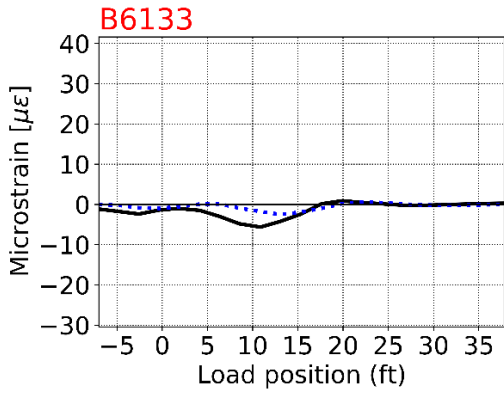


Figure B-122
Culvert #7 load path 1 calibration plots for strain sensors

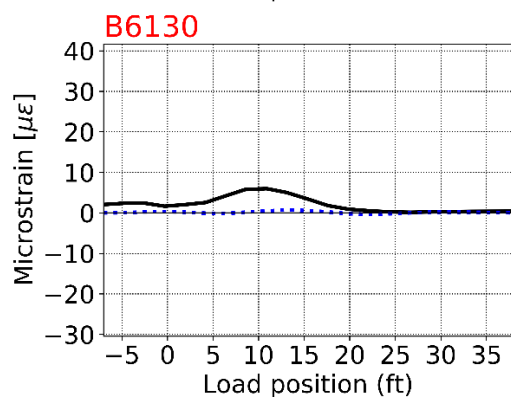
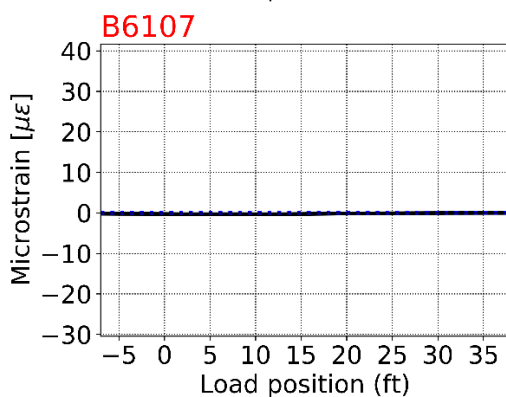
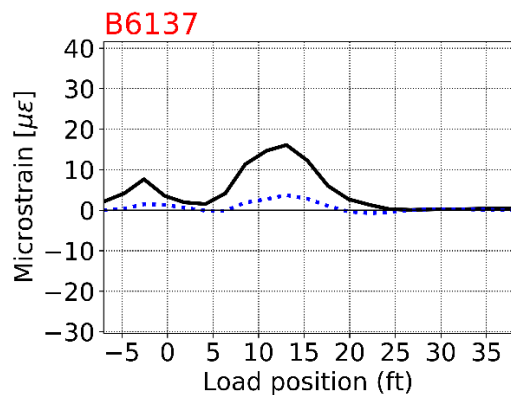
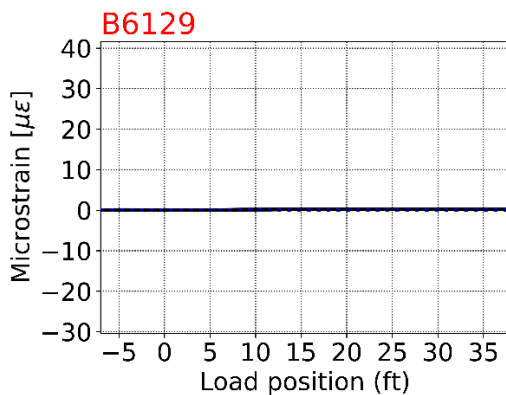
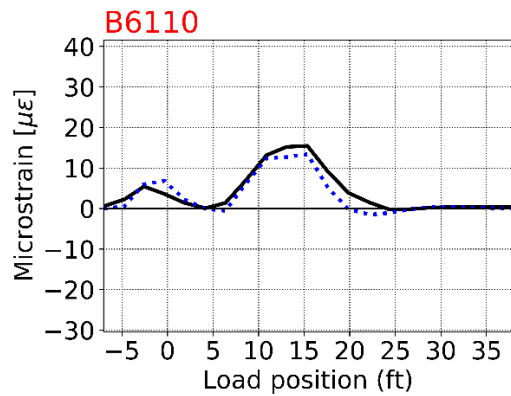
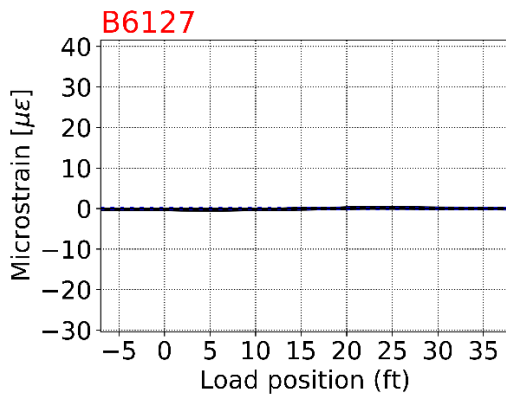
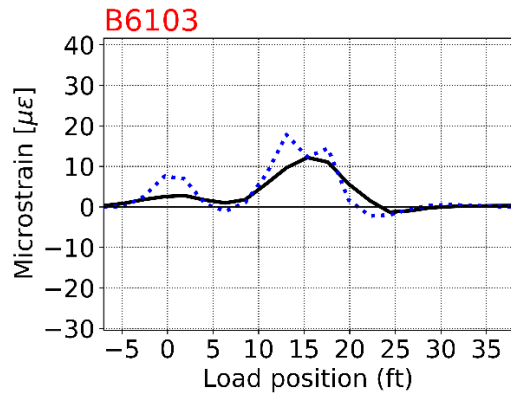
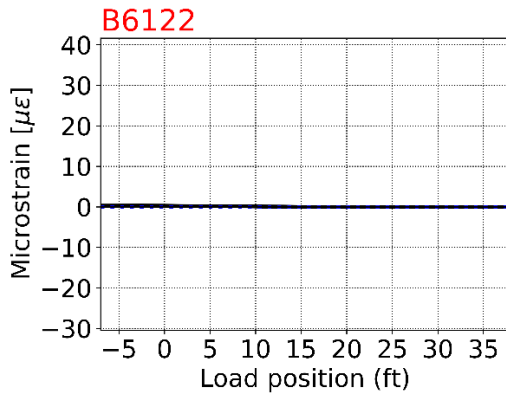


Figure B-123
Culvert #7 load path 1 calibration plots for strain sensors

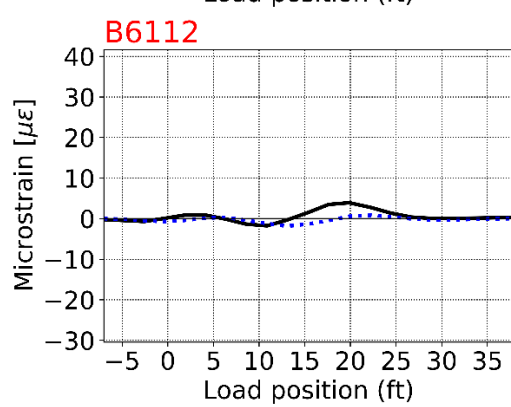
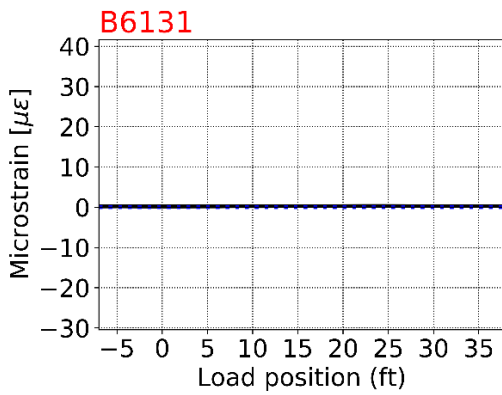
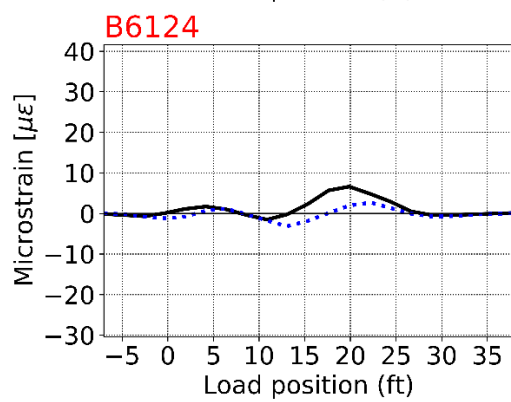
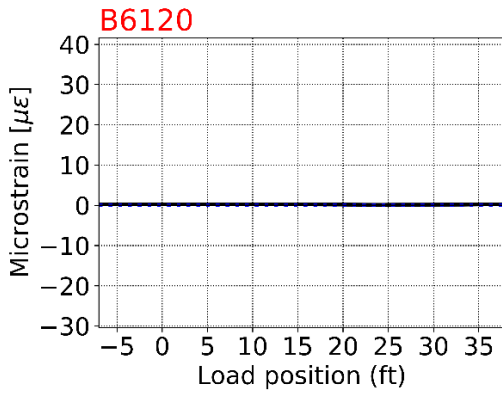
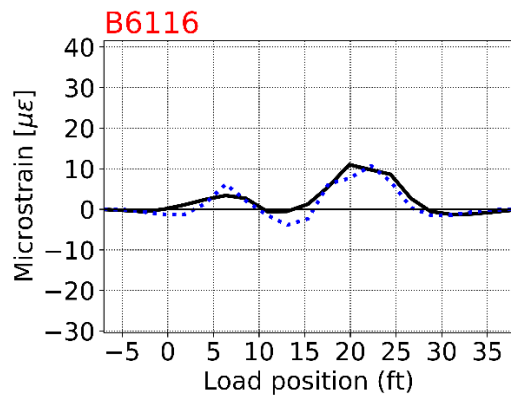
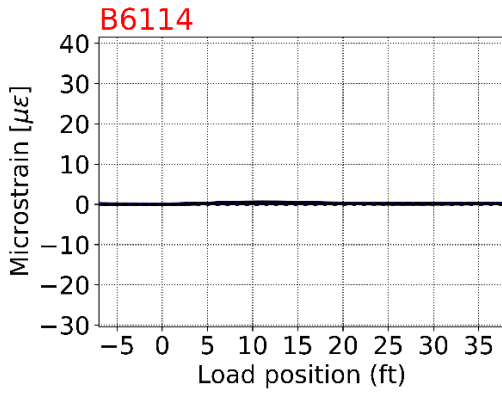
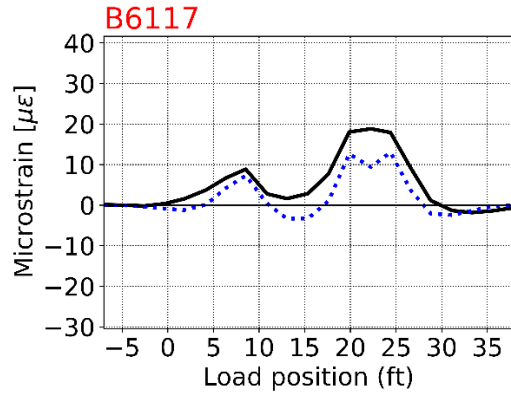
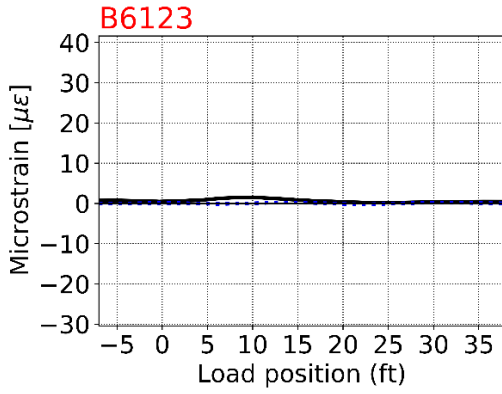


Figure B-124
Culvert #7 load path 1 calibration plots for strain sensors

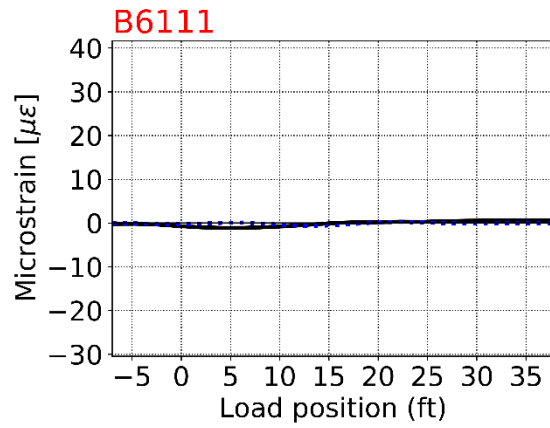
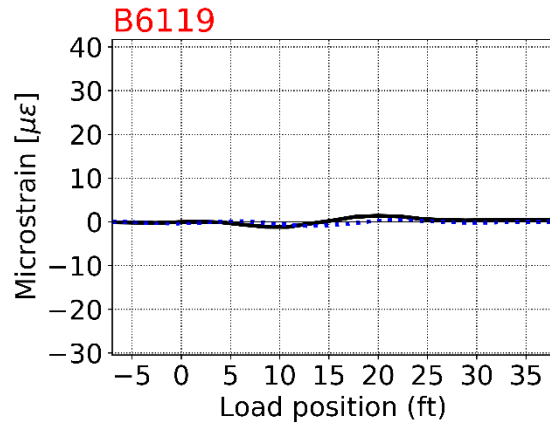


Figure B-125
Culvert #7 load path 1 calibration plots for strain sensors

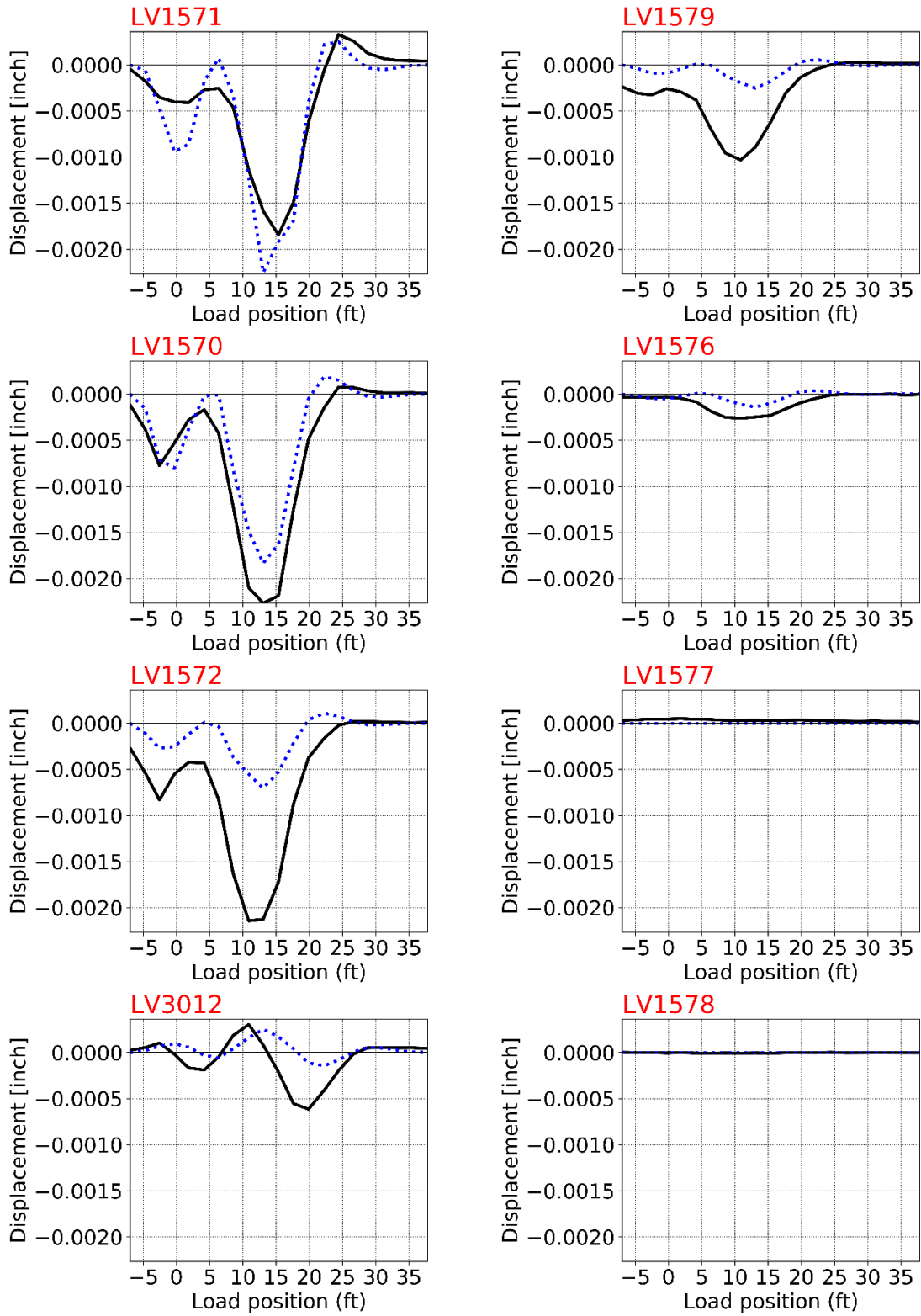


Figure B-126
Culvert #7 load path 1 calibration plots for LVDT sensors

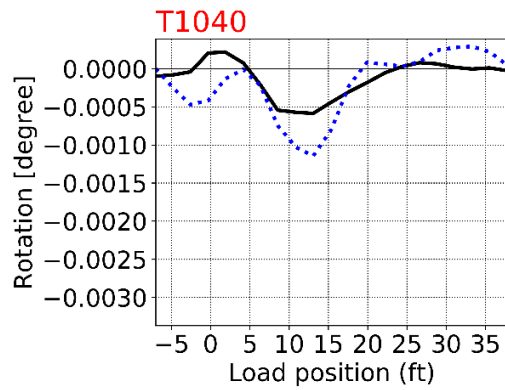
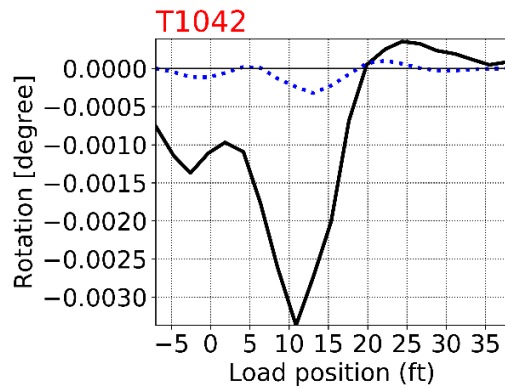
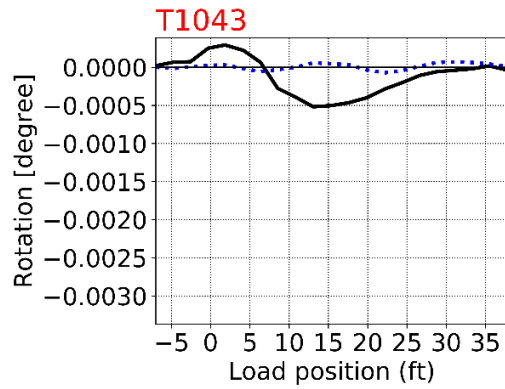
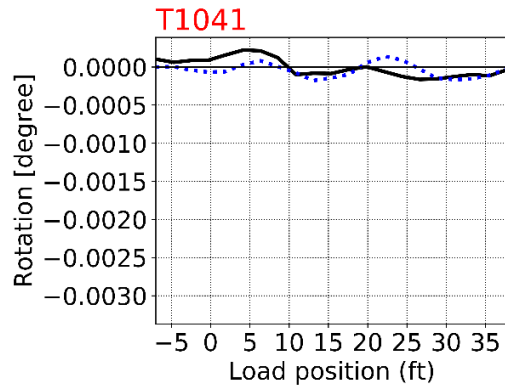


Figure B-127
Culvert #7 load path 1 calibration plots for tilt-meter sensors

Load Path 2 Sensors

Figure B-128
Culvert #7 load path 2 calibration plots for strain sensors

Figure B-129
Culvert #7 load path 2 calibration plots for strain sensors

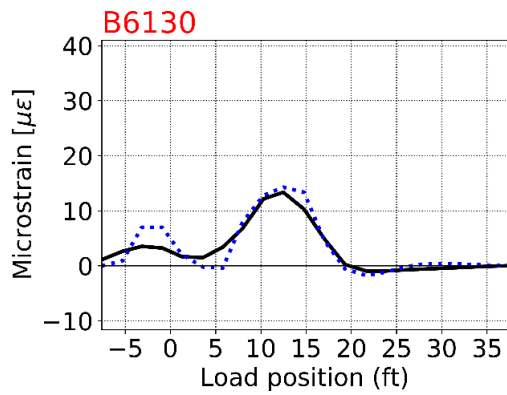
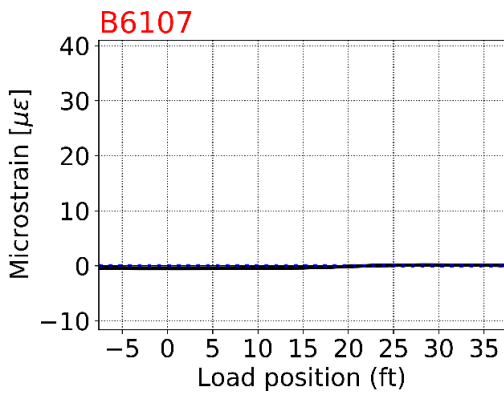
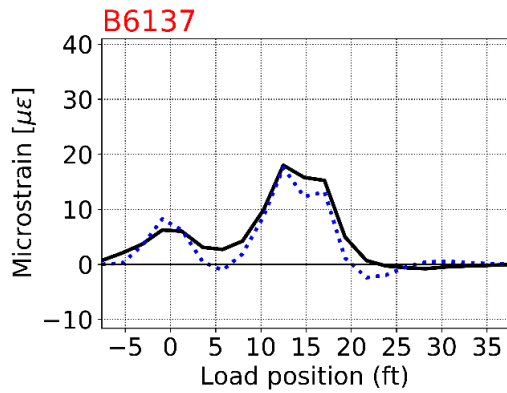
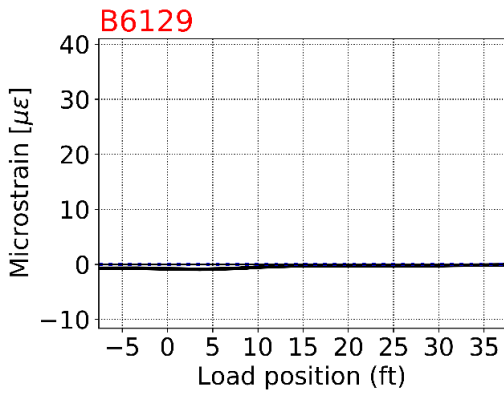
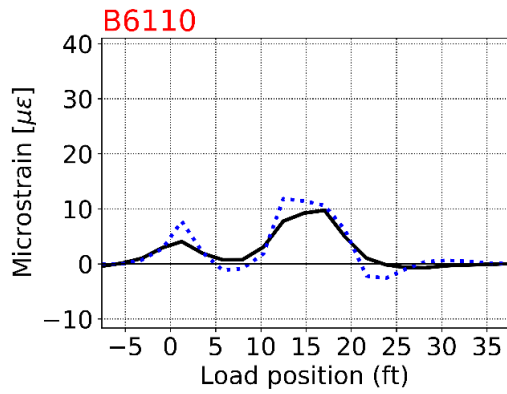
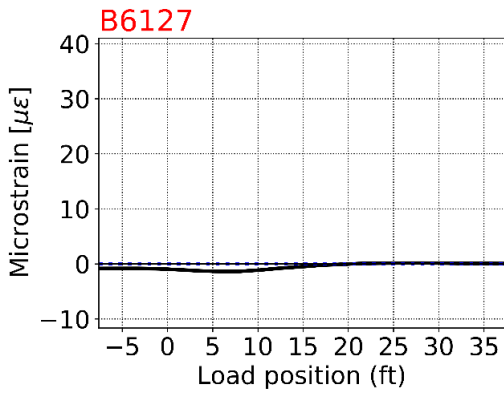
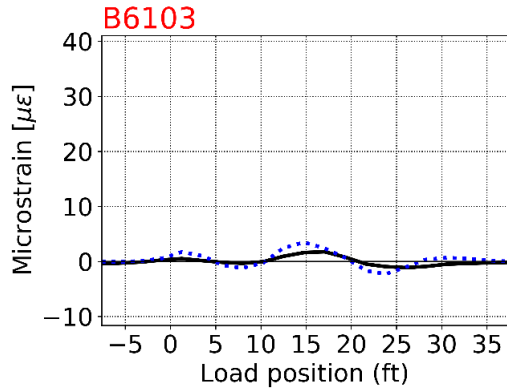
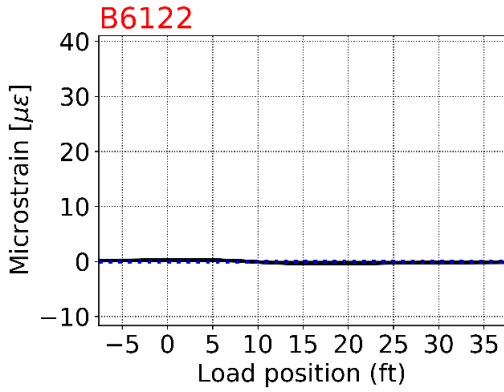


Figure B-130
Culvert #7 load path 2 calibration plots for strain sensors

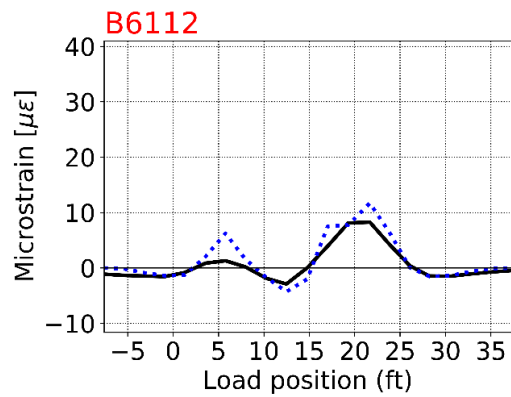
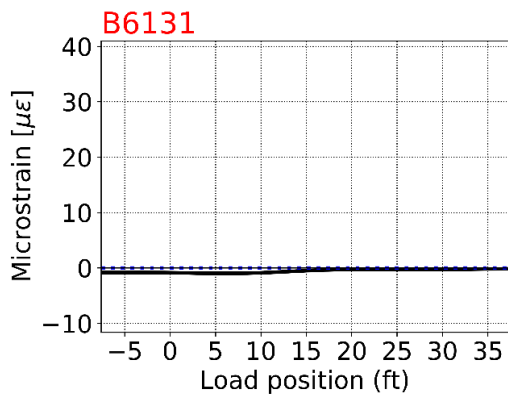
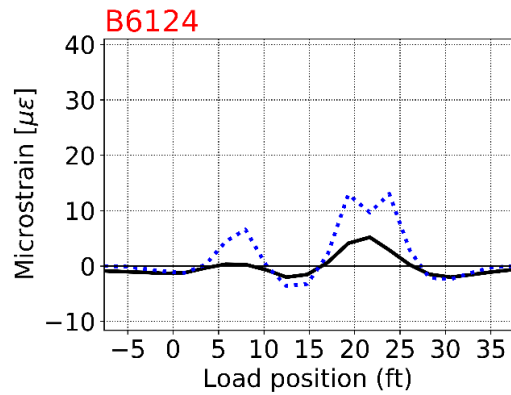
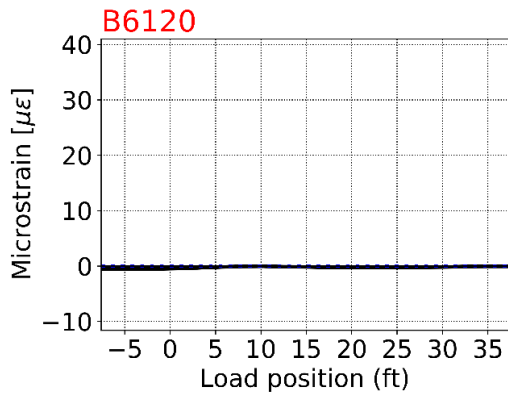
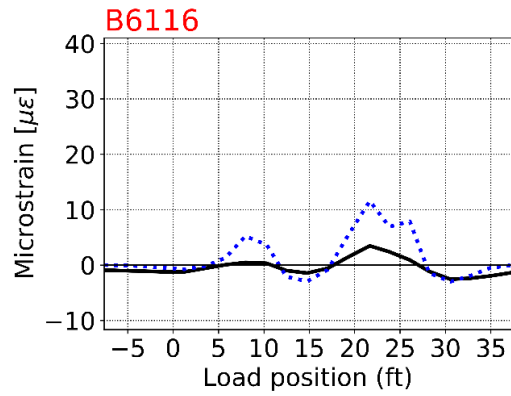
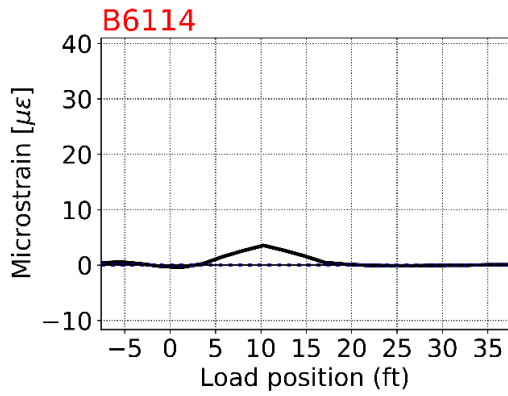
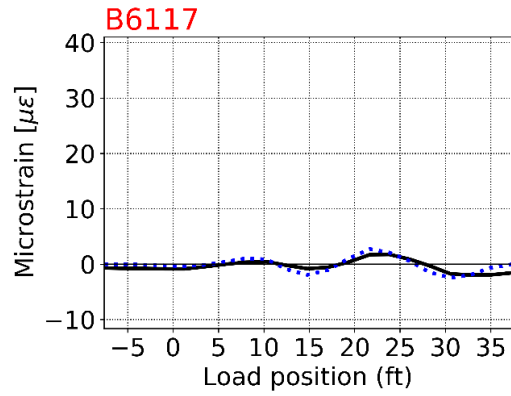
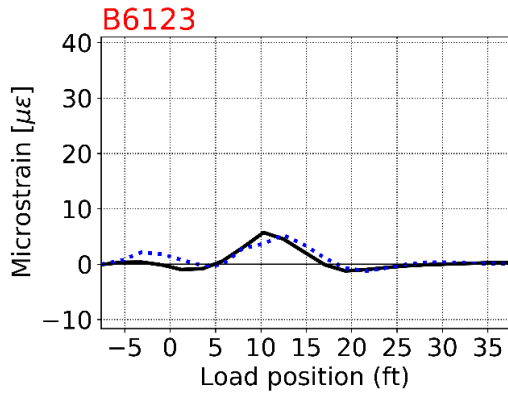


Figure B-131
Culvert #7 load path 2 calibration plots for strain sensors

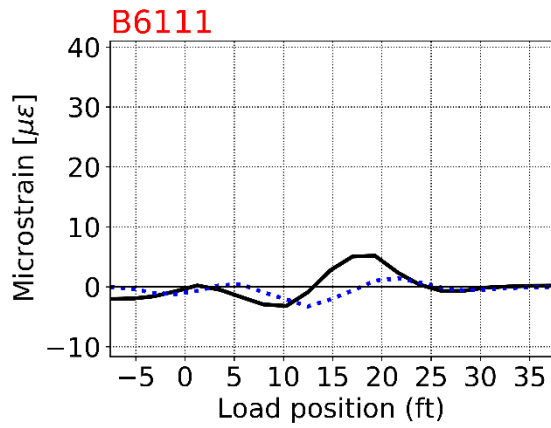
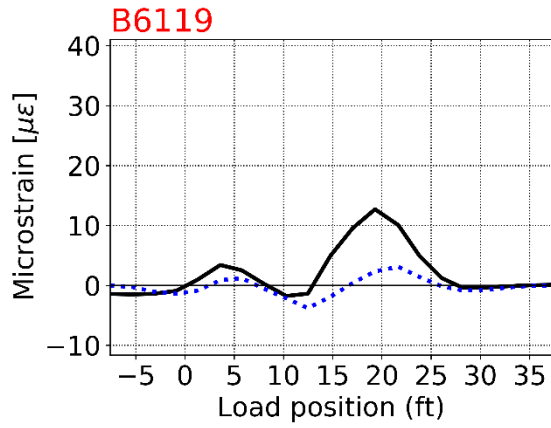


Figure B-132
Culvert #7 load path 2 calibration plots for strain sensors

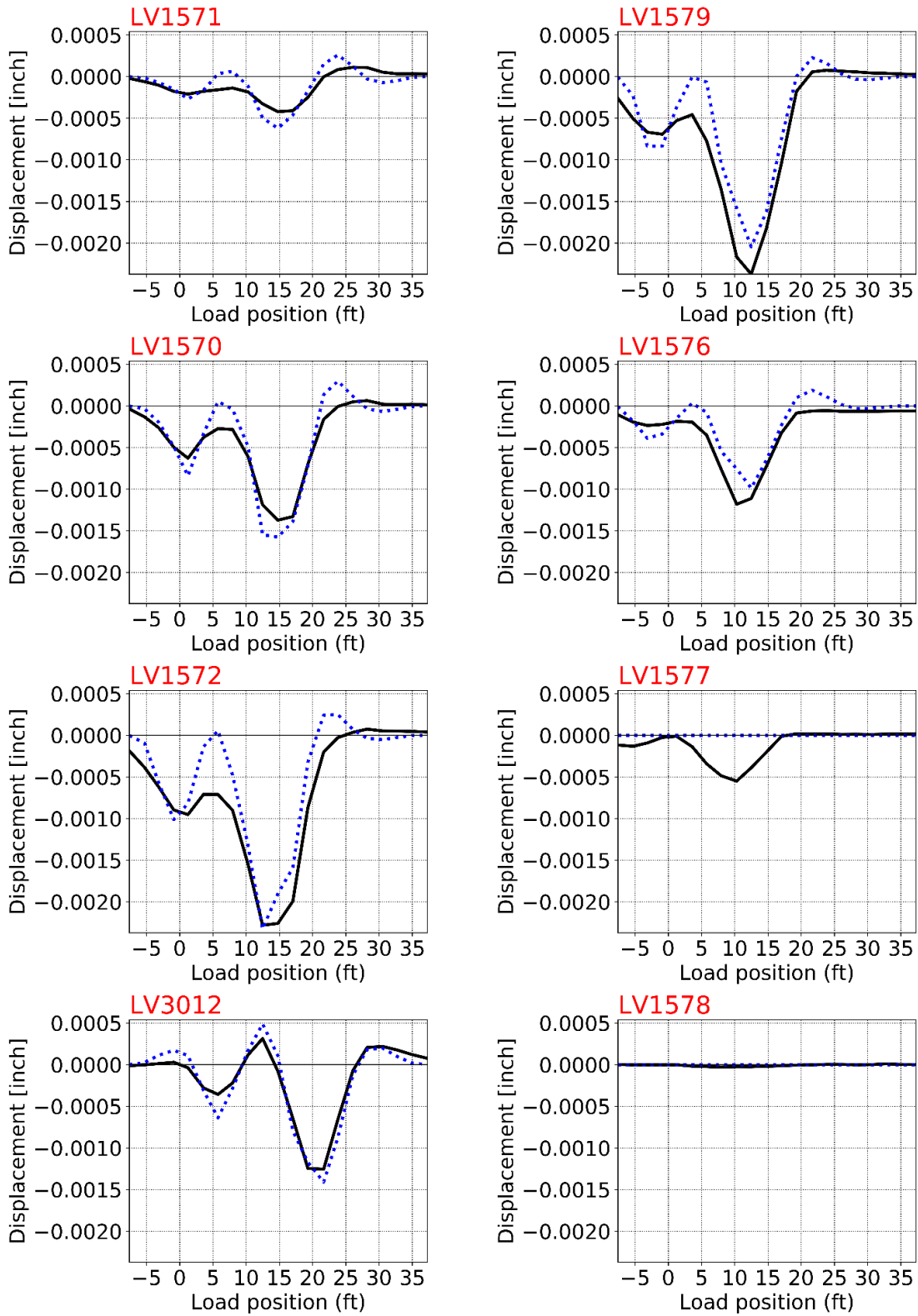


Figure B-133
Culvert #7 load path 2 calibration plots for LVDT sensors

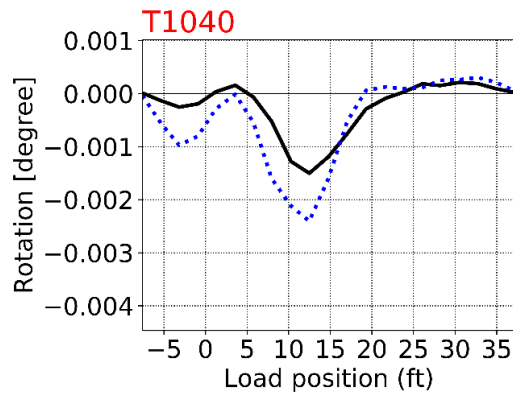
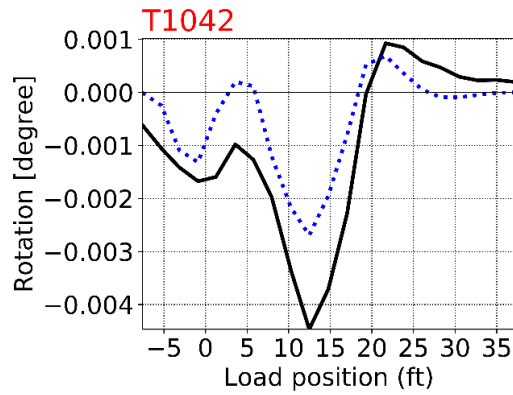
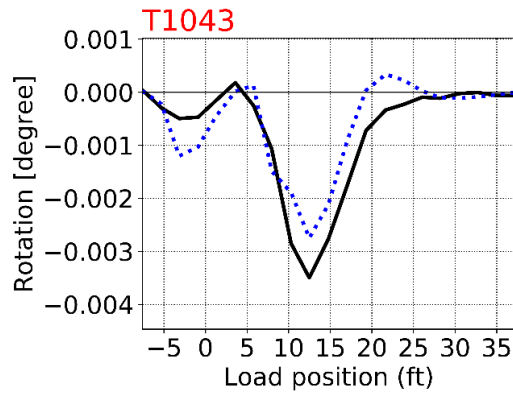
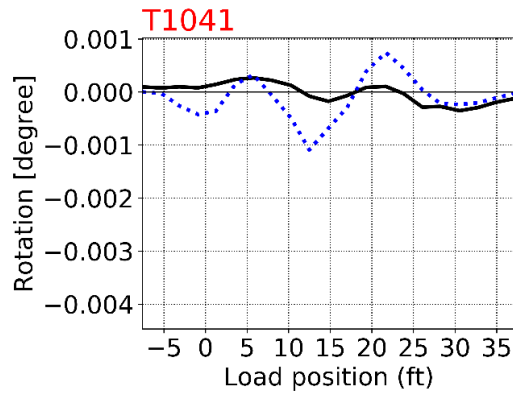


Figure B-134
Culvert #7 load path 2 calibration plots for tilt-meter sensors

Load Path 3 Sensors

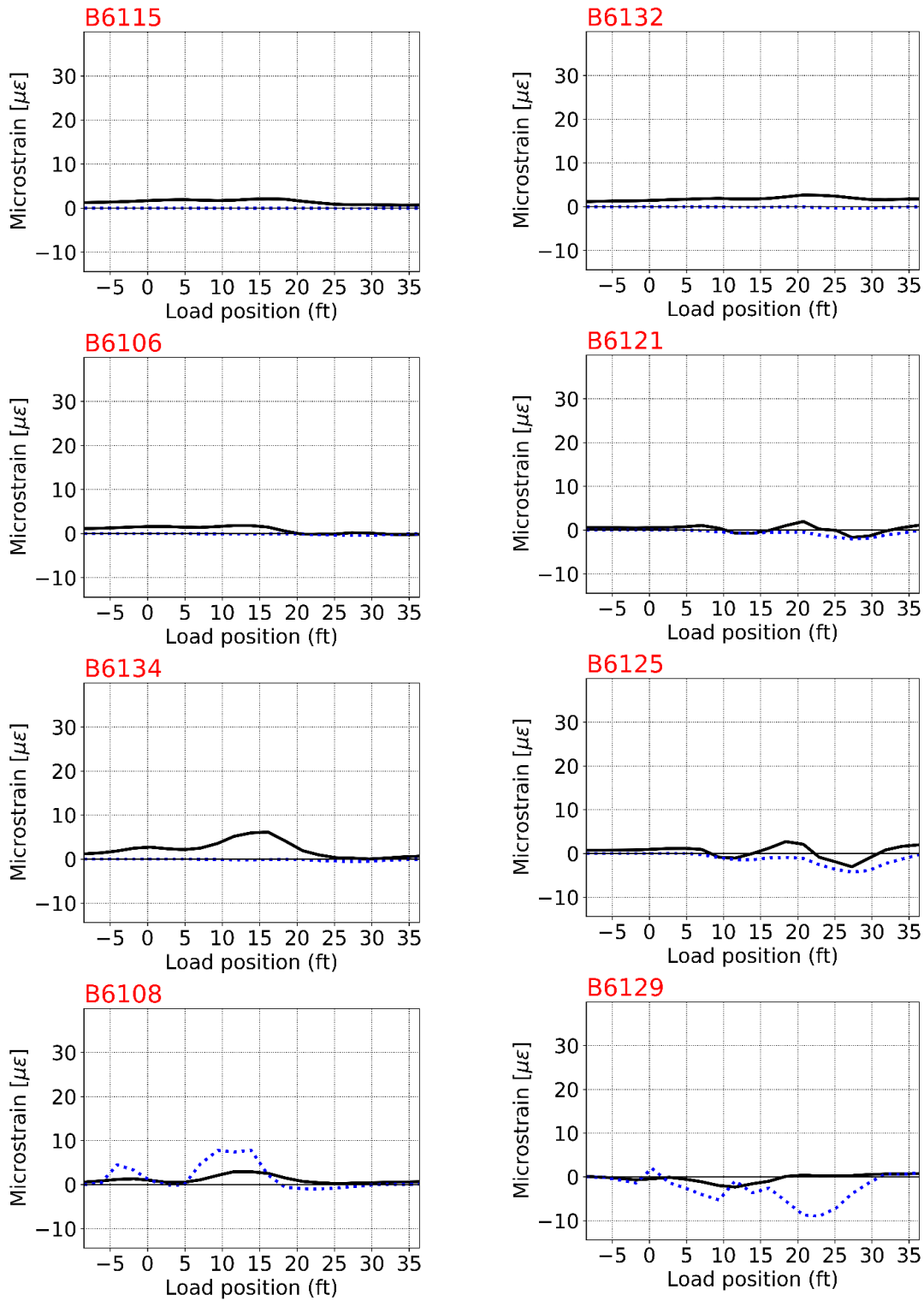


Figure B-135
Culvert #7 load path 3 calibration plots for strain sensors

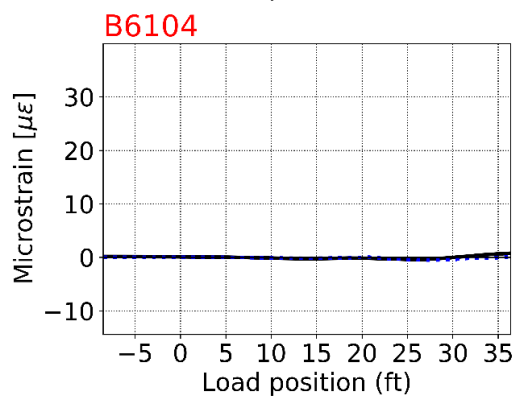
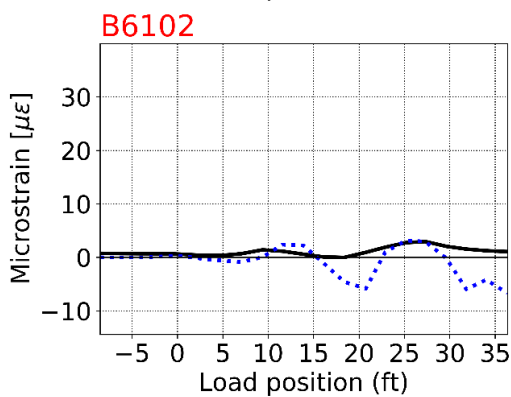
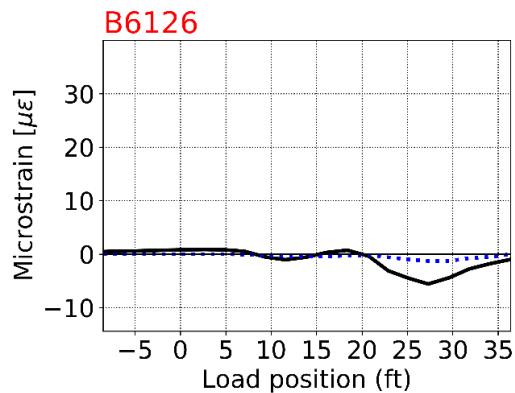
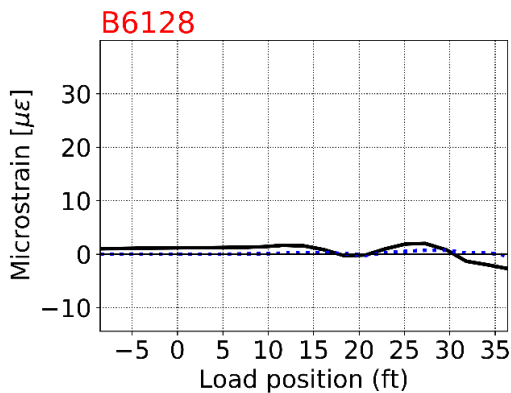
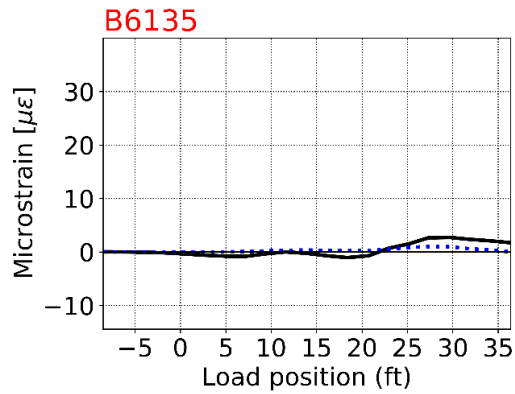
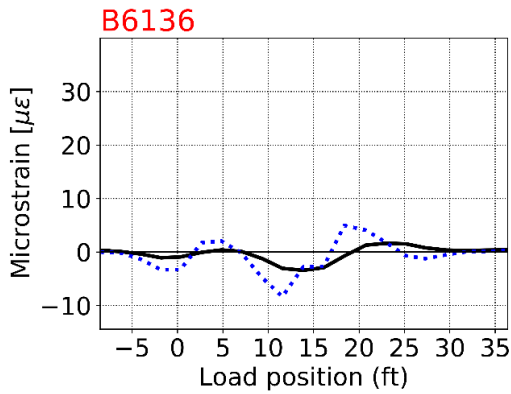
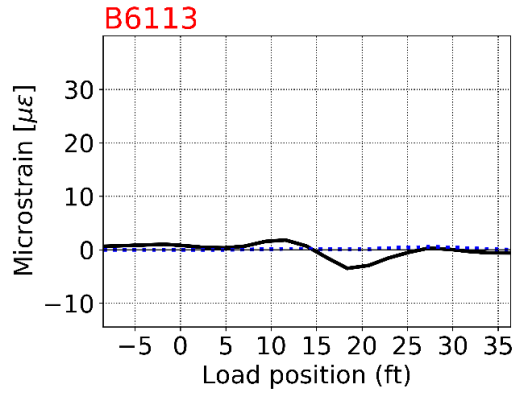
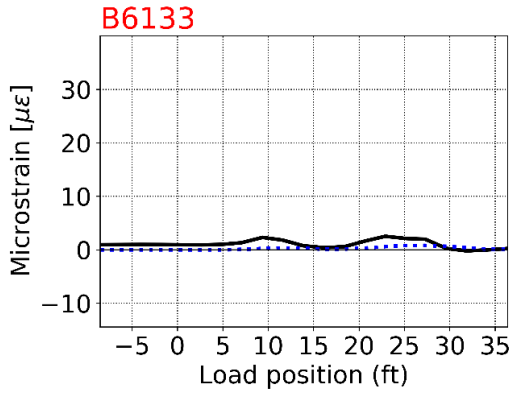


Figure B-136
Culvert #7 load path 3 calibration plots for strain sensors

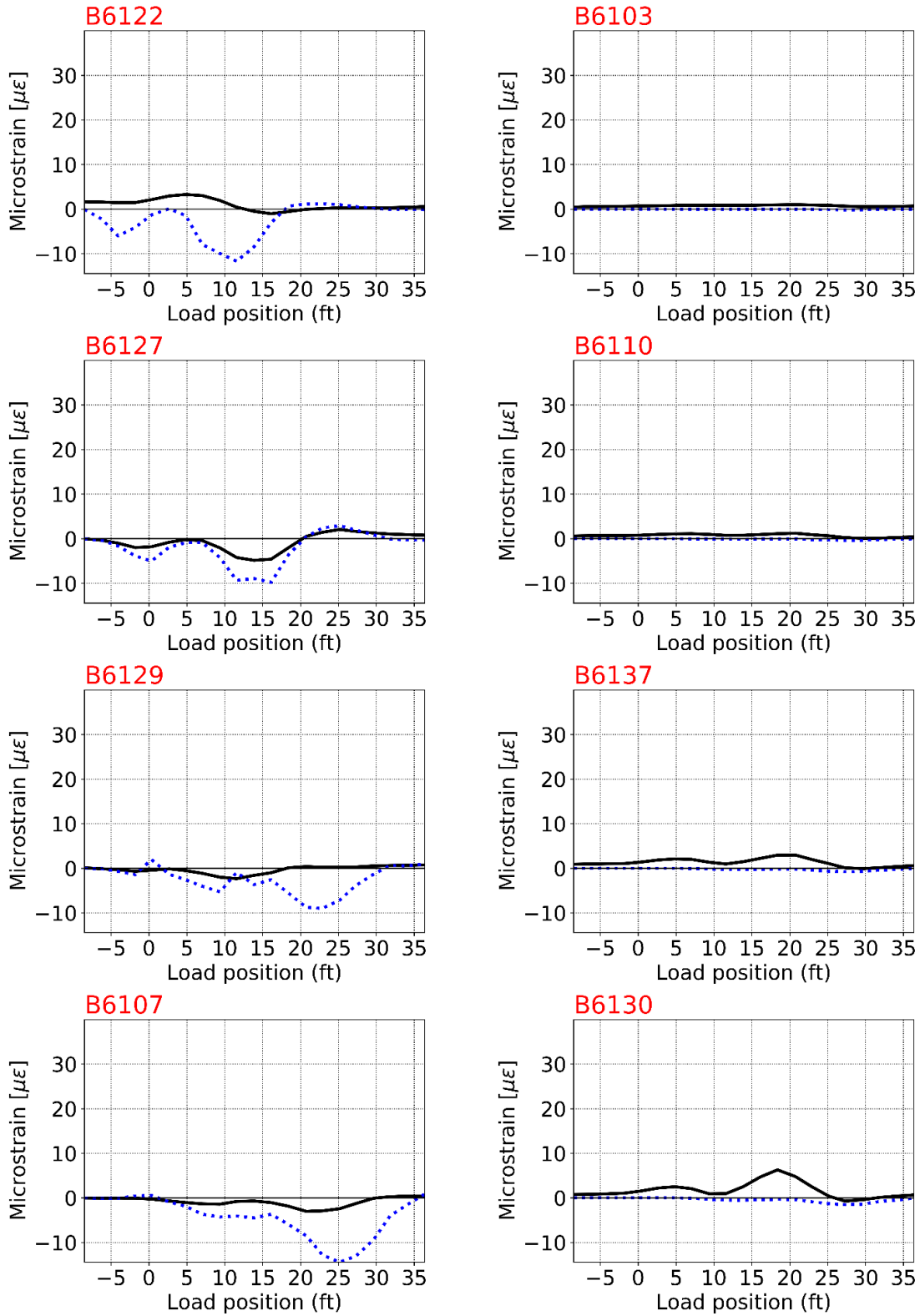


Figure B-137
Culvert #7 load path 3 calibration plots for strain sensors

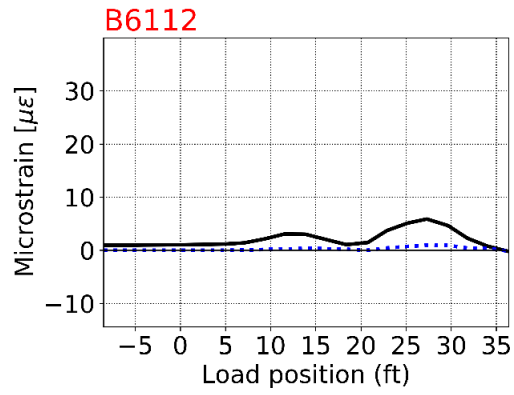
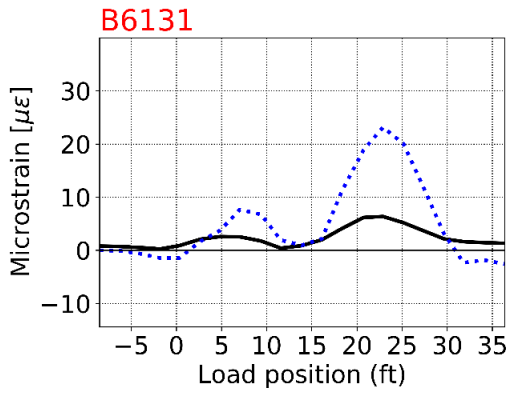
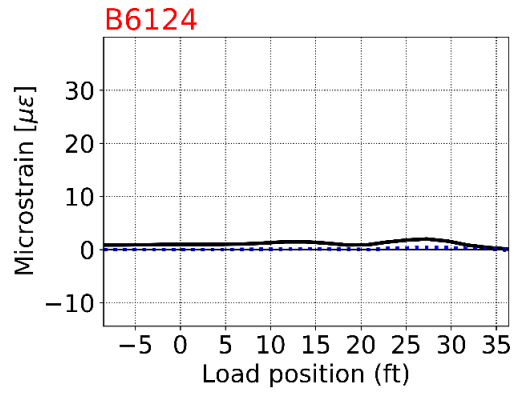
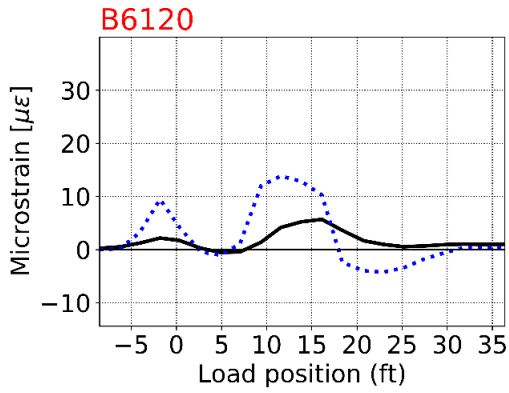
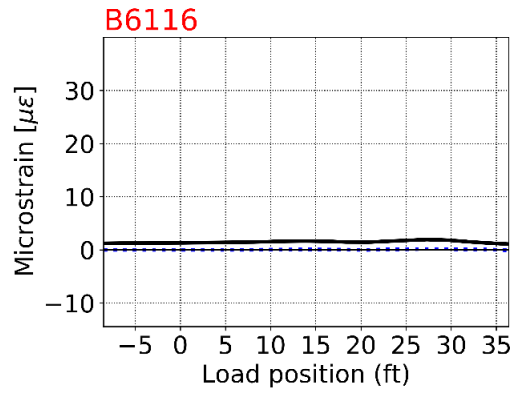
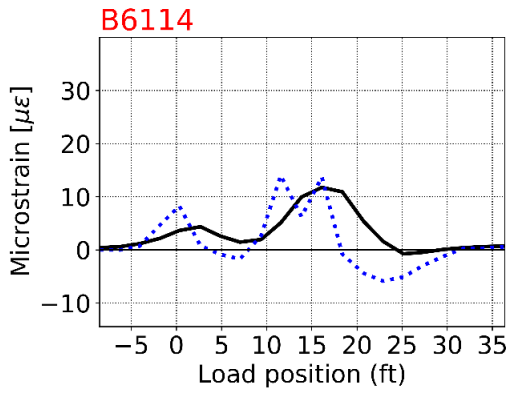
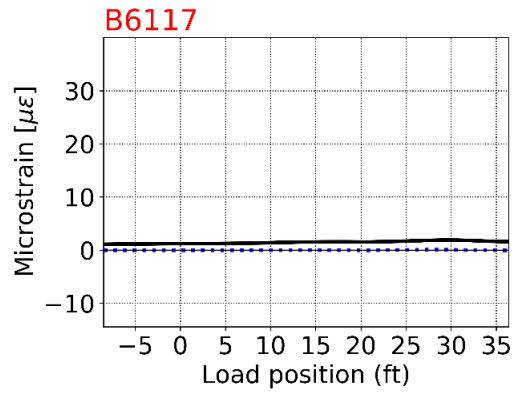
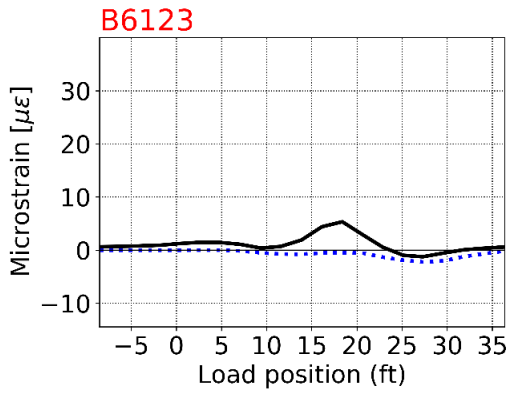


Figure B-138
Culvert #7 load path 3 calibration plots for strain sensors

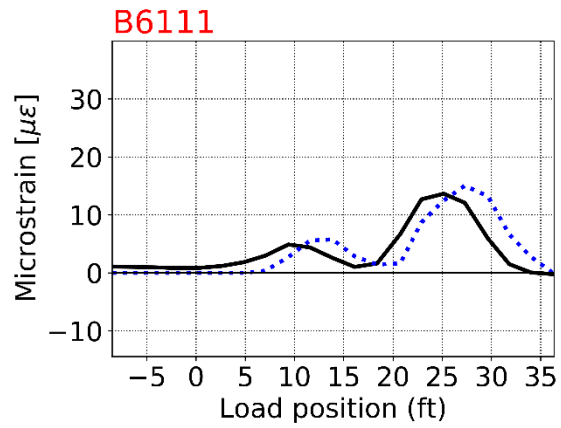
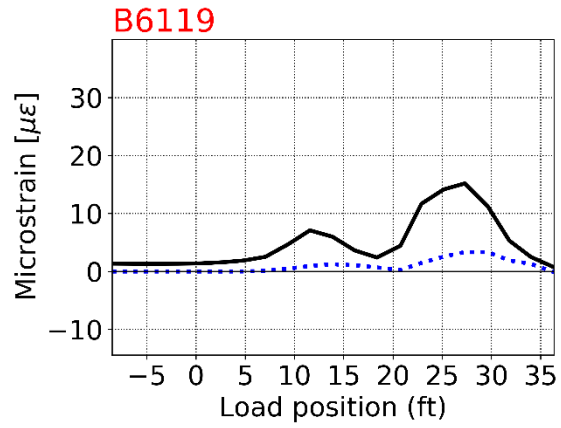


Figure B-139
Culvert #7 load path 3 calibration plots for strain sensors

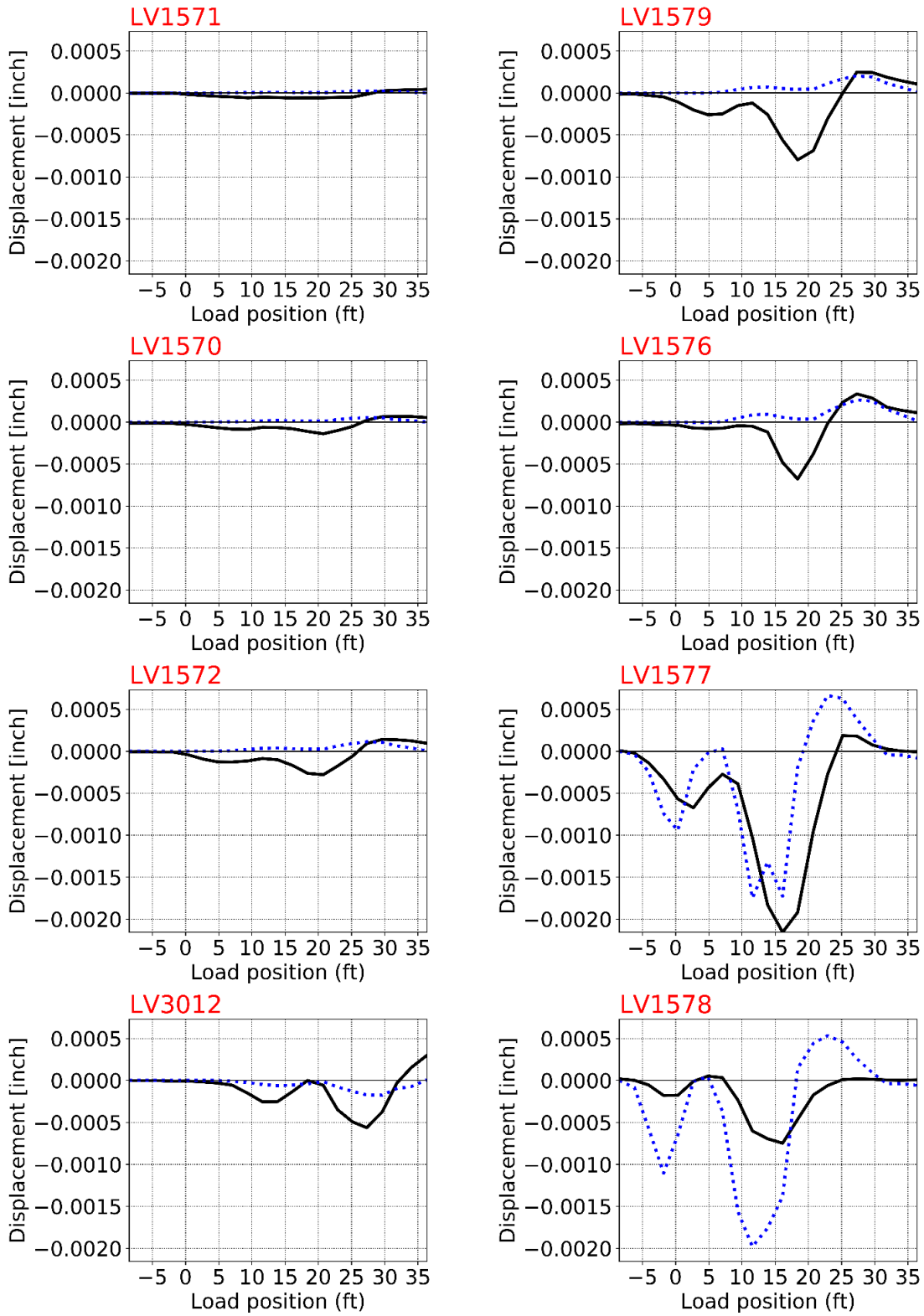


Figure B-140
Culvert #7 load path 3 calibration plots for LVDT sensors

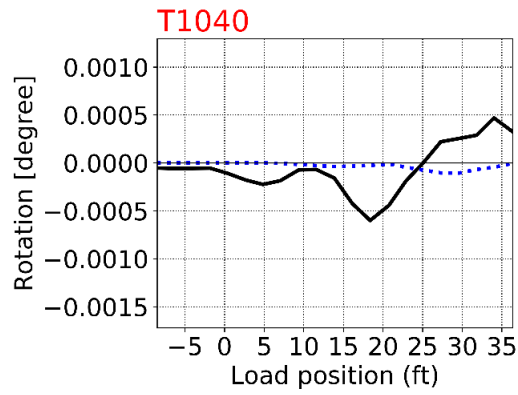
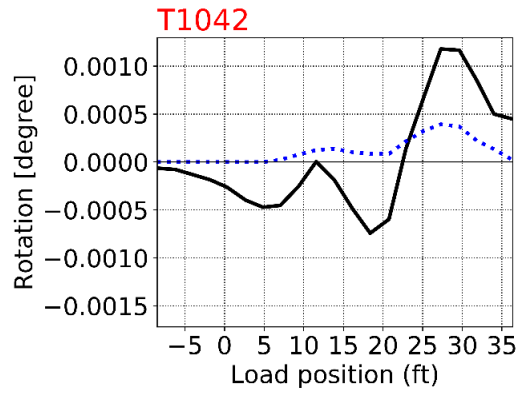
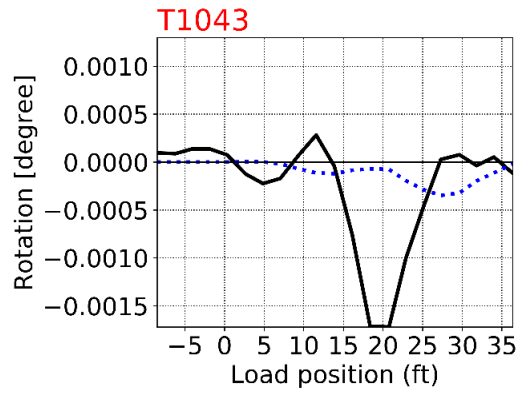
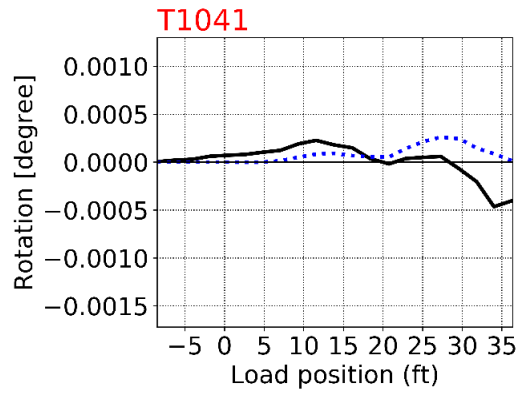


Figure B-141
Culvert #7 load path 3 calibration plots for tilt-meter sensors

Culvert #8

Load Path 1 Sensors

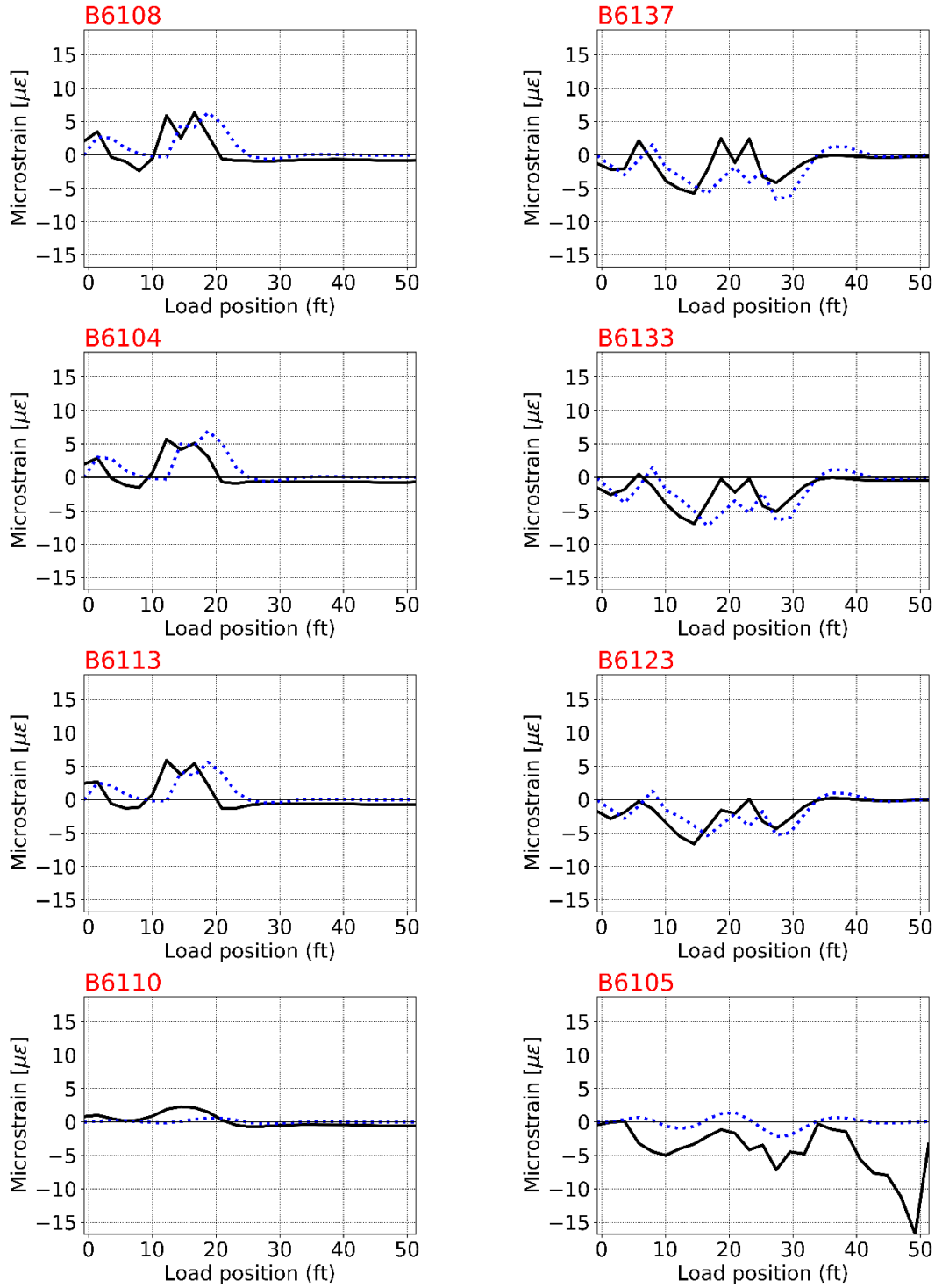


Figure B-142
Culvert #8 load path 1 calibration plots for strain sensors

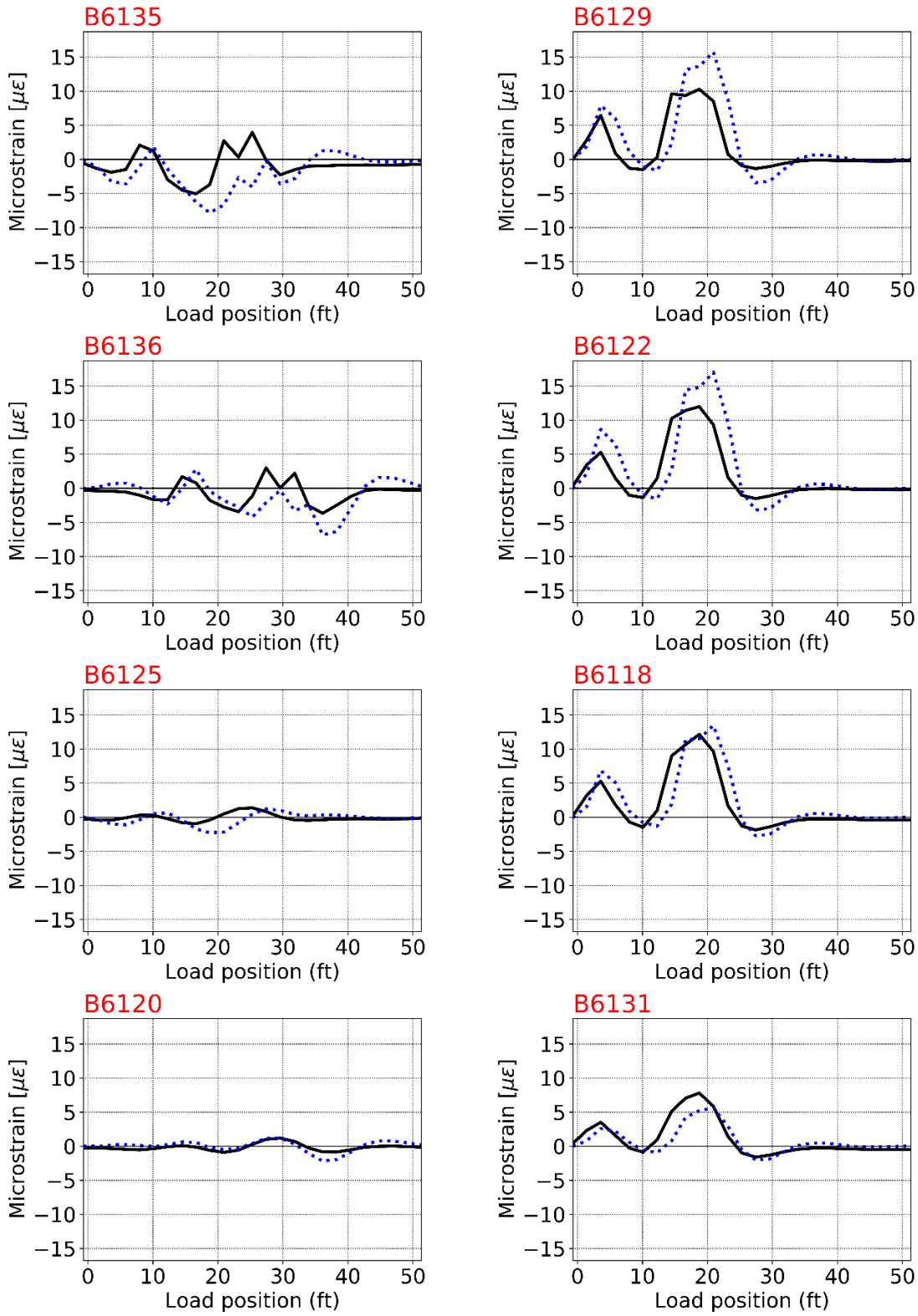


Figure B-143
Culvert #8 load path 1 calibration plots for strain sensors

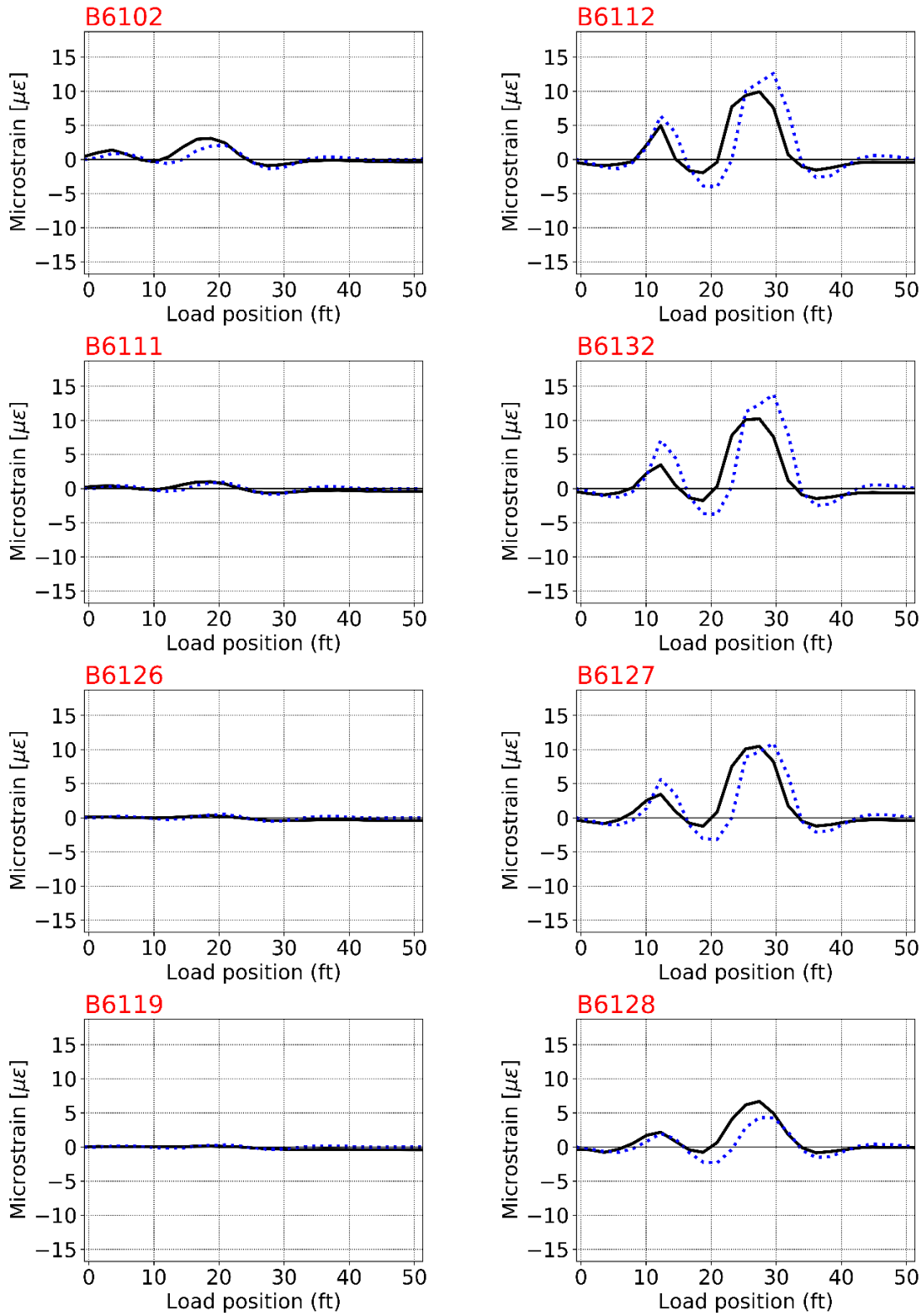


Figure B-144
Culvert #8 load path 1 calibration plots for strain sensors

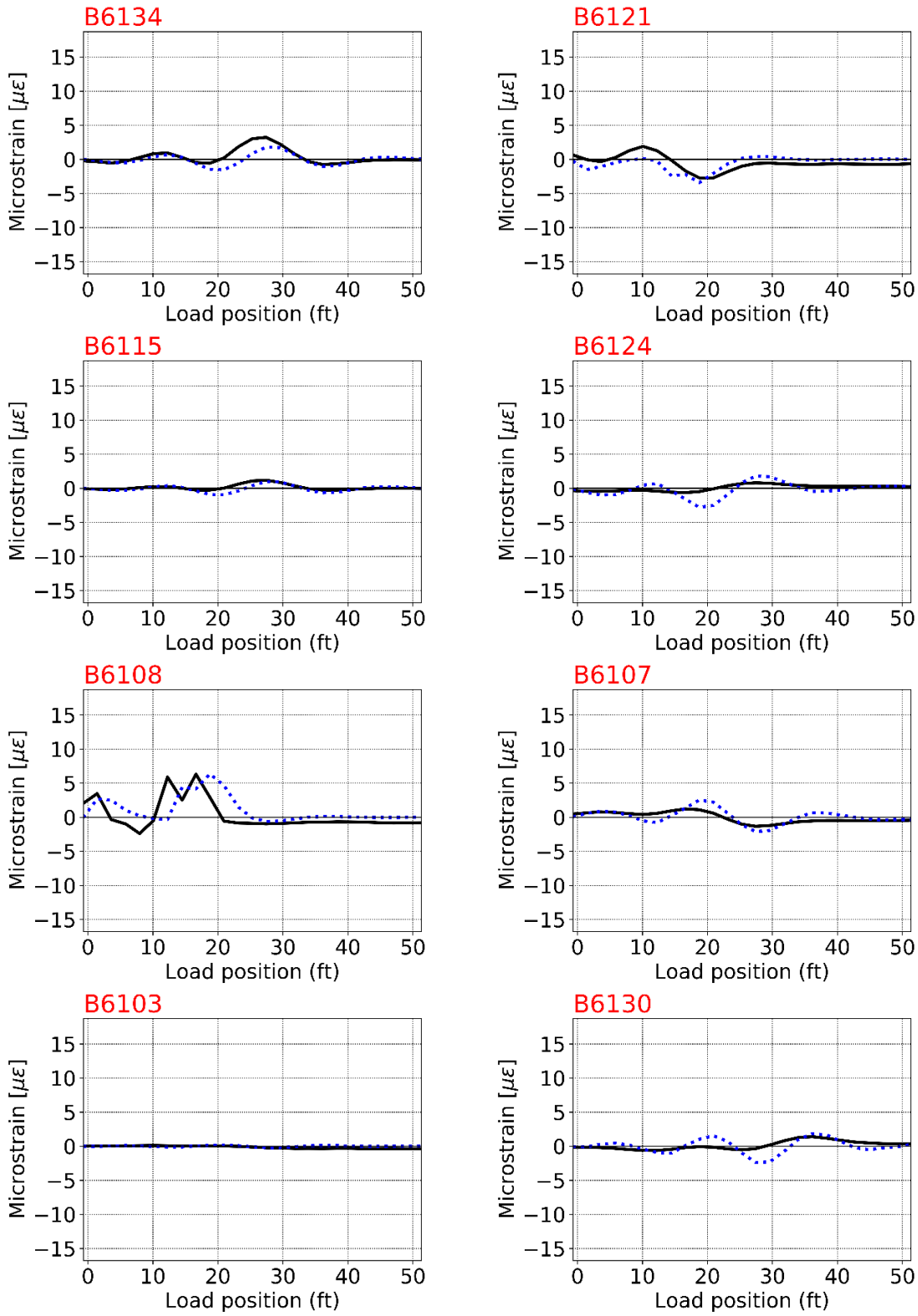


Figure B-145
Culvert #8 load path 1 calibration plots for strain sensors

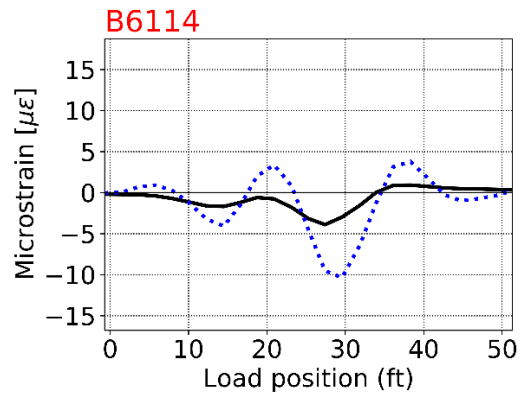
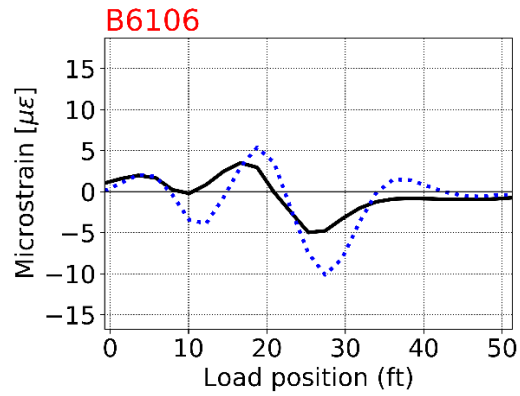
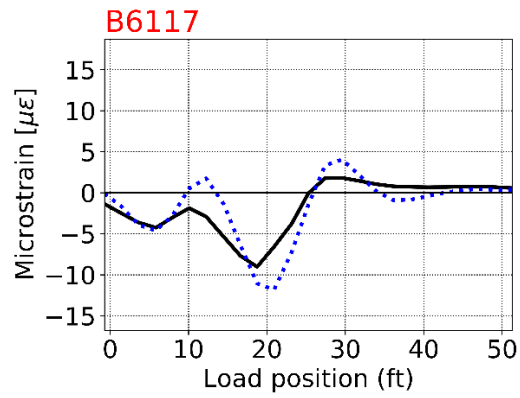
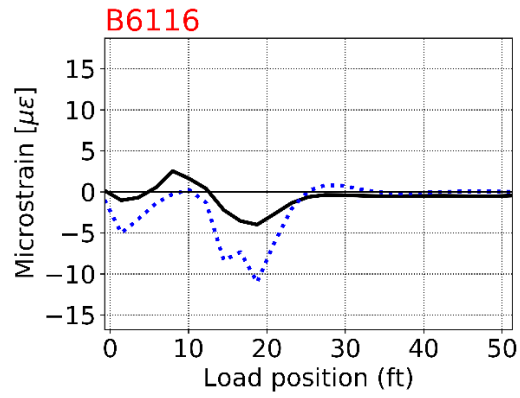


Figure B-146
Culvert #8 load path 1 calibration plots for strain sensors

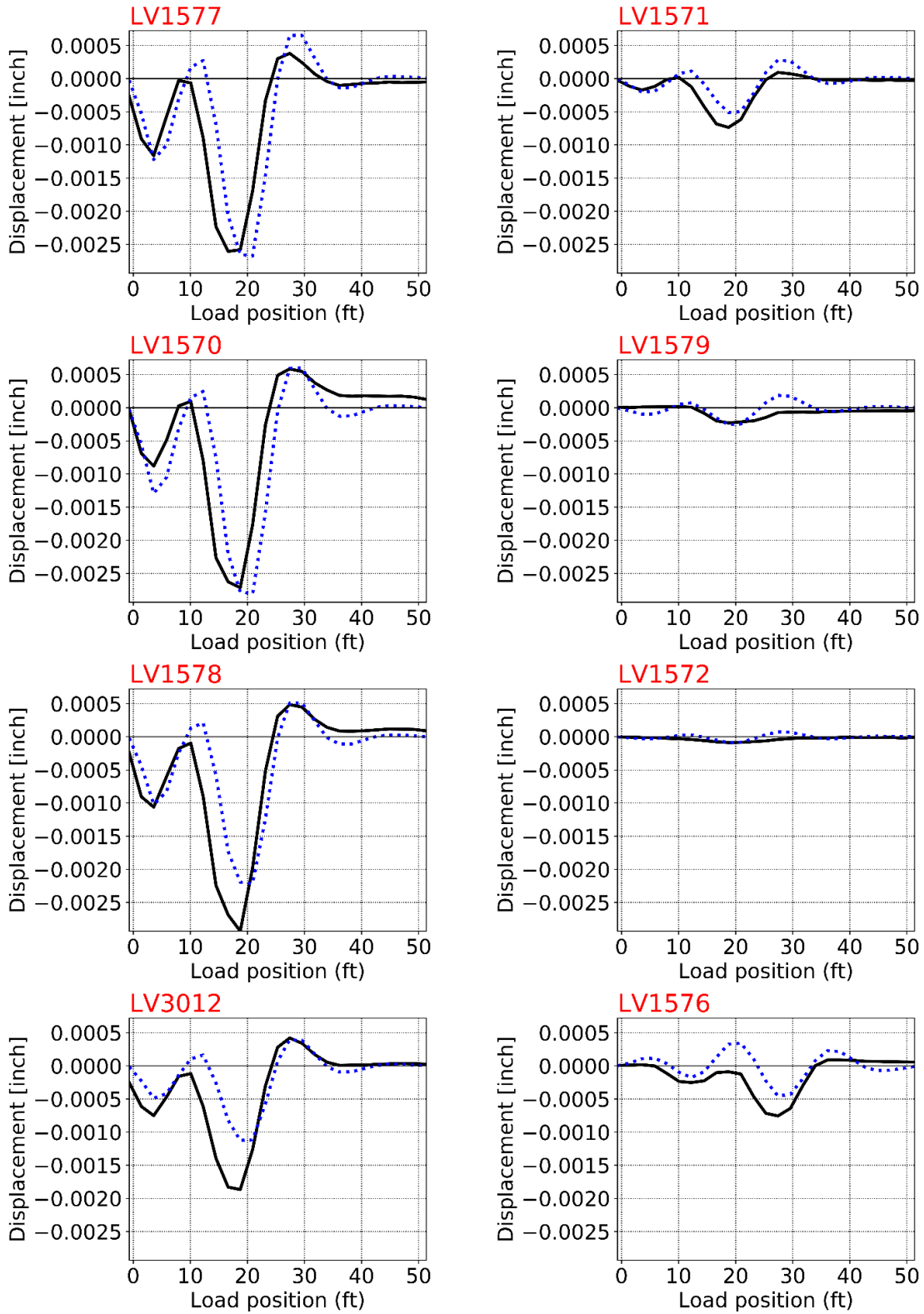


Figure B-147
Culvert #8 load path 1 calibration plots for LVDT sensors

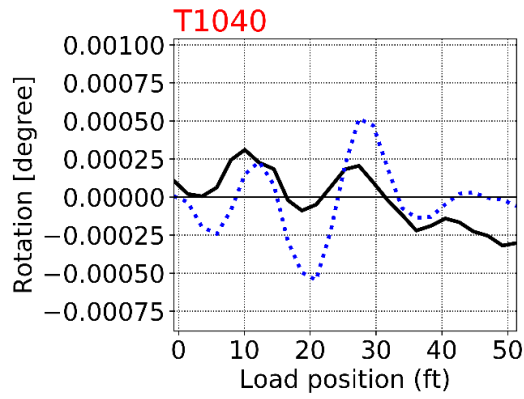
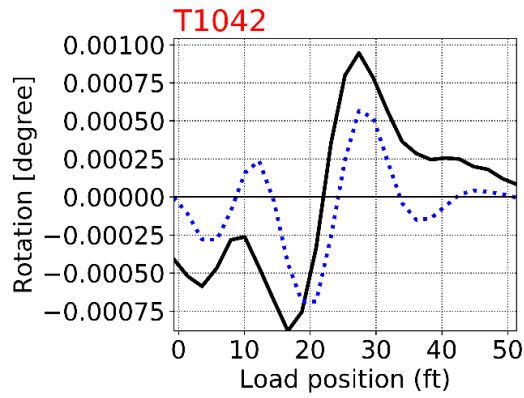
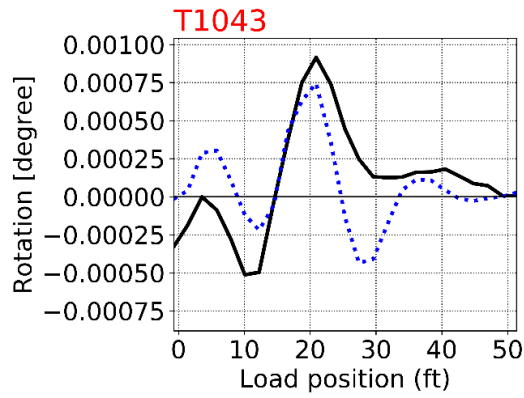
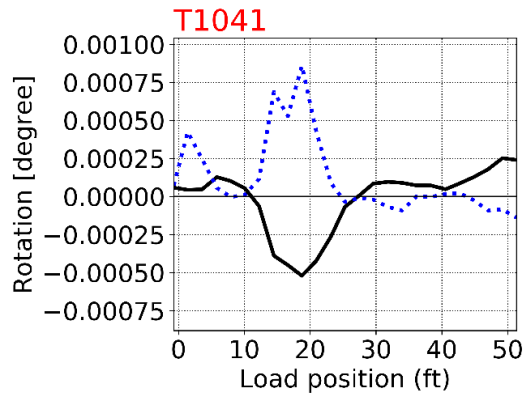


Figure B-148
Culvert #8 load path 2 calibration plots for tilt-meter sensors

Load Path 2 Sensors

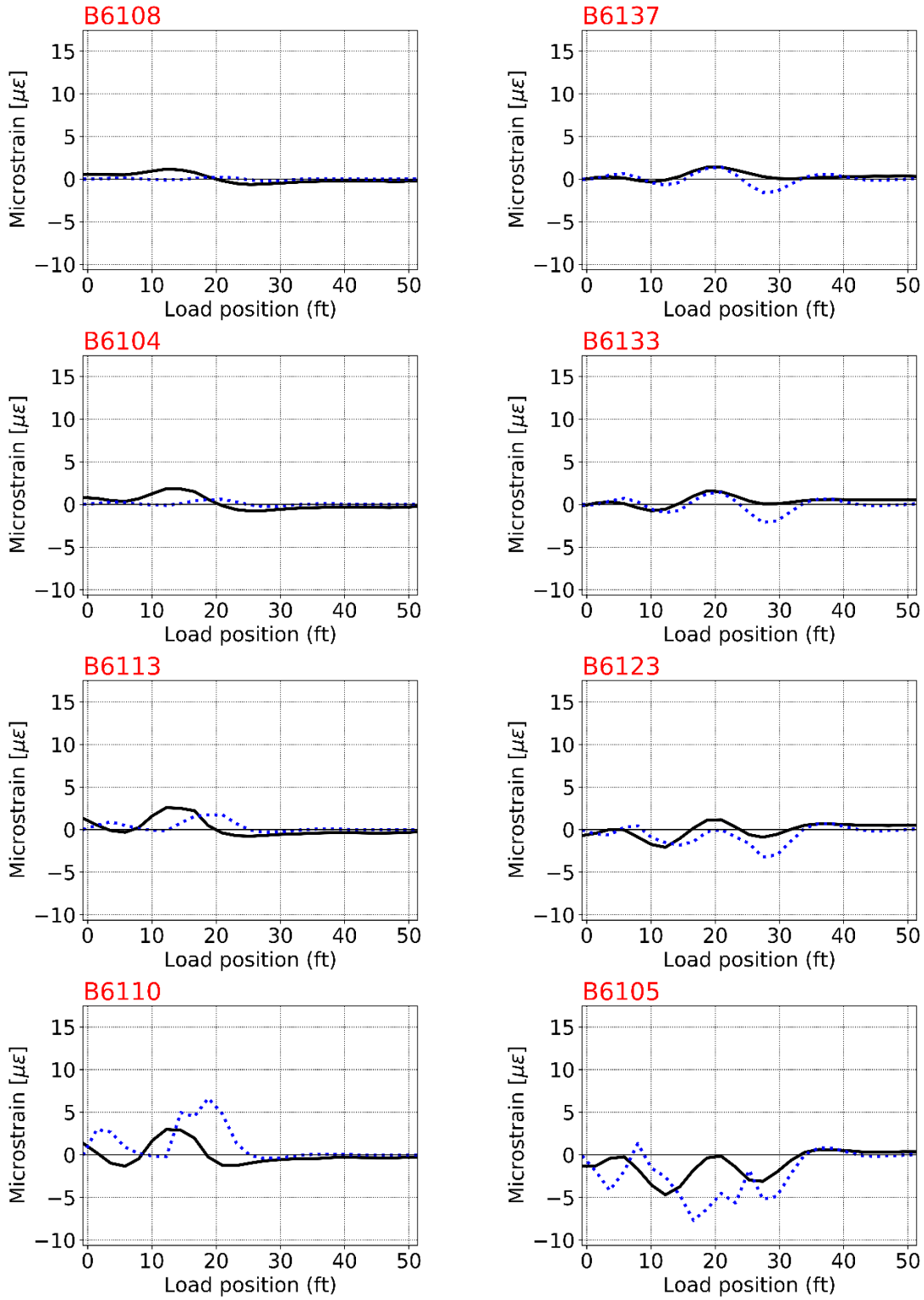


Figure B-149
Culvert #8 load path 2 calibration plots for strain sensors

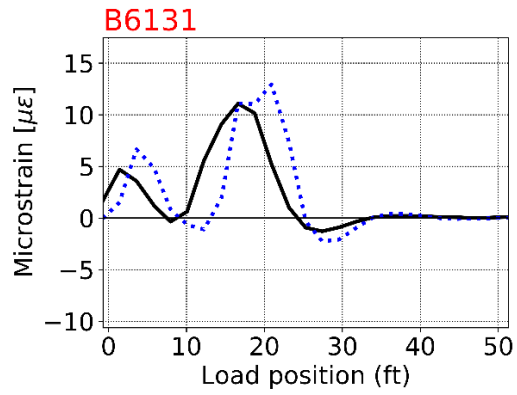
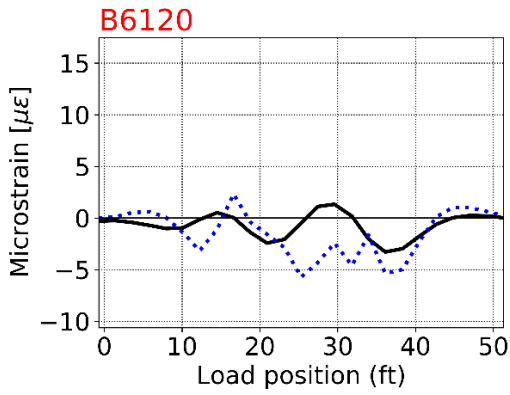
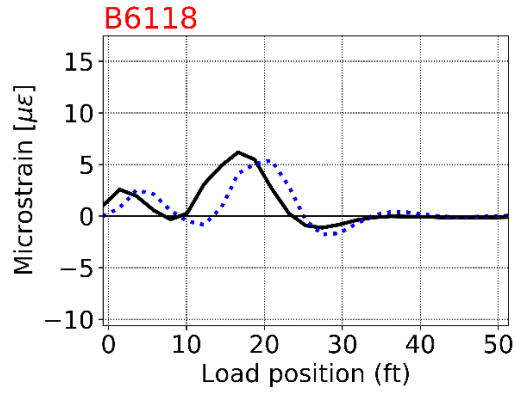
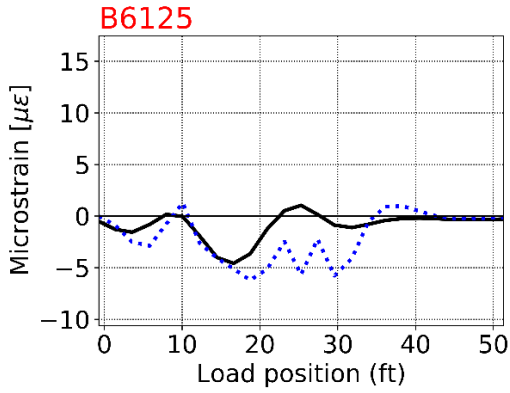
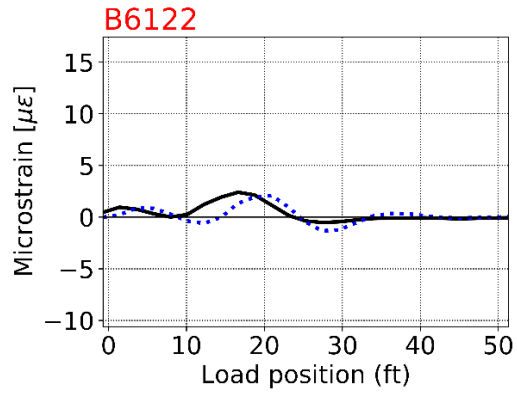
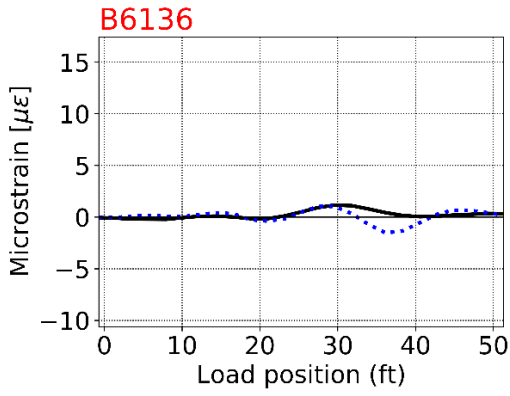
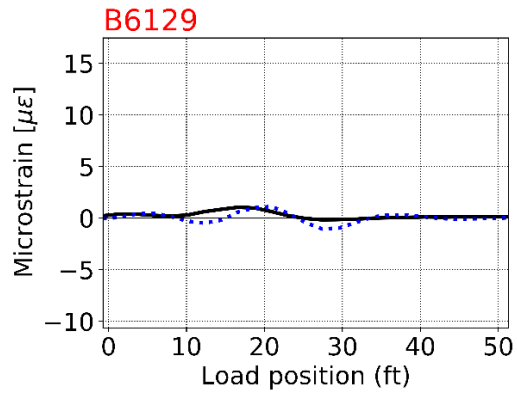
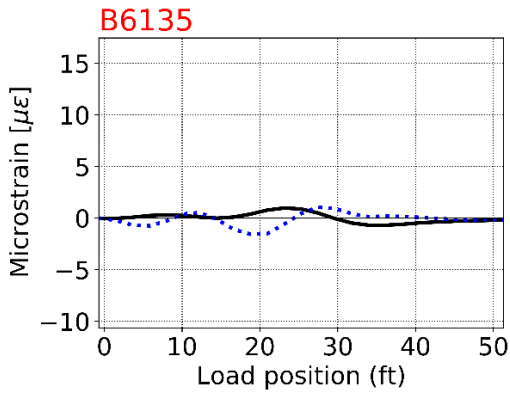


Figure B-150
Culvert #8 load path 2 calibration plots for strain sensors

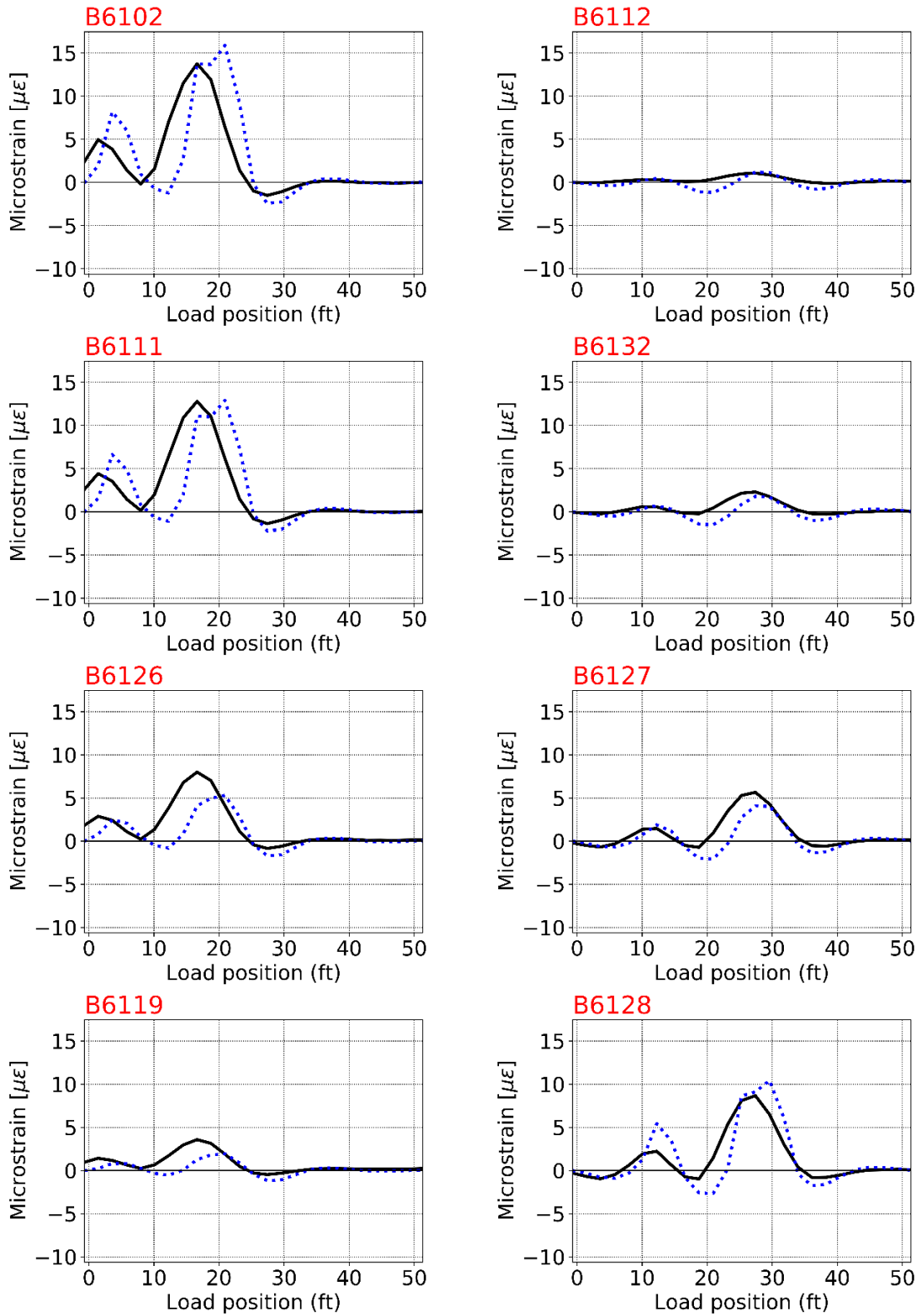


Figure B-151
Culvert #8 load path 2 calibration plots for strain sensors

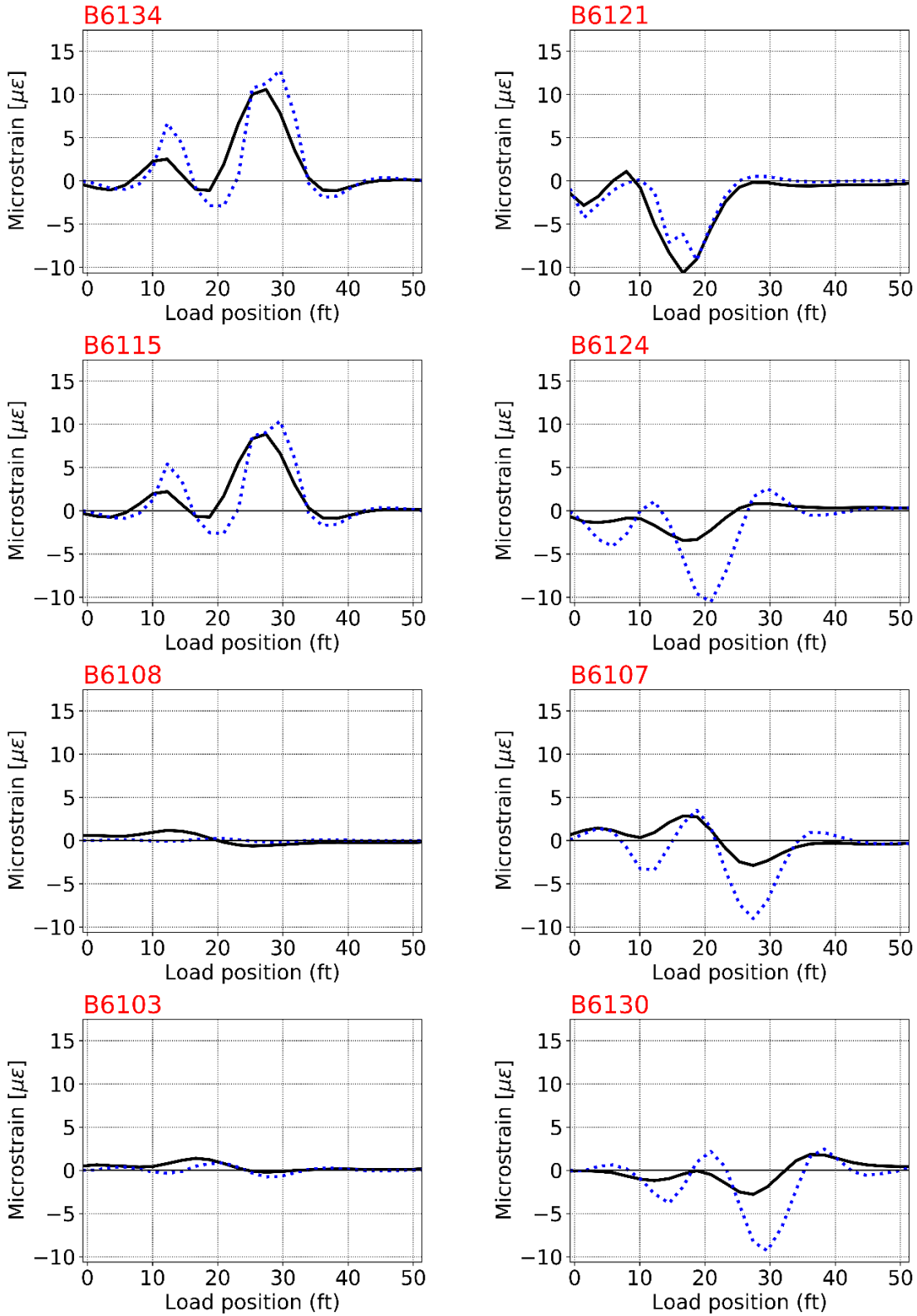


Figure B-152
Culvert #8 load path 2 calibration plots for strain sensors

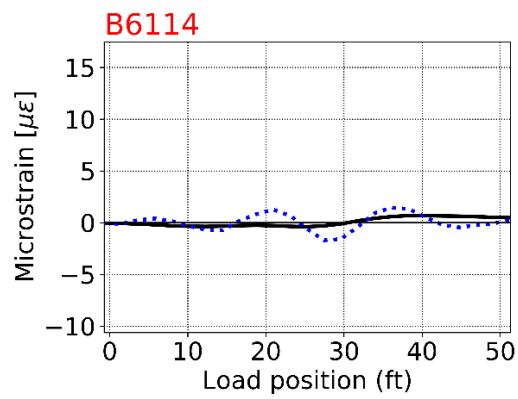
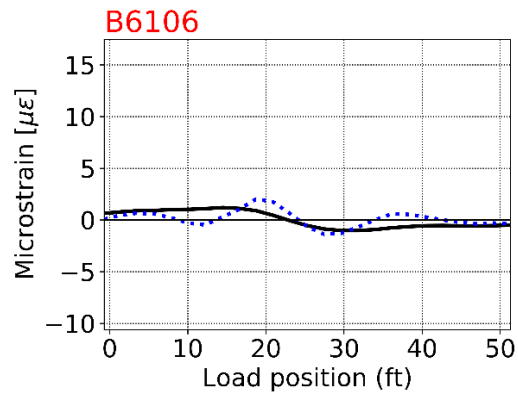
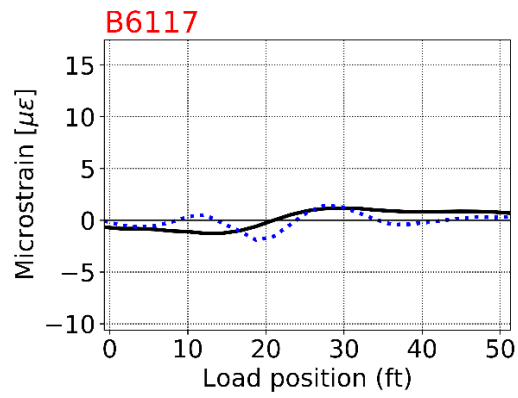
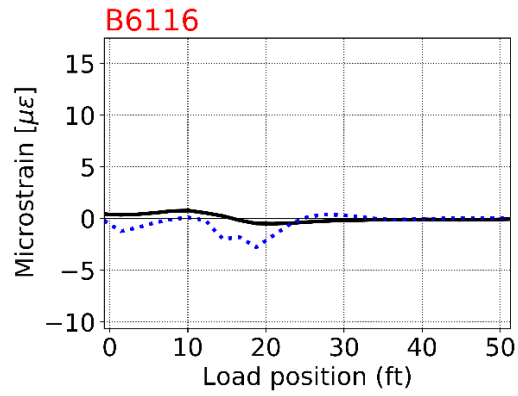


Figure B-153
Culvert #8 load path 2 calibration plots for strain sensors

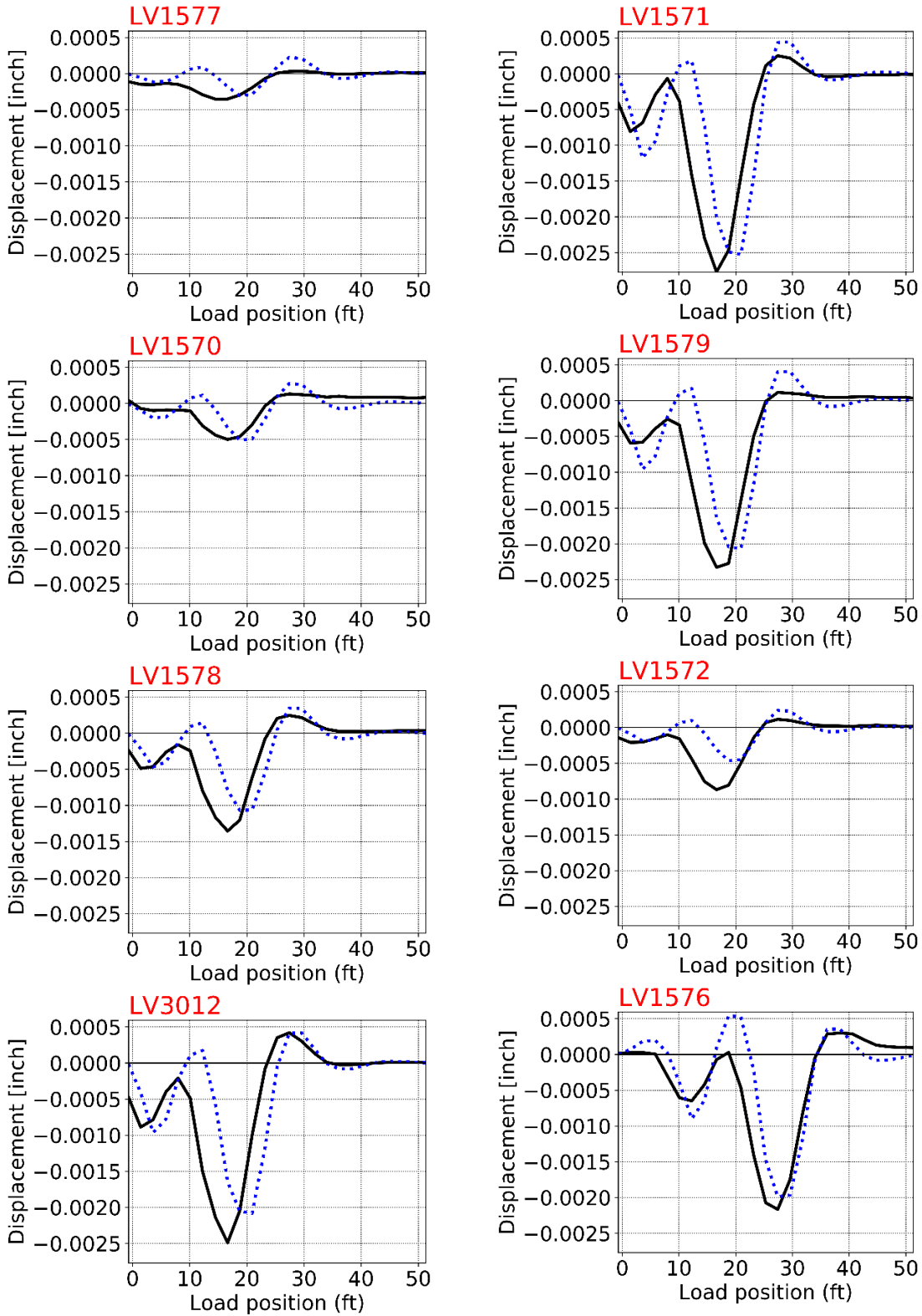


Figure B-154
Culvert #8 load path 2 calibration plots for LVDT sensors

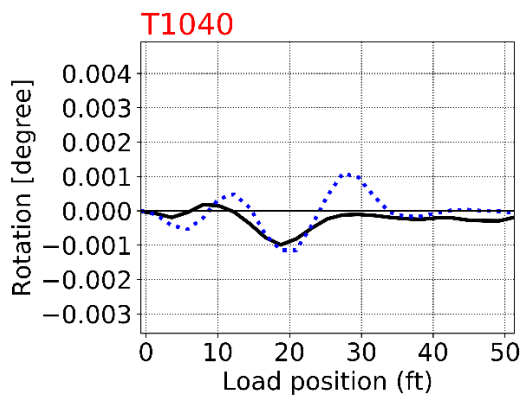
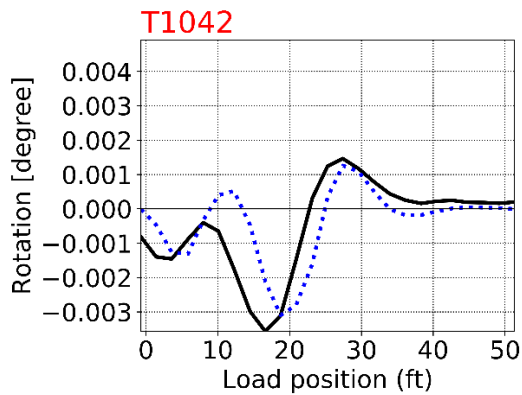
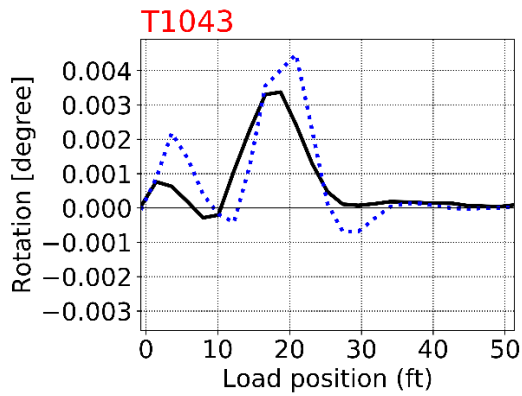
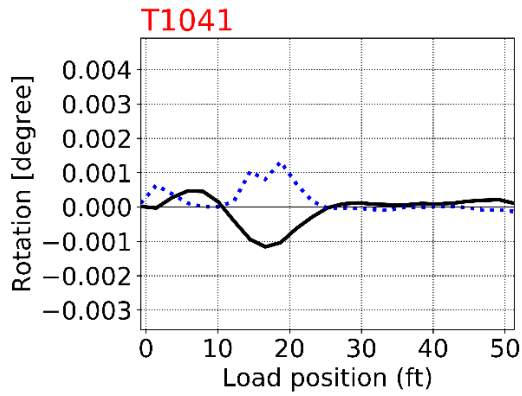


Figure B-155
Culvert #8 load path 3 calibration plots for tilt-meter sensors

Load Path 3 Sensors

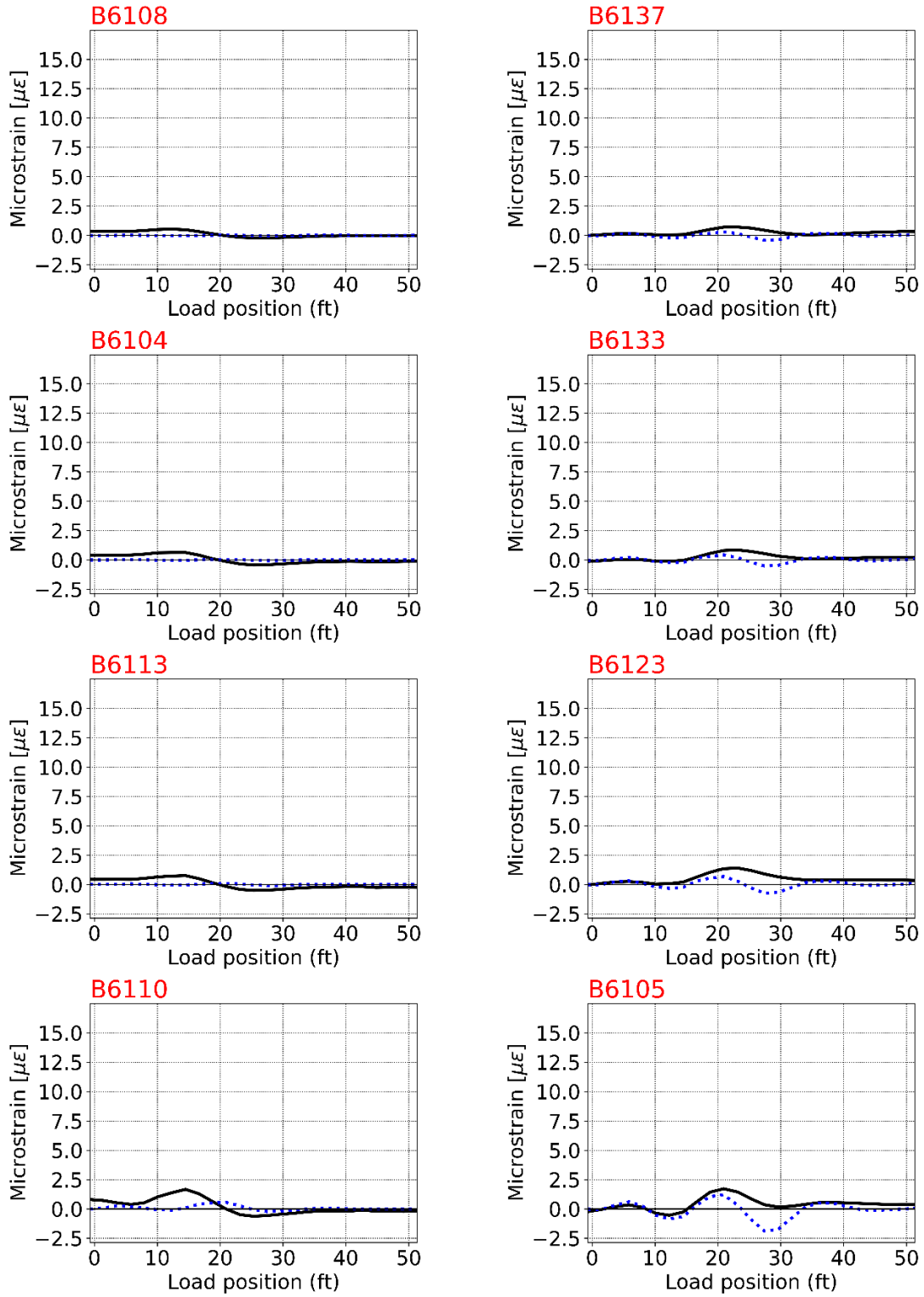


Figure B-156
Culvert #8 load path 3 calibration plots for strain sensors

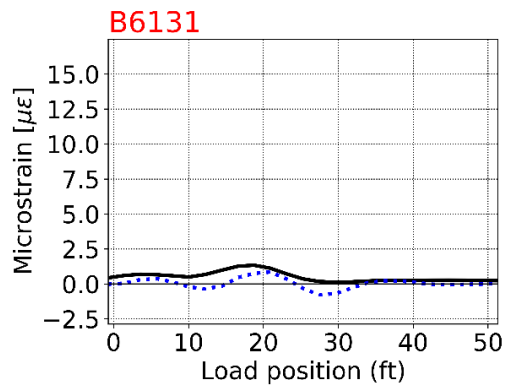
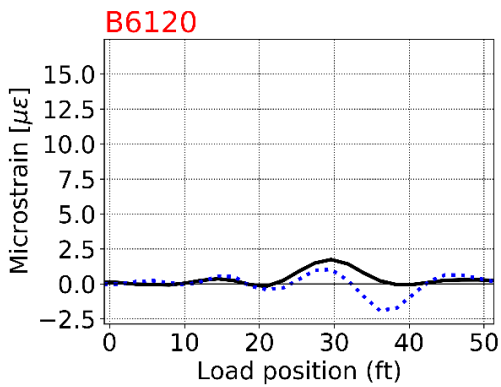
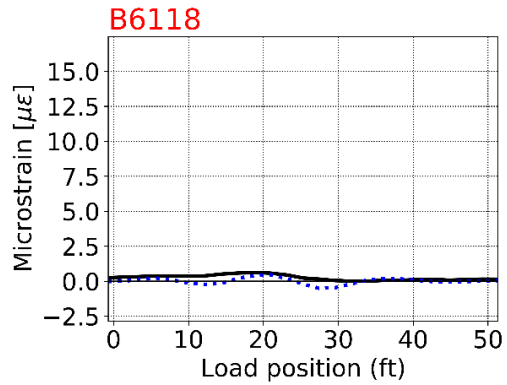
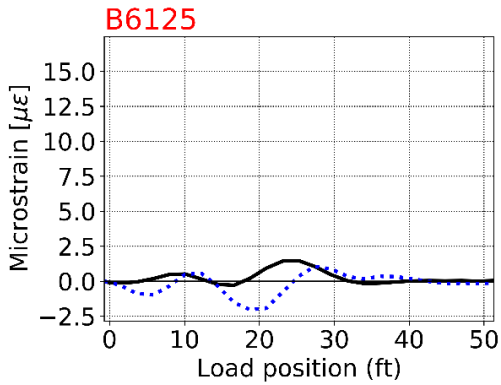
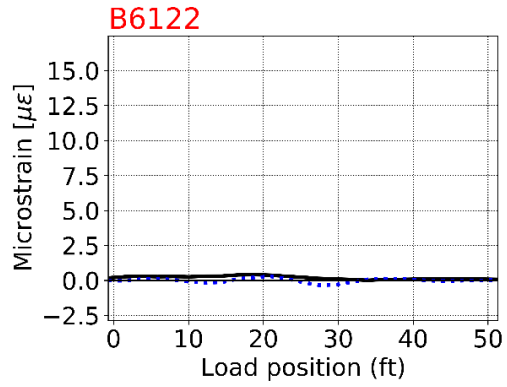
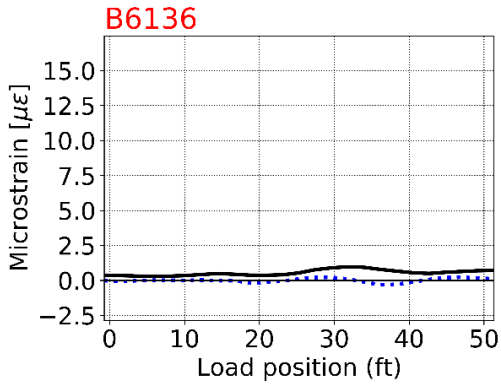
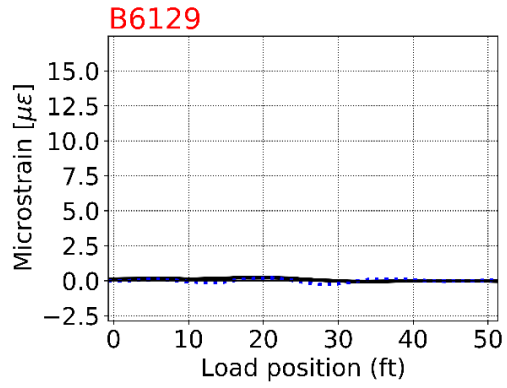
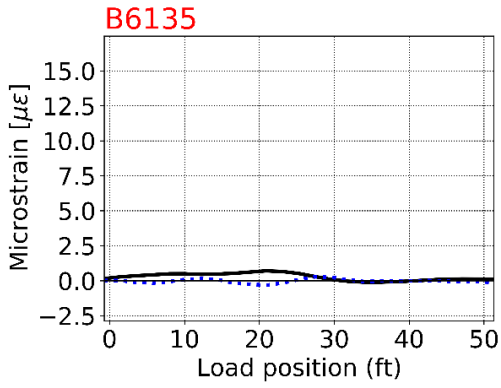


Figure B-157
Culvert #8 load path 3 calibration plots for strain sensors

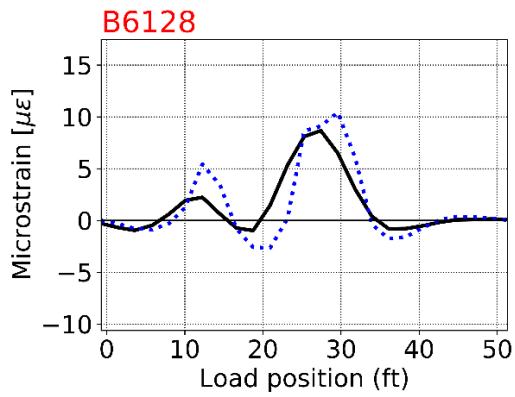
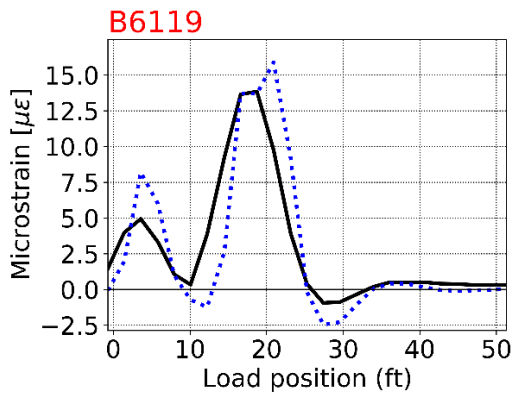
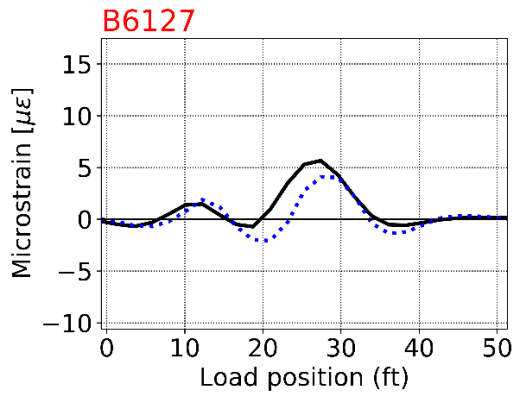
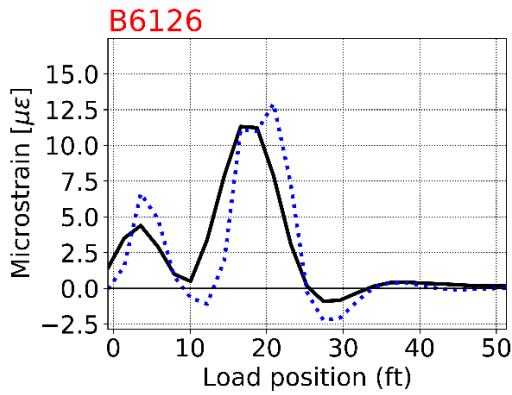
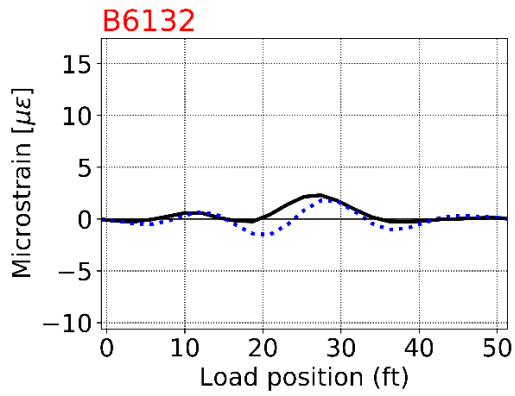
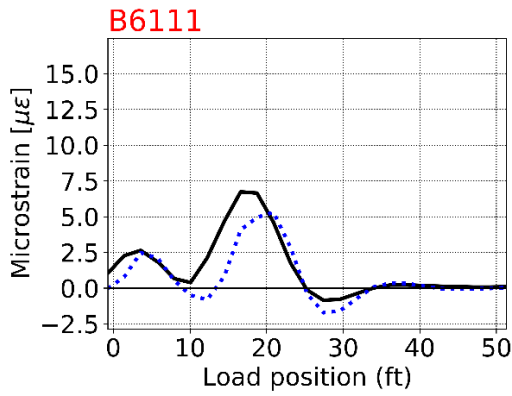
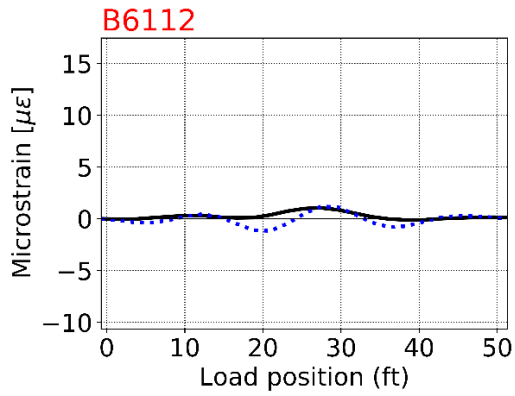
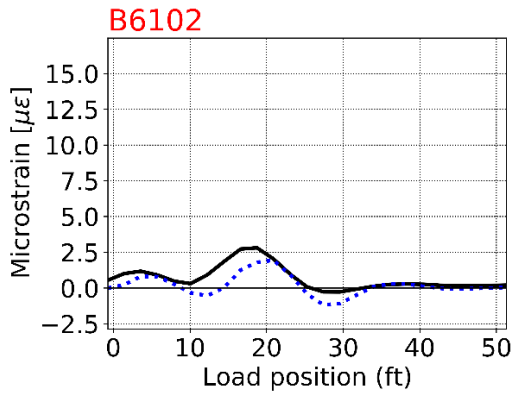


Figure B-158
Culvert #8 load path 3 calibration plots for strain sensors

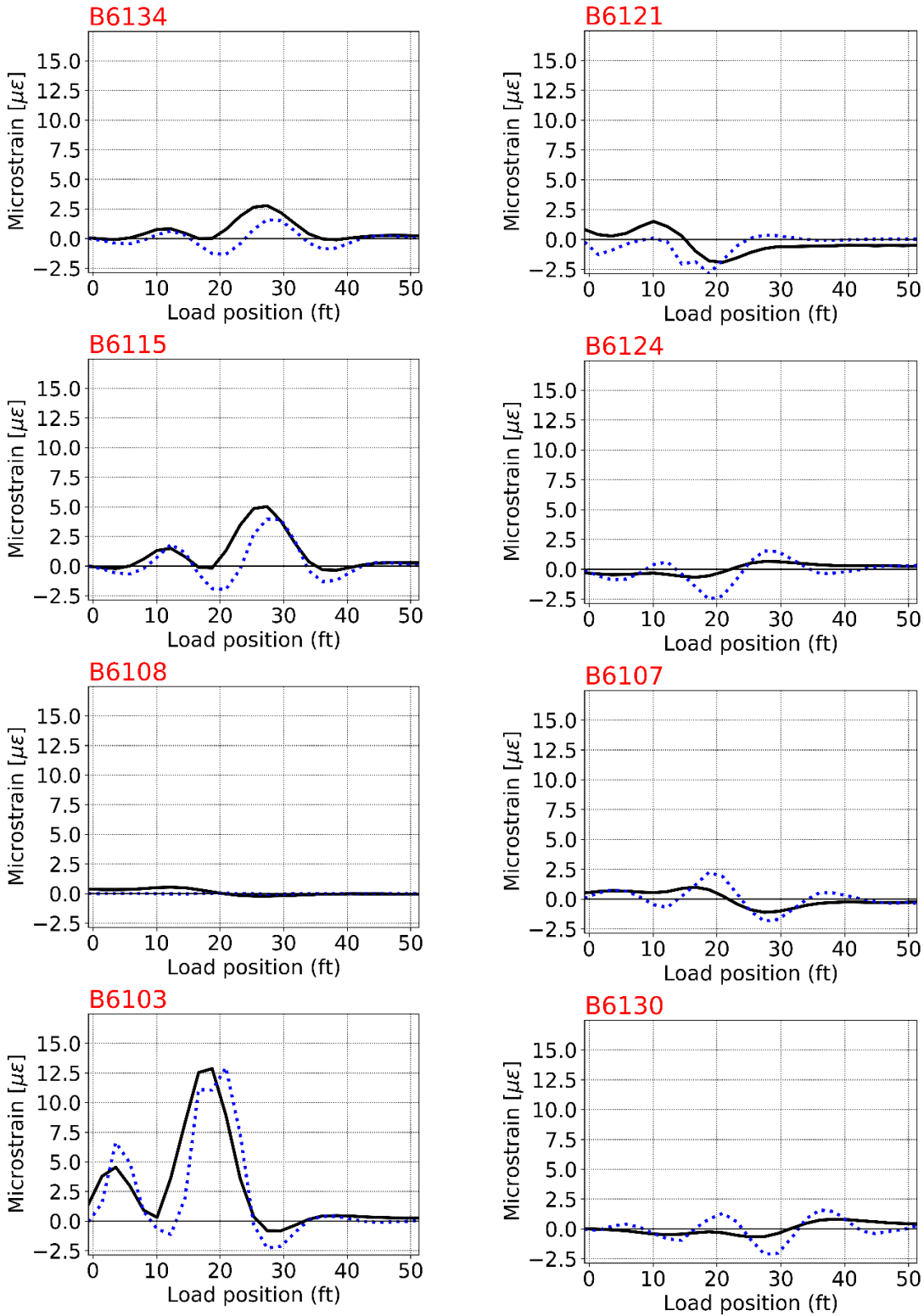


Figure B-159
Culvert #8 load path 3 calibration plots for strain sensors

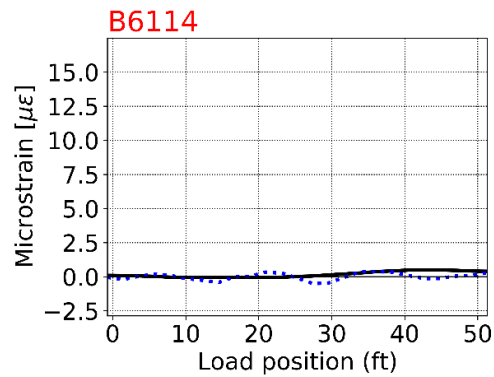
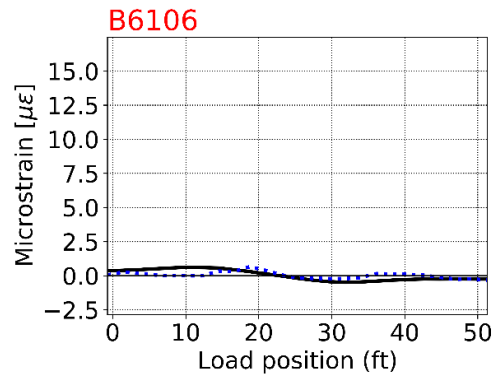
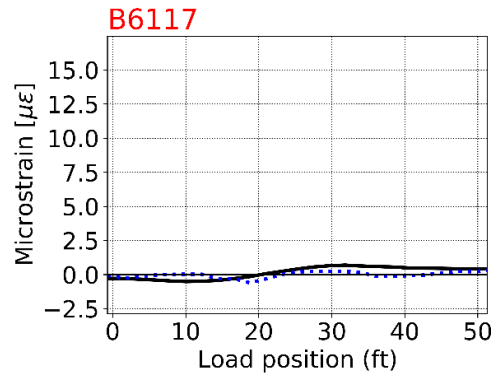
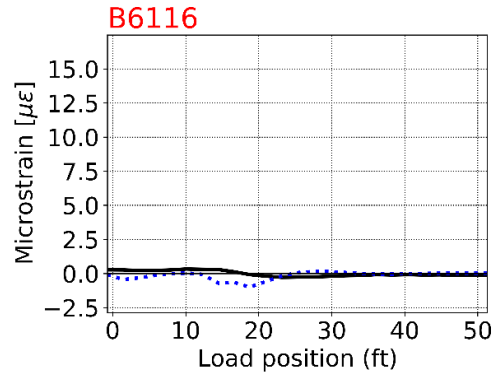


Figure B-160
Culvert #8 load path 3 calibration plots for strain sensors

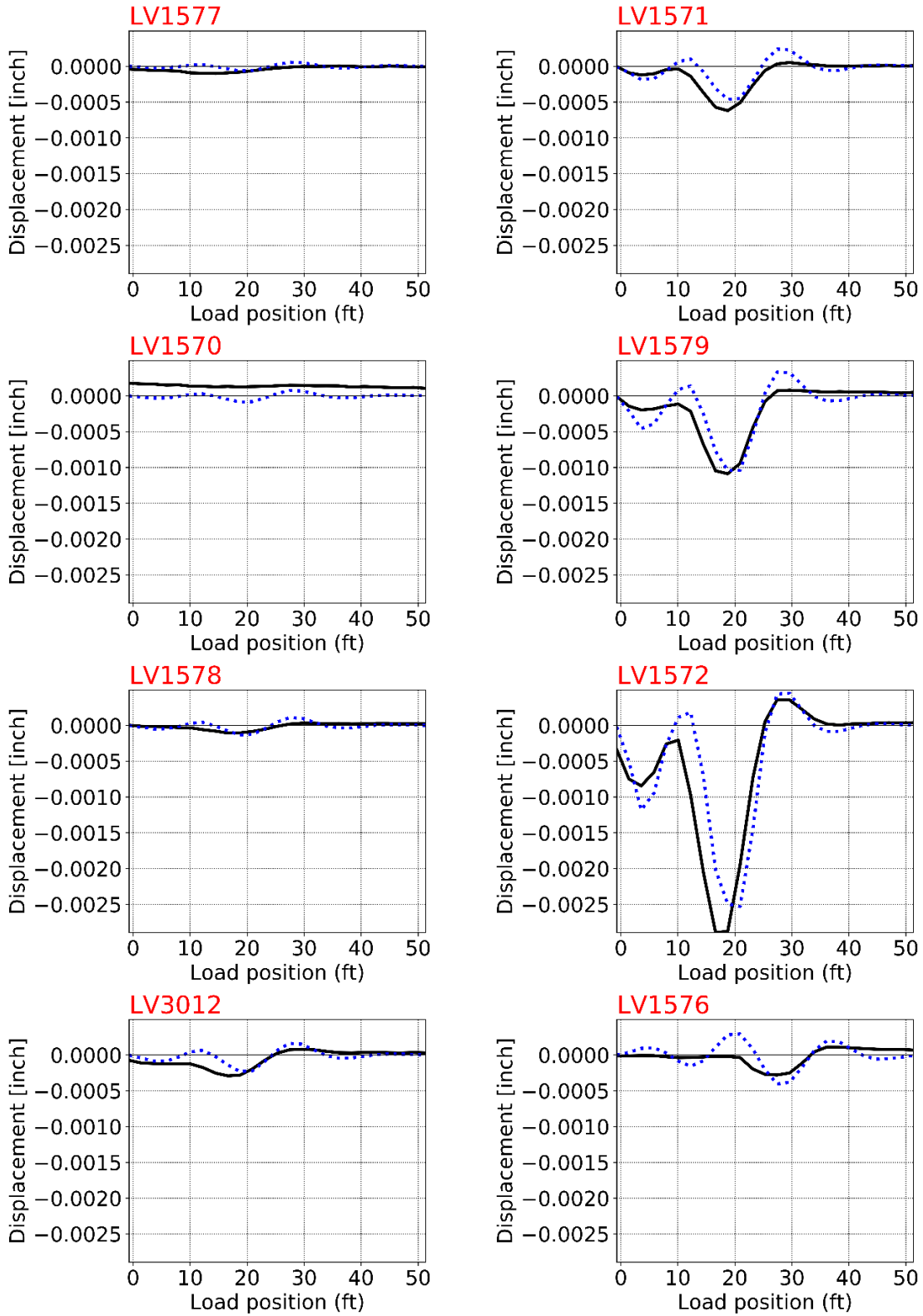


Figure B-161
Culvert #8 load path 3 calibration plots for LVDT sensors

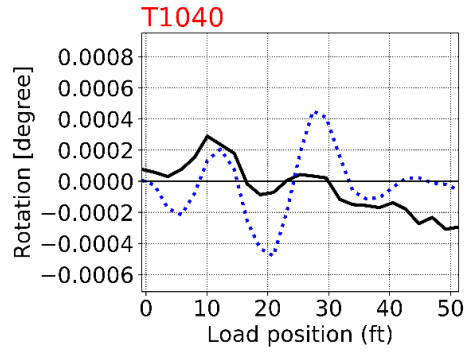
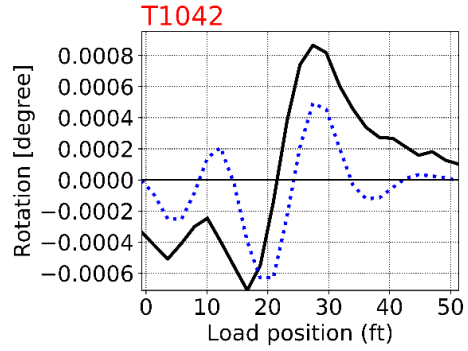
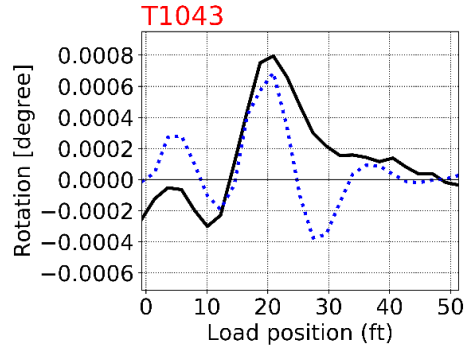
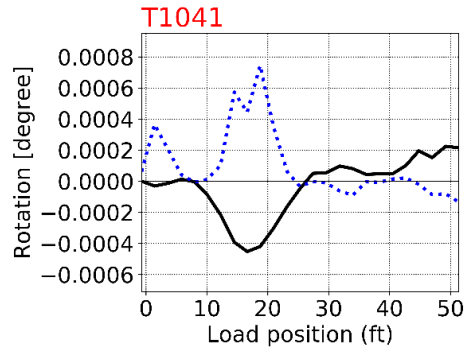


Figure B-162
Culvert #8 load path 3 calibration plots for tilt-meter sensors

APPENDIX C

Straining Actions at Critical Sections

Culvert #1

Table C-1

Culvert #1 un-factored dead and live loads at critical sections for each load type

| Loads Types | | | M(kip-in/in) - V(kip/in) - A (kip/in) at critical sections | | | | | | | | | | |
|--------------|------|-----------|--|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| Load | Type | GW (kips) | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
| DC | dead | - | 0.494 | 0.152 | -0.502 | 0.019 | -0.034 | 0.285 | -0.464 | 0.028 | -0.043 | -0.055 | -0.104 |
| DW | dead | - | 0.246 | -0.020 | -0.204 | 0.013 | -0.017 | 0.177 | -0.214 | 0.015 | -0.019 | -0.018 | -0.047 |
| EV | dead | - | 0.749 | -0.019 | -0.609 | 0.036 | -0.050 | 0.521 | -0.641 | 0.045 | -0.057 | -0.055 | -0.140 |
| EH | dead | - | -0.506 | -1.198 | 0.353 | 0.018 | 0.018 | 0.112 | 0.262 | -0.004 | -0.020 | -0.021 | 0.023 |
| ES | dead | - | -0.054 | -0.123 | 0.032 | 0.002 | 0.002 | 0.011 | 0.024 | 0.000 | -0.002 | -0.002 | 0.002 |
| LS | live | - | -0.268 | -0.616 | 0.159 | 0.009 | 0.009 | 0.053 | 0.122 | -0.002 | -0.010 | -0.010 | 0.011 |
| HL-93 | live | NA | 2.286 | -1.410 | 0.149 | -0.162 | 2.168 | -1.212 | 0.157 | -0.157 | -0.128 | -0.189 | -0.161 |
| HL-93 TD | live | NA | 2.014 | -1.323 | 0.136 | -0.146 | 1.889 | -1.232 | 0.142 | -0.157 | -0.129 | -0.246 | -0.209 |
| LA Type 3 | live | 41 | 1.144 | -0.855 | 0.080 | -0.087 | 1.095 | -0.805 | 0.085 | -0.095 | -0.077 | -0.140 | -0.117 |
| LA Type 3-S2 | live | 73 | 1.163 | -0.924 | 0.081 | -0.090 | 1.098 | -0.913 | 0.086 | -0.093 | -0.075 | -0.141 | -0.118 |
| LA Type 6 | live | 80 | 1.400 | -1.038 | 0.097 | -0.105 | 1.305 | -0.854 | 0.102 | -0.106 | -0.086 | -0.162 | -0.135 |
| LA Type 8 | live | 80 | 1.370 | -0.997 | 0.092 | -0.103 | 1.301 | -0.843 | 0.097 | -0.097 | -0.078 | -0.161 | -0.133 |
| Type 3-3 | live | 80 | 1.062 | -0.733 | 0.069 | -0.080 | 1.018 | -0.637 | 0.073 | -0.076 | -0.062 | -0.122 | -0.101 |
| NRL | live | 80 | 1.236 | -0.934 | 0.085 | -0.093 | 1.101 | -0.887 | 0.090 | -0.096 | -0.078 | -0.171 | -0.144 |
| SU 4 | live | 54 | 1.249 | -0.831 | 0.085 | -0.092 | 1.202 | -0.704 | 0.090 | -0.101 | -0.082 | -0.160 | -0.134 |
| SU 5 | live | 62 | 1.229 | -0.887 | 0.085 | -0.092 | 1.182 | -0.793 | 0.090 | -0.101 | -0.082 | -0.162 | -0.136 |
| SU 6 | live | 69.5 | 1.229 | -0.887 | 0.085 | -0.092 | 1.143 | -0.821 | 0.090 | -0.101 | -0.082 | -0.172 | -0.145 |
| SU 7 | live | 77.5 | 1.229 | -0.902 | 0.085 | -0.092 | 1.121 | -0.849 | 0.090 | -0.100 | -0.081 | -0.173 | -0.145 |

Table C-2
Culvert #1 load factors, factored loads and rating factors at critical sections for HL-93 inventory level

| HL-93 (INV) | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|--------------------------|-------|--------|------|-------|-------|--------|------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 0.50 | 0.50 | 1.35 | 0.50 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 0.50 | 0.50 |
| γ_{ES} | 0.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 0.50 | 0.50 |
| γ_{LS} | 0.00 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 0.00 | 0.00 |
| γ_{LL} | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 |
| γ_{DC}^*DC | 0.62 | -0.63 | 0.02 | -0.04 | 0.36 | -0.58 | 0.04 | -0.05 | -0.07 | -0.13 | -0.15 |
| γ_{DW}^*DW | 0.37 | -0.31 | 0.02 | -0.03 | 0.27 | -0.32 | 0.02 | -0.03 | -0.03 | -0.07 | -0.07 |
| γ_{EV}^*EV | 0.97 | -0.79 | 0.05 | -0.06 | 0.68 | -0.83 | 0.06 | -0.07 | -0.07 | -0.18 | -0.18 |
| γ_{EH}^*EH | -0.25 | 0.18 | 0.02 | 0.01 | 0.15 | 0.13 | 0.00 | -0.03 | -0.03 | 0.01 | 0.01 |
| γ_{ES}^*ES | -0.03 | 0.02 | 0.00 | 0.00 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.00 | 0.00 | 0.02 | 0.00 | 0.09 | 0.00 | 0.00 | -0.02 | -0.02 | 0.00 | 0.00 |
| γ_{LL}^*LL | 5.95 | -3.67 | 0.39 | -0.42 | 5.65 | -3.21 | 0.41 | -0.41 | -0.34 | -0.64 | -0.54 |
| $\phi_c\phi_s\phi_{R_n}$ | 14.80 | -16.12 | 0.96 | -0.96 | 14.80 | -16.12 | 0.96 | -37.04 | -37.04 | -37.04 | -37.04 |
| RF | 2.20 | 3.97 | 2.08 | 1.98 | 2.32 | 4.53 | 2.07 | 86.31 | 103.78 | 57.24 | 67.47 |

Table C-3
Culvert #1 load factors, factored loads and rating factors at critical sections for HL-93 operational level

| HL-93 (OPR) | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|--------------------------|-------|--------|------|-------|-------|--------|------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 0.50 | 0.50 | 1.35 | 0.50 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 0.50 | 0.50 |
| γ_{ES} | 0.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 0.50 | 0.50 |
| γ_{LS} | 0.00 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 0.00 | 0.00 |
| γ_{LL} | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 |
| γ_{DC}^*DC | 0.62 | -0.63 | 0.02 | -0.04 | 0.36 | -0.58 | 0.04 | -0.05 | -0.07 | -0.13 | -0.15 |
| γ_{DW}^*DW | 0.37 | -0.31 | 0.02 | -0.03 | 0.27 | -0.32 | 0.02 | -0.03 | -0.03 | -0.07 | -0.07 |
| γ_{EV}^*EV | 0.97 | -0.79 | 0.05 | -0.06 | 0.68 | -0.83 | 0.06 | -0.07 | -0.07 | -0.18 | -0.18 |
| γ_{EH}^*EH | -0.25 | 0.18 | 0.02 | 0.01 | 0.15 | 0.13 | 0.00 | -0.03 | -0.03 | 0.01 | 0.01 |
| γ_{ES}^*ES | -0.03 | 0.02 | 0.00 | 0.00 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.00 | 0.00 | 0.02 | 0.00 | 0.09 | 0.00 | 0.00 | -0.02 | -0.02 | 0.00 | 0.00 |
| γ_{LL}^*LL | 4.59 | -2.83 | 0.30 | -0.33 | 4.36 | -2.47 | 0.31 | -0.32 | -0.26 | -0.49 | -0.42 |
| $\phi_c\phi_s\phi_{R_n}$ | 14.80 | -16.12 | 0.96 | -0.96 | 14.80 | -16.12 | 0.96 | -37.04 | -37.04 | -37.04 | -37.04 |
| RF | 2.86 | 5.15 | 2.67 | 2.57 | 3.00 | 5.87 | 2.68 | 110.57 | 132.51 | 74.21 | 87.46 |

Table C-4
Culvert #1 load factors, factored loads and rating factors at critical sections for LA Type 3

| LA Type 3 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|----------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 0.50 | 0.50 | 1.35 | 0.50 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 0.50 | 0.50 |
| γ_{ES} | 0.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 0.50 | 0.50 |
| γ_{LS} | 0.00 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.62 | -0.63 | 0.02 | -0.04 | 0.36 | -0.58 | 0.04 | -0.05 | -0.07 | -0.13 | -0.15 |
| γ_{DW}^*DW | 0.37 | -0.31 | 0.02 | -0.03 | 0.27 | -0.32 | 0.02 | -0.03 | -0.03 | -0.07 | -0.07 |
| γ_{EV}^*EV | 0.97 | -0.79 | 0.05 | -0.06 | 0.68 | -0.83 | 0.06 | -0.07 | -0.07 | -0.18 | -0.18 |
| γ_{EH}^*EH | -0.25 | 0.18 | 0.02 | 0.01 | 0.15 | 0.13 | 0.00 | -0.03 | -0.03 | 0.01 | 0.01 |
| γ_{ES}^*ES | -0.03 | 0.02 | 0.00 | 0.00 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.00 | 0.00 | 0.02 | 0.00 | 0.09 | 0.00 | 0.00 | -0.02 | -0.02 | 0.00 | 0.00 |
| γ_{LL}^*LL | 2.84 | -2.12 | 0.20 | -0.22 | 2.72 | -2.00 | 0.21 | -0.24 | -0.19 | -0.35 | -0.29 |
| $\phi_c\phi_s\phi_{R_n}$ | 14.80 | -16.12 | 0.96 | -0.96 | 14.80 | -16.12 | 0.96 | -37.04 | -37.04 | -37.04 | -37.04 |
| RF | 4.62 | 6.88 | 3.92 | 3.85 | 4.75 | 7.28 | 4.02 | 145.49 | 175.20 | 105.40 | 126.38 |

Table C-5
Culvert #1 load factors, factored loads and rating factors at critical sections for LA Type 3 S2

| LA Type 3 S2 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|-------------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 0.50 | 0.50 | 1.35 | 0.50 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 0.50 | 0.50 |
| γ_{ES} | 0.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 0.50 | 0.50 |
| γ_{LS} | 0.00 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.62 | -0.63 | 0.02 | -0.04 | 0.36 | -0.58 | 0.04 | -0.05 | -0.07 | -0.13 | -0.15 |
| γ_{DW}^*DW | 0.37 | -0.31 | 0.02 | -0.03 | 0.27 | -0.32 | 0.02 | -0.03 | -0.03 | -0.07 | -0.07 |
| γ_{EV}^*EV | 0.97 | -0.79 | 0.05 | -0.06 | 0.68 | -0.83 | 0.06 | -0.07 | -0.07 | -0.18 | -0.18 |
| γ_{EH}^*EH | -0.25 | 0.18 | 0.02 | 0.01 | 0.15 | 0.13 | 0.00 | -0.03 | -0.03 | 0.01 | 0.01 |
| γ_{ES}^*ES | -0.03 | 0.02 | 0.00 | 0.00 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.00 | 0.00 | 0.02 | 0.00 | 0.09 | 0.00 | 0.00 | -0.02 | -0.02 | 0.00 | 0.00 |
| γ_{LL}^*LL | 2.88 | -2.29 | 0.20 | -0.22 | 2.72 | -2.26 | 0.21 | -0.23 | -0.19 | -0.35 | -0.29 |
| $\phi_c\phi_s\phi_{R_n}$ | 14.80 | -16.12 | 0.96 | -0.96 | 14.80 | -16.12 | 0.96 | -37.04 | -37.04 | -37.04 | -37.04 |
| RF | 4.55 | 6.36 | 3.85 | 3.74 | 4.74 | 6.42 | 3.93 | 148.25 | 179.49 | 104.84 | 125.57 |

Table C-6
Culvert #1 load factors, factored loads and rating factors at critical sections for LA Type 6

| LA Type 6 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|----------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 0.50 | 0.50 | 1.35 | 0.50 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 0.50 | 0.50 |
| γ_{ES} | 0.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 0.50 | 0.50 |
| γ_{LS} | 0.00 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.62 | -0.63 | 0.02 | -0.04 | 0.36 | -0.58 | 0.04 | -0.05 | -0.07 | -0.13 | -0.15 |
| γ_{DW}^*DW | 0.37 | -0.31 | 0.02 | -0.03 | 0.27 | -0.32 | 0.02 | -0.03 | -0.03 | -0.07 | -0.07 |
| γ_{EV}^*EV | 0.97 | -0.79 | 0.05 | -0.06 | 0.68 | -0.83 | 0.06 | -0.07 | -0.07 | -0.18 | -0.18 |
| γ_{EH}^*EH | -0.25 | 0.18 | 0.02 | 0.01 | 0.15 | 0.13 | 0.00 | -0.03 | -0.03 | 0.01 | 0.01 |
| γ_{ES}^*ES | -0.03 | 0.02 | 0.00 | 0.00 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.00 | 0.00 | 0.02 | 0.00 | 0.09 | 0.00 | 0.00 | -0.02 | -0.02 | 0.00 | 0.00 |
| γ_{LL}^*LL | 3.47 | -2.58 | 0.24 | -0.26 | 3.24 | -2.12 | 0.25 | -0.26 | -0.21 | -0.40 | -0.33 |
| $\phi_c\phi_s\phi_{R_n}$ | 14.80 | -16.12 | 0.96 | -0.96 | 14.80 | -16.12 | 0.96 | -37.04 | -37.04 | -37.04 | -37.04 |
| RF | 3.78 | 5.66 | 3.29 | 3.19 | 4.00 | 6.86 | 3.32 | 131.17 | 159.54 | 91.40 | 109.72 |

Table C-7
Culvert #1 load factors, factored loads and rating factors at critical sections for LA Type 8

| LA Type 8 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|----------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 0.50 | 0.50 | 1.35 | 0.50 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 0.50 | 0.50 |
| γ_{ES} | 0.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 0.50 | 0.50 |
| γ_{LS} | 0.00 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.62 | -0.63 | 0.02 | -0.04 | 0.36 | -0.58 | 0.04 | -0.05 | -0.07 | -0.13 | -0.15 |
| γ_{DW}^*DW | 0.37 | -0.31 | 0.02 | -0.03 | 0.27 | -0.32 | 0.02 | -0.03 | -0.03 | -0.07 | -0.07 |
| γ_{EV}^*EV | 0.97 | -0.79 | 0.05 | -0.06 | 0.68 | -0.83 | 0.06 | -0.07 | -0.07 | -0.18 | -0.18 |
| γ_{EH}^*EH | -0.25 | 0.18 | 0.02 | 0.01 | 0.15 | 0.13 | 0.00 | -0.03 | -0.03 | 0.01 | 0.01 |
| γ_{ES}^*ES | -0.03 | 0.02 | 0.00 | 0.00 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.00 | 0.00 | 0.02 | 0.00 | 0.09 | 0.00 | 0.00 | -0.02 | -0.02 | 0.00 | 0.00 |
| γ_{LL}^*LL | 3.40 | -2.47 | 0.23 | -0.26 | 3.23 | -2.09 | 0.24 | -0.24 | -0.19 | -0.40 | -0.33 |
| $\phi_c\phi_s\phi_{R_n}$ | 14.80 | -16.12 | 0.96 | -0.96 | 14.80 | -16.12 | 0.96 | -37.04 | -37.04 | -37.04 | -37.04 |
| RF | 3.86 | 5.90 | 3.45 | 3.27 | 4.02 | 6.95 | 3.49 | 142.42 | 173.51 | 92.06 | 110.75 |

Table C-8
Culvert #1 load factors, factored loads and rating factors at critical sections for Type 3-3

| Type 3-3 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|---------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 0.50 | 0.50 | 1.35 | 0.50 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 0.50 | 0.50 |
| γ_{ES} | 0.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 0.50 | 0.50 |
| γ_{LS} | 0.00 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.62 | -0.63 | 0.02 | -0.04 | 0.36 | -0.58 | 0.04 | -0.05 | -0.07 | -0.13 | -0.15 |
| γ_{DW}^*DW | 0.37 | -0.31 | 0.02 | -0.03 | 0.27 | -0.32 | 0.02 | -0.03 | -0.03 | -0.07 | -0.07 |
| γ_{EV}^*EV | 0.97 | -0.79 | 0.05 | -0.06 | 0.68 | -0.83 | 0.06 | -0.07 | -0.07 | -0.18 | -0.18 |
| γ_{EH}^*EH | -0.25 | 0.18 | 0.02 | 0.01 | 0.15 | 0.13 | 0.00 | -0.03 | -0.03 | 0.01 | 0.01 |
| γ_{ES}^*ES | -0.03 | 0.02 | 0.00 | 0.00 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.00 | 0.00 | 0.02 | 0.00 | 0.09 | 0.00 | 0.00 | -0.02 | -0.02 | 0.00 | 0.00 |
| γ_{LL}^*LL | 2.63 | -1.82 | 0.17 | -0.20 | 2.52 | -1.58 | 0.18 | -0.19 | -0.15 | -0.30 | -0.25 |
| $\phi_c\phi_s\phi_{R_n}$ | 14.80 | -16.12 | 0.96 | -0.96 | 14.80 | -16.12 | 0.96 | -37.04 | -37.04 | -37.04 | -37.04 |
| RF | 4.98 | 8.03 | 4.49 | 4.21 | 5.10 | 9.19 | 4.65 | 178.36 | 214.15 | 121.31 | 145.65 |

Table C-9
Culvert #1 load factors, factored loads and rating factors at critical sections for NRL

| NRL | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|--------------------------|-------|--------|------|-------|-------|--------|------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 0.50 | 0.50 | 1.35 | 0.50 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 0.50 | 0.50 |
| γ_{ES} | 0.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 0.50 | 0.50 |
| γ_{LS} | 0.00 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.62 | -0.63 | 0.02 | -0.04 | 0.36 | -0.58 | 0.04 | -0.05 | -0.07 | -0.13 | -0.15 |
| γ_{DW}^*DW | 0.37 | -0.31 | 0.02 | -0.03 | 0.27 | -0.32 | 0.02 | -0.03 | -0.03 | -0.07 | -0.07 |
| γ_{EV}^*EV | 0.97 | -0.79 | 0.05 | -0.06 | 0.68 | -0.83 | 0.06 | -0.07 | -0.07 | -0.18 | -0.18 |
| γ_{EH}^*EH | -0.25 | 0.18 | 0.02 | 0.01 | 0.15 | 0.13 | 0.00 | -0.03 | -0.03 | 0.01 | 0.01 |
| γ_{ES}^*ES | -0.03 | 0.02 | 0.00 | 0.00 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.00 | 0.00 | 0.02 | 0.00 | 0.09 | 0.00 | 0.00 | -0.02 | -0.02 | 0.00 | 0.00 |
| γ_{LL}^*LL | 3.07 | -2.32 | 0.21 | -0.23 | 2.73 | -2.20 | 0.22 | -0.24 | -0.19 | -0.42 | -0.36 |
| $\phi_c\phi_s\phi_{R_n}$ | 14.80 | -16.12 | 0.96 | -0.96 | 14.80 | -16.12 | 0.96 | -37.04 | -37.04 | -37.04 | -37.04 |
| RF | 4.28 | 6.29 | 3.71 | 3.61 | 4.73 | 6.61 | 3.78 | 144.01 | 174.33 | 86.58 | 102.89 |

Table C-10
Culvert #1 load factors, factored loads and rating factors at critical sections for SU4

| SU4 | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|------|-------|-------|--------|------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 0.50 | 0.50 | 1.35 | 0.50 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 0.50 | 0.50 |
| γ_{ES} | 0.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 0.50 | 0.50 |
| γ_{LS} | 0.00 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.62 | -0.63 | 0.02 | -0.04 | 0.36 | -0.58 | 0.04 | -0.05 | -0.07 | -0.13 | -0.15 |
| γ_{DW}^*DW | 0.37 | -0.31 | 0.02 | -0.03 | 0.27 | -0.32 | 0.02 | -0.03 | -0.03 | -0.07 | -0.07 |
| γ_{EV}^*EV | 0.97 | -0.79 | 0.05 | -0.06 | 0.68 | -0.83 | 0.06 | -0.07 | -0.07 | -0.18 | -0.18 |
| γ_{EH}^*EH | -0.25 | 0.18 | 0.02 | 0.01 | 0.15 | 0.13 | 0.00 | -0.03 | -0.03 | 0.01 | 0.01 |
| γ_{ES}^*ES | -0.03 | 0.02 | 0.00 | 0.00 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.00 | 0.00 | 0.02 | 0.00 | 0.09 | 0.00 | 0.00 | -0.02 | -0.02 | 0.00 | 0.00 |
| γ_{LL}^*LL | 3.10 | -2.06 | 0.21 | -0.23 | 2.98 | -1.75 | 0.22 | -0.25 | -0.20 | -0.40 | -0.33 |
| $\phi_c\phi_s\phi R_n$ | 14.80 | -16.12 | 0.96 | -0.96 | 14.80 | -16.12 | 0.96 | -37.04 | -37.04 | -37.04 | -37.04 |
| RF | 4.24 | 7.08 | 3.70 | 3.67 | 4.34 | 8.33 | 3.79 | 137.55 | 165.77 | 92.28 | 109.93 |

Table C-11
Culvert #1 load factors, factored loads and rating factors at critical sections for SU5

| SU5 | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|------|-------|-------|--------|------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 0.50 | 0.50 | 1.35 | 0.50 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 0.50 | 0.50 |
| γ_{ES} | 0.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 0.50 | 0.50 |
| γ_{LS} | 0.00 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.62 | -0.63 | 0.02 | -0.04 | 0.36 | -0.58 | 0.04 | -0.05 | -0.07 | -0.13 | -0.15 |
| γ_{DW}^*DW | 0.37 | -0.31 | 0.02 | -0.03 | 0.27 | -0.32 | 0.02 | -0.03 | -0.03 | -0.07 | -0.07 |
| γ_{EV}^*EV | 0.97 | -0.79 | 0.05 | -0.06 | 0.68 | -0.83 | 0.06 | -0.07 | -0.07 | -0.18 | -0.18 |
| γ_{EH}^*EH | -0.25 | 0.18 | 0.02 | 0.01 | 0.15 | 0.13 | 0.00 | -0.03 | -0.03 | 0.01 | 0.01 |
| γ_{ES}^*ES | -0.03 | 0.02 | 0.00 | 0.00 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.00 | 0.00 | 0.02 | 0.00 | 0.09 | 0.00 | 0.00 | -0.02 | -0.02 | 0.00 | 0.00 |
| γ_{LL}^*LL | 3.05 | -2.20 | 0.21 | -0.23 | 2.93 | -1.97 | 0.22 | -0.25 | -0.20 | -0.40 | -0.34 |
| $\phi_c\phi_s\phi R_n$ | 14.80 | -16.12 | 0.96 | -0.96 | 14.80 | -16.12 | 0.96 | -37.04 | -37.04 | -37.04 | -37.04 |
| RF | 4.31 | 6.63 | 3.71 | 3.66 | 4.41 | 7.39 | 3.77 | 137.55 | 165.77 | 91.23 | 108.76 |

Table C-12
Culvert #1 load factors, factored loads and rating factors at critical sections for SU6

| SU6 | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|------|-------|-------|--------|------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 0.50 | 0.50 | 1.35 | 0.50 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 0.50 | 0.50 |
| γ_{ES} | 0.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 0.50 | 0.50 |
| γ_{LS} | 0.00 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.62 | -0.63 | 0.02 | -0.04 | 0.36 | -0.58 | 0.04 | -0.05 | -0.07 | -0.13 | -0.15 |
| γ_{DW}^*DW | 0.37 | -0.31 | 0.02 | -0.03 | 0.27 | -0.32 | 0.02 | -0.03 | -0.03 | -0.07 | -0.07 |
| γ_{EV}^*EV | 0.97 | -0.79 | 0.05 | -0.06 | 0.68 | -0.83 | 0.06 | -0.07 | -0.07 | -0.18 | -0.18 |
| γ_{EH}^*EH | -0.25 | 0.18 | 0.02 | 0.01 | 0.15 | 0.13 | 0.00 | -0.03 | -0.03 | 0.01 | 0.01 |
| γ_{ES}^*ES | -0.03 | 0.02 | 0.00 | 0.00 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.00 | 0.00 | 0.02 | 0.00 | 0.09 | 0.00 | 0.00 | -0.02 | -0.02 | 0.00 | 0.00 |
| γ_{LL}^*LL | 3.05 | -2.20 | 0.21 | -0.23 | 2.84 | -2.04 | 0.22 | -0.25 | -0.20 | -0.43 | -0.36 |
| $\phi_c\phi_s\phi R_n$ | 14.80 | -16.12 | 0.96 | -0.96 | 14.80 | -16.12 | 0.96 | -37.04 | -37.04 | -37.04 | -37.04 |
| RF | 4.30 | 6.63 | 3.71 | 3.66 | 4.55 | 7.14 | 3.79 | 137.74 | 166.23 | 85.98 | 102.28 |

Table C-13
Culvert #1 load factors, factored loads and rating factors at critical sections for SU7

| SU7 | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|------|-------|-------|--------|------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 0.50 | 0.50 | 1.35 | 0.50 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 0.50 | 0.50 |
| γ_{ES} | 0.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 0.50 | 0.50 |
| γ_{LS} | 0.00 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.62 | -0.63 | 0.02 | -0.04 | 0.36 | -0.58 | 0.04 | -0.05 | -0.07 | -0.13 | -0.15 |
| γ_{DW}^*DW | 0.37 | -0.31 | 0.02 | -0.03 | 0.27 | -0.32 | 0.02 | -0.03 | -0.03 | -0.07 | -0.07 |
| γ_{EV}^*EV | 0.97 | -0.79 | 0.05 | -0.06 | 0.68 | -0.83 | 0.06 | -0.07 | -0.07 | -0.18 | -0.18 |
| γ_{EH}^*EH | -0.25 | 0.18 | 0.02 | 0.01 | 0.15 | 0.13 | 0.00 | -0.03 | -0.03 | 0.01 | 0.01 |
| γ_{ES}^*ES | -0.03 | 0.02 | 0.00 | 0.00 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.00 | 0.00 | 0.02 | 0.00 | 0.09 | 0.00 | 0.00 | -0.02 | -0.02 | 0.00 | 0.00 |
| γ_{LL}^*LL | 3.05 | -2.24 | 0.21 | -0.23 | 2.78 | -2.11 | 0.22 | -0.25 | -0.20 | -0.43 | -0.36 |
| $\phi_c\phi_s\phi R_n$ | 14.80 | -16.12 | 0.96 | -0.96 | 14.80 | -16.12 | 0.96 | -37.04 | -37.04 | -37.04 | -37.04 |
| RF | 4.30 | 6.52 | 3.71 | 3.66 | 4.64 | 6.90 | 3.76 | 138.64 | 167.73 | 85.68 | 101.93 |

Culvert #2

Table C-14

Culvert #2 un-factored dead and live loads at critical sections for each load type

| Loads Types | | | M(kip-in/in) - V(kip/in) - A (kip/in) at critical sections | | | | | | | | | | |
|--------------|------|-----------|--|--------|--------|--------|-------|--------|--------|--------|--------|--------|--------|
| Load | Type | GW (kips) | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
| | | | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| DC | dead | - | 0.279 | -0.326 | -0.013 | -0.021 | 0.175 | -0.306 | -0.017 | -0.031 | -0.046 | -0.069 | -0.084 |
| DW | dead | - | 0.195 | -0.228 | -0.009 | 0.015 | 0.122 | -0.214 | -0.012 | -0.017 | -0.016 | -0.042 | -0.042 |
| EV | dead | - | 2.262 | -2.640 | -0.103 | 0.171 | 1.414 | -2.476 | -0.141 | -0.196 | -0.185 | -0.492 | -0.491 |
| EH | dead | - | 0.111 | 0.183 | -0.003 | 0.003 | 0.047 | 0.091 | 0.002 | -0.016 | -0.010 | -0.010 | 0.008 |
| ES | dead | - | 0.007 | 0.011 | 0.000 | 0.000 | 0.003 | 0.006 | 0.000 | -0.001 | -0.001 | -0.001 | 0.000 |
| LS | live | - | 0.029 | 0.048 | -0.001 | -0.001 | 0.013 | 0.026 | 0.000 | -0.005 | -0.003 | -0.003 | 0.002 |
| HL-93 | live | NA | 0.869 | -0.758 | -0.038 | 0.053 | 0.671 | -0.708 | -0.047 | -0.071 | -0.067 | -0.149 | -0.150 |
| HL-93 TD | live | NA | 0.898 | -0.963 | -0.040 | 0.059 | 0.586 | -0.918 | -0.054 | -0.073 | -0.069 | -0.177 | -0.177 |
| LA Type 3 | live | 41 | 0.413 | -0.437 | -0.018 | 0.027 | 0.275 | -0.418 | -0.024 | -0.034 | -0.031 | -0.080 | -0.080 |
| LA Type 3-S2 | live | 73 | 0.467 | -0.497 | -0.021 | 0.030 | 0.315 | -0.475 | -0.028 | -0.035 | -0.034 | -0.091 | -0.091 |
| LA Type 6 | live | 80 | 0.597 | -0.628 | -0.026 | 0.038 | 0.387 | -0.607 | -0.035 | -0.049 | -0.045 | -0.115 | -0.115 |
| LA Type 8 | live | 80 | 0.607 | -0.629 | -0.026 | 0.038 | 0.414 | -0.596 | -0.035 | -0.049 | -0.046 | -0.115 | -0.115 |
| Type 3-3 | live | 80 | 0.466 | -0.481 | -0.021 | 0.029 | 0.327 | -0.469 | -0.028 | -0.037 | -0.034 | -0.087 | -0.087 |
| NRL | live | 80 | 0.433 | -0.459 | -0.019 | 0.028 | 0.291 | -0.438 | -0.026 | -0.035 | -0.033 | -0.084 | -0.084 |
| SU 4 | live | 54 | 0.538 | -0.535 | -0.024 | 0.032 | 0.424 | -0.505 | -0.029 | -0.041 | -0.040 | -0.097 | -0.097 |
| SU 5 | live | 62 | 0.538 | -0.512 | -0.022 | 0.031 | 0.410 | -0.482 | -0.028 | -0.042 | -0.040 | -0.093 | -0.093 |
| SU 6 | live | 69.5 | 0.530 | -0.501 | -0.022 | 0.030 | 0.395 | -0.471 | -0.027 | -0.042 | -0.039 | -0.091 | -0.091 |
| SU 7 | live | 77.5 | 0.487 | -0.489 | -0.021 | 0.029 | 0.389 | -0.461 | -0.027 | -0.038 | -0.036 | -0.089 | -0.089 |

Table C-15
Culvert #2 load factors, factored loads and rating factors at critical sections for HL-93 inventory level

| HL-93 (INV) | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|-------|-------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 0.90 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 1.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 1.75 | 0.00 |
| γ_{LL} | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 |
| γ_{DC}^*DC | 0.35 | -0.41 | -0.02 | -0.02 | 0.22 | -0.38 | -0.02 | -0.04 | -0.06 | -0.09 | -0.11 |
| γ_{DW}^*DW | 0.29 | -0.34 | -0.01 | 0.02 | 0.18 | -0.32 | -0.02 | -0.03 | -0.02 | -0.06 | -0.06 |
| γ_{EV}^*EV | 2.94 | -3.43 | -0.13 | 0.22 | 1.84 | -3.22 | -0.18 | -0.25 | -0.24 | -0.64 | -0.64 |
| γ_{EH}^*EH | 0.15 | 0.09 | 0.00 | 0.00 | 0.06 | 0.05 | 0.00 | -0.02 | -0.01 | -0.01 | 0.00 |
| γ_{ES}^*ES | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.05 | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | -0.01 | -0.01 | -0.01 | 0.00 |
| γ_{LL}^*LL | 1.98 | -2.12 | -0.09 | 0.13 | 1.48 | -2.02 | -0.12 | -0.16 | -0.15 | -0.39 | -0.39 |
| $\phi_c\phi_s\phi R_n$ | 13.71 | -15.09 | -0.83 | 0.83 | 13.71 | -15.09 | -0.83 | -34.78 | -34.78 | -34.78 | -34.78 |
| RF | 4.91 | 5.18 | 7.40 | 4.57 | 7.59 | 5.54 | 5.11 | 202.67 | 218.60 | 85.79 | 86.85 |

Table C-16
Culvert #2 load factors, factored loads and rating factors at critical sections for HL-93 operational level

| HL-93 (OPR) | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|--------------------------|-------|--------|-------|-------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 0.90 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 1.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 1.75 | 0.00 |
| γ_{LL} | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 |
| γ_{DC}^*DC | 0.35 | -0.41 | -0.02 | -0.02 | 0.22 | -0.38 | -0.02 | -0.04 | -0.06 | -0.09 | -0.11 |
| γ_{DW}^*DW | 0.29 | -0.34 | -0.01 | 0.02 | 0.18 | -0.32 | -0.02 | -0.03 | -0.02 | -0.06 | -0.06 |
| γ_{EV}^*EV | 2.94 | -3.43 | -0.13 | 0.22 | 1.84 | -3.22 | -0.18 | -0.25 | -0.24 | -0.64 | -0.64 |
| γ_{EH}^*EH | 0.15 | 0.09 | 0.00 | 0.00 | 0.06 | 0.05 | 0.00 | -0.02 | -0.01 | -0.01 | 0.00 |
| γ_{ES}^*ES | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.05 | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | -0.01 | -0.01 | -0.01 | 0.00 |
| γ_{LL}^*LL | 1.53 | -1.64 | -0.07 | 0.10 | 1.14 | -1.56 | -0.09 | -0.12 | -0.12 | -0.30 | -0.30 |
| $\phi_c\phi_s\phi_{R_n}$ | 13.71 | -15.09 | -0.83 | 0.83 | 13.71 | -15.09 | -0.83 | -34.78 | -34.78 | -34.78 | -34.78 |
| RF | 6.32 | 6.72 | 9.55 | 5.93 | 9.80 | 7.18 | 6.62 | 259.09 | 280.69 | 110.78 | 112.59 |

Table C-17
Culvert #2 load factors, factored loads and rating factors at critical sections for LA Type 3

| LA Type 3 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|----------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 0.90 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 1.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 1.75 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.35 | -0.41 | -0.02 | -0.02 | 0.22 | -0.38 | -0.02 | -0.04 | -0.06 | -0.09 | -0.11 |
| γ_{DW}^*DW | 0.29 | -0.34 | -0.01 | 0.02 | 0.18 | -0.32 | -0.02 | -0.03 | -0.02 | -0.06 | -0.06 |
| γ_{EV}^*EV | 2.94 | -3.43 | -0.13 | 0.22 | 1.84 | -3.22 | -0.18 | -0.25 | -0.24 | -0.64 | -0.64 |
| γ_{EH}^*EH | 0.15 | 0.09 | 0.00 | 0.00 | 0.06 | 0.05 | 0.00 | -0.02 | -0.01 | -0.01 | 0.00 |
| γ_{ES}^*ES | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.05 | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | -0.01 | -0.01 | -0.01 | 0.00 |
| γ_{LL}^*LL | 0.87 | -0.92 | -0.04 | 0.06 | 0.58 | -0.88 | -0.05 | -0.07 | -0.07 | -0.17 | -0.17 |
| $\phi_c\phi_s\phi R_n$ | 13.71 | -15.09 | -0.83 | 0.83 | 13.71 | -15.09 | -0.83 | -34.78 | -34.78 | -34.78 | -34.78 |
| RF | 10.86 | 11.98 | 16.69 | 10.68 | 19.00 | 12.77 | 11.80 | 438.62 | 485.70 | 196.01 | 201.91 |

Table C-18
Culvert #2 load factors, factored loads and rating factors at critical sections for LA Type 3 S2

| LA Type 3 S2 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|-------------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 0.90 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 1.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 1.75 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.35 | -0.41 | -0.02 | -0.02 | 0.22 | -0.38 | -0.02 | -0.04 | -0.06 | -0.09 | -0.11 |
| γ_{DW}^*DW | 0.29 | -0.34 | -0.01 | 0.02 | 0.18 | -0.32 | -0.02 | -0.03 | -0.02 | -0.06 | -0.06 |
| γ_{EV}^*EV | 2.94 | -3.43 | -0.13 | 0.22 | 1.84 | -3.22 | -0.18 | -0.25 | -0.24 | -0.64 | -0.64 |
| γ_{EH}^*EH | 0.15 | 0.09 | 0.00 | 0.00 | 0.06 | 0.05 | 0.00 | -0.02 | -0.01 | -0.01 | 0.00 |
| γ_{ES}^*ES | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.05 | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | -0.01 | -0.01 | -0.01 | 0.00 |
| γ_{LL}^*LL | 0.98 | -1.04 | -0.04 | 0.06 | 0.66 | -1.00 | -0.06 | -0.07 | -0.07 | -0.19 | -0.19 |
| $\phi_c\phi_s\phi R_n$ | 13.71 | -15.09 | -0.83 | 0.83 | 13.71 | -15.09 | -0.83 | -34.78 | -34.78 | -34.78 | -34.78 |
| RF | 9.68 | 10.55 | 14.77 | 9.40 | 16.64 | 11.24 | 10.38 | 426.08 | 455.04 | 173.09 | 177.68 |

Table C-19
Culvert #2 load factors, factored loads and rating factors at critical sections for LA Type 6

| LA Type 6 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|----------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 0.90 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 1.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 1.75 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.35 | -0.41 | -0.02 | -0.02 | 0.22 | -0.38 | -0.02 | -0.04 | -0.06 | -0.09 | -0.11 |
| γ_{DW}^*DW | 0.29 | -0.34 | -0.01 | 0.02 | 0.18 | -0.32 | -0.02 | -0.03 | -0.02 | -0.06 | -0.06 |
| γ_{EV}^*EV | 2.94 | -3.43 | -0.13 | 0.22 | 1.84 | -3.22 | -0.18 | -0.25 | -0.24 | -0.64 | -0.64 |
| γ_{EH}^*EH | 0.15 | 0.09 | 0.00 | 0.00 | 0.06 | 0.05 | 0.00 | -0.02 | -0.01 | -0.01 | 0.00 |
| γ_{ES}^*ES | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.05 | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | -0.01 | -0.01 | -0.01 | 0.00 |
| γ_{LL}^*LL | 1.25 | -1.32 | -0.06 | 0.08 | 0.81 | -1.27 | -0.07 | -0.10 | -0.10 | -0.24 | -0.24 |
| $\phi_c\phi_s\phi_{R_n}$ | 13.71 | -15.09 | -0.83 | 0.83 | 13.71 | -15.09 | -0.83 | -34.78 | -34.78 | -34.78 | -34.78 |
| RF | 7.64 | 8.35 | 11.70 | 7.42 | 13.65 | 8.80 | 8.11 | 313.02 | 343.34 | 137.46 | 140.34 |

Table C-20
Culvert #2 load factors, factored loads and rating factors at critical sections for LA Type 8

| LA Type 8 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|----------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 0.90 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 1.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 1.75 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC*DC} | 0.35 | -0.41 | -0.02 | -0.02 | 0.22 | -0.38 | -0.02 | -0.04 | -0.06 | -0.09 | -0.11 |
| γ_{DW*DW} | 0.29 | -0.34 | -0.01 | 0.02 | 0.18 | -0.32 | -0.02 | -0.03 | -0.02 | -0.06 | -0.06 |
| γ_{EV*EV} | 2.94 | -3.43 | -0.13 | 0.22 | 1.84 | -3.22 | -0.18 | -0.25 | -0.24 | -0.64 | -0.64 |
| γ_{EH*EH} | 0.15 | 0.09 | 0.00 | 0.00 | 0.06 | 0.05 | 0.00 | -0.02 | -0.01 | -0.01 | 0.00 |
| γ_{ES*ES} | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS*LS} | 0.05 | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | -0.01 | -0.01 | -0.01 | 0.00 |
| γ_{LL*LL} | 1.27 | -1.32 | -0.05 | 0.08 | 0.87 | -1.25 | -0.07 | -0.10 | -0.10 | -0.24 | -0.24 |
| $\phi_c\phi_s\phi R_n$ | 13.71 | -15.09 | -0.83 | 0.83 | 13.71 | -15.09 | -0.83 | -34.78 | -34.78 | -34.78 | -34.78 |
| RF | 7.53 | 8.34 | 11.89 | 7.44 | 12.78 | 8.97 | 8.26 | 310.35 | 340.85 | 137.23 | 140.13 |

Table C-21
Culvert #2 load factors, factored loads and rating factors at critical sections for Type 3-3

| Type 3-3 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|---------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 0.90 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 1.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 1.75 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.35 | -0.41 | -0.02 | -0.02 | 0.22 | -0.38 | -0.02 | -0.04 | -0.06 | -0.09 | -0.11 |
| γ_{DW}^*DW | 0.29 | -0.34 | -0.01 | 0.02 | 0.18 | -0.32 | -0.02 | -0.03 | -0.02 | -0.06 | -0.06 |
| γ_{EV}^*EV | 2.94 | -3.43 | -0.13 | 0.22 | 1.84 | -3.22 | -0.18 | -0.25 | -0.24 | -0.64 | -0.64 |
| γ_{EH}^*EH | 0.15 | 0.09 | 0.00 | 0.00 | 0.06 | 0.05 | 0.00 | -0.02 | -0.01 | -0.01 | 0.00 |
| γ_{ES}^*ES | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.05 | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | -0.01 | -0.01 | -0.01 | 0.00 |
| γ_{LL}^*LL | 0.98 | -1.01 | -0.04 | 0.06 | 0.69 | -0.98 | -0.06 | -0.08 | -0.07 | -0.18 | -0.18 |
| $\phi_c\phi_s\phi R_n$ | 13.71 | -15.09 | -0.83 | 0.83 | 13.71 | -15.09 | -0.83 | -34.78 | -34.78 | -34.78 | -34.78 |
| RF | 9.69 | 10.89 | 14.84 | 9.77 | 16.08 | 11.39 | 10.45 | 404.03 | 446.67 | 180.43 | 185.47 |

Table C-22
Culvert #2 load factors, factored loads and rating factors at critical sections for NRL

| NRL Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|----------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 0.90 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 1.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 1.75 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.35 | -0.41 | -0.02 | -0.02 | 0.22 | -0.38 | -0.02 | -0.04 | -0.06 | -0.09 | -0.11 |
| γ_{DW}^*DW | 0.29 | -0.34 | -0.01 | 0.02 | 0.18 | -0.32 | -0.02 | -0.03 | -0.02 | -0.06 | -0.06 |
| γ_{EV}^*EV | 2.94 | -3.43 | -0.13 | 0.22 | 1.84 | -3.22 | -0.18 | -0.25 | -0.24 | -0.64 | -0.64 |
| γ_{EH}^*EH | 0.15 | 0.09 | 0.00 | 0.00 | 0.06 | 0.05 | 0.00 | -0.02 | -0.01 | -0.01 | 0.00 |
| γ_{ES}^*ES | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.05 | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | -0.01 | -0.01 | -0.01 | 0.00 |
| γ_{LL}^*LL | 0.91 | -0.96 | -0.04 | 0.06 | 0.61 | -0.92 | -0.05 | -0.07 | -0.07 | -0.18 | -0.18 |
| $\phi_c\phi_s\phi R_n$ | 13.71 | -15.09 | -0.83 | 0.83 | 13.71 | -15.09 | -0.83 | -34.78 | -34.78 | -34.78 | -34.78 |
| RF | 10.40 | 11.43 | 15.97 | 10.19 | 17.98 | 12.18 | 11.24 | 419.54 | 464.38 | 187.22 | 192.60 |

Table C-23
Culvert #2 load factors, factored loads and rating factors at critical sections for SU4

| SU4 | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|-------|-------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 0.90 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 1.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 1.75 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.35 | -0.41 | -0.02 | -0.02 | 0.22 | -0.38 | -0.02 | -0.04 | -0.06 | -0.09 | -0.11 |
| γ_{DW}^*DW | 0.29 | -0.34 | -0.01 | 0.02 | 0.18 | -0.32 | -0.02 | -0.03 | -0.02 | -0.06 | -0.06 |
| γ_{EV}^*EV | 2.94 | -3.43 | -0.13 | 0.22 | 1.84 | -3.22 | -0.18 | -0.25 | -0.24 | -0.64 | -0.64 |
| γ_{EH}^*EH | 0.15 | 0.09 | 0.00 | 0.00 | 0.06 | 0.05 | 0.00 | -0.02 | -0.01 | -0.01 | 0.00 |
| γ_{ES}^*ES | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.05 | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | -0.01 | -0.01 | -0.01 | 0.00 |
| γ_{LL}^*LL | 1.13 | -1.12 | -0.05 | 0.07 | 0.89 | -1.06 | -0.06 | -0.09 | -0.08 | -0.20 | -0.20 |
| $\phi_c\phi_s\phi R_n$ | 13.71 | -15.09 | -0.83 | 0.83 | 13.71 | -15.09 | -0.83 | -34.78 | -34.78 | -34.78 | -34.78 |
| RF | 8.45 | 9.80 | 12.95 | 8.86 | 12.50 | 10.58 | 9.86 | 361.70 | 388.94 | 162.00 | 166.18 |

Table C-24
Culvert #2 load factors, factored loads and rating factors at critical sections for SU5

| SU5 | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|-------|-------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 0.90 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 1.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 1.75 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.35 | -0.41 | -0.02 | -0.02 | 0.22 | -0.38 | -0.02 | -0.04 | -0.06 | -0.09 | -0.11 |
| γ_{DW}^*DW | 0.29 | -0.34 | -0.01 | 0.02 | 0.18 | -0.32 | -0.02 | -0.03 | -0.02 | -0.06 | -0.06 |
| γ_{EV}^*EV | 2.94 | -3.43 | -0.13 | 0.22 | 1.84 | -3.22 | -0.18 | -0.25 | -0.24 | -0.64 | -0.64 |
| γ_{EH}^*EH | 0.15 | 0.09 | 0.00 | 0.00 | 0.06 | 0.05 | 0.00 | -0.02 | -0.01 | -0.01 | 0.00 |
| γ_{ES}^*ES | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.05 | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | -0.01 | -0.01 | -0.01 | 0.00 |
| γ_{LL}^*LL | 1.13 | -1.07 | -0.05 | 0.06 | 0.86 | -1.01 | -0.06 | -0.09 | -0.08 | -0.20 | -0.20 |
| $\phi_c\phi_s\phi R_n$ | 13.71 | -15.09 | -0.83 | 0.83 | 13.71 | -15.09 | -0.83 | -34.78 | -34.78 | -34.78 | -34.78 |
| RF | 8.44 | 10.24 | 13.77 | 9.31 | 12.91 | 11.08 | 10.34 | 354.27 | 390.33 | 169.38 | 174.05 |

Table C-25
Culvert #2 load factors, factored loads and rating factors at critical sections for SU6

| SU6 | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|-------|-------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 0.90 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 1.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 1.75 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.35 | -0.41 | -0.02 | -0.02 | 0.22 | -0.38 | -0.02 | -0.04 | -0.06 | -0.09 | -0.11 |
| γ_{DW}^*DW | 0.29 | -0.34 | -0.01 | 0.02 | 0.18 | -0.32 | -0.02 | -0.03 | -0.02 | -0.06 | -0.06 |
| γ_{EV}^*EV | 2.94 | -3.43 | -0.13 | 0.22 | 1.84 | -3.22 | -0.18 | -0.25 | -0.24 | -0.64 | -0.64 |
| γ_{EH}^*EH | 0.15 | 0.09 | 0.00 | 0.00 | 0.06 | 0.05 | 0.00 | -0.02 | -0.01 | -0.01 | 0.00 |
| γ_{ES}^*ES | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.05 | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | -0.01 | -0.01 | -0.01 | 0.00 |
| γ_{LL}^*LL | 1.11 | -1.05 | -0.05 | 0.06 | 0.83 | -0.99 | -0.06 | -0.09 | -0.08 | -0.19 | -0.19 |
| $\phi_c\phi_s\phi R_n$ | 13.71 | -15.09 | -0.83 | 0.83 | 13.71 | -15.09 | -0.83 | -34.78 | -34.78 | -34.78 | -34.78 |
| RF | 8.57 | 10.46 | 13.89 | 9.48 | 13.39 | 11.35 | 10.59 | 360.90 | 399.85 | 173.23 | 178.27 |

Table C-26
Culvert #2 load factors, factored loads and rating factors at critical sections for SU7

| SU7 | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|-------|-------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 0.90 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 1.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 1.75 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.35 | -0.41 | -0.02 | -0.02 | 0.22 | -0.38 | -0.02 | -0.04 | -0.06 | -0.09 | -0.11 |
| γ_{DW}^*DW | 0.29 | -0.34 | -0.01 | 0.02 | 0.18 | -0.32 | -0.02 | -0.03 | -0.02 | -0.06 | -0.06 |
| γ_{EV}^*EV | 2.94 | -3.43 | -0.13 | 0.22 | 1.84 | -3.22 | -0.18 | -0.25 | -0.24 | -0.64 | -0.64 |
| γ_{EH}^*EH | 0.15 | 0.09 | 0.00 | 0.00 | 0.06 | 0.05 | 0.00 | -0.02 | -0.01 | -0.01 | 0.00 |
| γ_{ES}^*ES | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.05 | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | -0.01 | -0.01 | -0.01 | 0.00 |
| γ_{LL}^*LL | 1.02 | -1.03 | -0.04 | 0.06 | 0.82 | -0.97 | -0.06 | -0.08 | -0.08 | -0.19 | -0.19 |
| $\phi_c\phi_s\phi R_n$ | 13.71 | -15.09 | -0.83 | 0.83 | 13.71 | -15.09 | -0.83 | -34.78 | -34.78 | -34.78 | -34.78 |
| RF | 9.29 | 10.71 | 14.27 | 9.74 | 13.57 | 11.60 | 10.83 | 396.70 | 424.97 | 177.22 | 182.39 |

Culvert #3

Table C-27

Culvert #3 un-factored dead and live loads at critical sections for each load type

| Loads Types | | | M(kip-in/in) - V(kip/in) - A (kip/in) at critical sections | | | | | | | | | | |
|--------------|------|-----------|--|--------|-------|--------|--------|--------|--------|--------|--------|--------|--------|
| Load | Type | GW (kips) | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
| | | | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| DC | dead | - | 0.509 | -0.672 | 0.028 | -0.044 | 0.215 | -0.574 | -0.029 | -0.056 | -0.074 | -0.107 | -0.126 |
| DW | dead | - | 0.315 | -0.430 | 0.018 | -0.027 | 0.151 | -0.355 | -0.018 | -0.024 | -0.024 | -0.059 | -0.058 |
| EV | dead | - | 0.317 | -0.418 | 0.017 | -0.027 | 0.134 | -0.357 | -0.018 | -0.026 | -0.023 | -0.058 | -0.056 |
| EH | dead | - | 0.451 | 0.809 | 0.112 | 0.012 | -0.183 | -0.929 | 0.018 | 0.047 | 0.043 | 0.052 | 0.009 |
| ES | dead | - | 0.056 | 0.099 | 0.014 | 0.002 | -0.022 | -0.114 | 0.002 | 0.007 | 0.005 | 0.007 | 0.001 |
| LS | live | - | 0.280 | 0.499 | 0.071 | 0.008 | -0.109 | -0.576 | 0.011 | 0.033 | 0.026 | 0.033 | 0.007 |
| HL-93 | live | NA | 4.786 | -4.254 | 0.274 | -0.362 | 3.619 | -2.949 | -0.243 | -0.308 | -0.263 | -0.373 | -0.357 |
| HL-93 TD | live | NA | 3.883 | -3.922 | 0.267 | -0.338 | 2.695 | -3.015 | -0.214 | -0.333 | -0.303 | -0.495 | -0.473 |
| LA Type 3 | live | 41 | 2.404 | -2.460 | 0.145 | -0.202 | 1.741 | -1.968 | -0.128 | -0.150 | -0.137 | -0.286 | -0.268 |
| LA Type 3-S2 | live | 73 | 2.489 | -2.839 | 0.153 | -0.205 | 1.703 | -2.399 | -0.138 | -0.172 | -0.154 | -0.286 | -0.268 |
| LA Type 6 | live | 80 | 2.769 | -2.833 | 0.167 | -0.232 | 2.152 | -1.911 | -0.150 | -0.176 | -0.160 | -0.327 | -0.312 |
| LA Type 8 | live | 80 | 2.688 | -2.594 | 0.188 | -0.232 | 1.898 | -2.236 | -0.147 | -0.231 | -0.209 | -0.341 | -0.326 |
| Type 3-3 | live | 80 | 2.327 | -2.053 | 0.140 | -0.176 | 1.748 | -1.774 | -0.115 | -0.176 | -0.159 | -0.249 | -0.238 |
| NRL | live | 80 | 2.452 | -2.955 | 0.146 | -0.217 | 1.723 | -1.936 | -0.140 | -0.159 | -0.144 | -0.337 | -0.323 |
| SU 4 | live | 54 | 2.548 | -2.699 | 0.153 | -0.214 | 1.949 | -1.955 | -0.135 | -0.162 | -0.145 | -0.325 | -0.308 |
| SU 5 | live | 62 | 2.548 | -2.699 | 0.153 | -0.214 | 1.949 | -1.955 | -0.135 | -0.162 | -0.145 | -0.325 | -0.308 |
| SU 6 | live | 69.5 | 2.464 | -2.876 | 0.148 | -0.216 | 1.741 | -2.094 | -0.137 | -0.159 | -0.144 | -0.337 | -0.323 |
| SU 7 | live | 77.5 | 2.432 | -2.987 | 0.146 | -0.217 | 1.723 | -1.987 | -0.140 | -0.159 | -0.144 | -0.337 | -0.323 |

Table C-28
Culvert #3 load factors, factored loads and rating factors at critical sections for HL-93 inventory level

| HL-93 (INV) | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|------|-------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 0.50 | 0.50 | 1.35 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL} | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 |
| γ_{DC}^*DC | 0.64 | -0.84 | 0.03 | -0.05 | 0.27 | -0.72 | -0.04 | -0.07 | -0.09 | -0.13 | -0.16 |
| γ_{DW}^*DW | 0.47 | -0.65 | 0.03 | -0.04 | 0.23 | -0.53 | -0.03 | -0.04 | -0.04 | -0.09 | -0.09 |
| γ_{EV}^*EV | 0.41 | -0.54 | 0.02 | -0.04 | 0.17 | -0.46 | -0.02 | -0.03 | -0.03 | -0.08 | -0.07 |
| γ_{EH}^*EH | 0.61 | 0.40 | 0.15 | 0.01 | -0.09 | -1.25 | 0.01 | 0.02 | 0.02 | 0.03 | 0.00 |
| γ_{ES}^*ES | 0.08 | 0.05 | 0.02 | 0.00 | -0.01 | -0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.49 | 0.00 | 0.12 | 0.00 | 0.00 | -1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^*LL | 12.97 | -11.52 | 0.74 | -0.98 | 9.80 | -8.17 | -0.66 | -0.90 | -0.82 | -1.34 | -1.28 |
| $\phi_c\phi_s\phi R_n$ | 18.70 | -20.37 | 1.23 | -1.23 | 18.70 | -20.37 | -1.23 | -59.81 | -59.81 | -59.81 | -59.81 |
| RF | 1.23 | 1.63 | 1.12 | 1.13 | 1.85 | 1.88 | 1.76 | 66.23 | 72.78 | 44.43 | 46.38 |

Table C-29
Culvert #3 load factors, factored loads and rating factors at critical sections for HL-93 operational level

| HL-93 (OPR) | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|------|-------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 0.50 | 0.50 | 1.35 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL} | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 |
| γ_{DC}^*DC | 0.64 | -0.84 | 0.03 | -0.05 | 0.27 | -0.72 | -0.04 | -0.07 | -0.09 | -0.13 | -0.16 |
| γ_{DW}^*DW | 0.47 | -0.65 | 0.03 | -0.04 | 0.23 | -0.53 | -0.03 | -0.04 | -0.04 | -0.09 | -0.09 |
| γ_{EV}^*EV | 0.41 | -0.54 | 0.02 | -0.04 | 0.17 | -0.46 | -0.02 | -0.03 | -0.03 | -0.08 | -0.07 |
| γ_{EH}^*EH | 0.61 | 0.40 | 0.15 | 0.01 | -0.09 | -1.25 | 0.01 | 0.02 | 0.02 | 0.03 | 0.00 |
| γ_{ES}^*ES | 0.08 | 0.05 | 0.02 | 0.00 | -0.01 | -0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.49 | 0.00 | 0.12 | 0.00 | 0.00 | -1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^*LL | 10.00 | -8.89 | 0.57 | -0.76 | 7.56 | -6.30 | -0.51 | -0.70 | -0.63 | -1.03 | -0.99 |
| $\phi_c\phi_s\phi R_n$ | 18.70 | -20.37 | 1.23 | -1.23 | 18.70 | -20.37 | -1.23 | -59.81 | -59.81 | -59.81 | -59.81 |
| RF | 1.57 | 2.11 | 1.40 | 1.47 | 2.40 | 2.36 | 2.28 | 85.86 | 94.35 | 57.59 | 60.13 |

Table C-30
Culvert #3 load factors, factored loads and rating factors at critical sections for LA Type 3

| LA Type 3 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|----------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 0.50 | 0.50 | 1.35 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.64 | -0.84 | 0.03 | -0.05 | 0.27 | -0.72 | -0.04 | -0.07 | -0.09 | -0.13 | -0.16 |
| γ_{DW}^*DW | 0.47 | -0.65 | 0.03 | -0.04 | 0.23 | -0.53 | -0.03 | -0.04 | -0.04 | -0.09 | -0.09 |
| γ_{EV}^*EV | 0.41 | -0.54 | 0.02 | -0.04 | 0.17 | -0.46 | -0.02 | -0.03 | -0.03 | -0.08 | -0.07 |
| γ_{EH}^*EH | 0.61 | 0.40 | 0.15 | 0.01 | -0.09 | -1.25 | 0.01 | 0.02 | 0.02 | 0.03 | 0.00 |
| γ_{ES}^*ES | 0.08 | 0.05 | 0.02 | 0.00 | -0.01 | -0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.49 | 0.00 | 0.12 | 0.00 | 0.00 | -1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^*LL | 6.20 | -6.35 | 0.37 | -0.52 | 4.49 | -5.08 | -0.33 | -0.39 | -0.35 | -0.74 | -0.69 |
| $\phi_c\phi_s\phi R_n$ | 18.70 | -20.37 | 1.23 | -1.23 | 18.70 | -20.37 | -1.23 | -59.81 | -59.81 | -59.81 | -59.81 |
| RF | 2.46 | 2.96 | 1.96 | 2.13 | 4.04 | 2.83 | 3.50 | 154.74 | 168.58 | 80.82 | 86.21 |

Table C-31
Culvert #3 load factors, factored loads and rating factors at critical sections for LA Type 3 S2

| LA Type 3 S2 | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|------|-------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 0.50 | 0.50 | 1.35 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.64 | -0.84 | 0.03 | -0.05 | 0.27 | -0.72 | -0.04 | -0.07 | -0.09 | -0.13 | -0.16 |
| γ_{DW}^*DW | 0.47 | -0.65 | 0.03 | -0.04 | 0.23 | -0.53 | -0.03 | -0.04 | -0.04 | -0.09 | -0.09 |
| γ_{EV}^*EV | 0.41 | -0.54 | 0.02 | -0.04 | 0.17 | -0.46 | -0.02 | -0.03 | -0.03 | -0.08 | -0.07 |
| γ_{EH}^*EH | 0.61 | 0.40 | 0.15 | 0.01 | -0.09 | -1.25 | 0.01 | 0.02 | 0.02 | 0.03 | 0.00 |
| γ_{ES}^*ES | 0.08 | 0.05 | 0.02 | 0.00 | -0.01 | -0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.49 | 0.00 | 0.12 | 0.00 | 0.00 | -1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^*LL | 6.42 | -7.33 | 0.40 | -0.53 | 4.39 | -6.19 | -0.35 | -0.44 | -0.40 | -0.74 | -0.69 |
| $\phi_c\phi_s\phi R_n$ | 18.70 | -20.37 | 1.23 | -1.23 | 18.70 | -20.37 | -1.23 | -59.81 | -59.81 | -59.81 | -59.81 |
| RF | 2.39 | 2.57 | 1.87 | 2.10 | 4.13 | 2.40 | 3.26 | 134.66 | 150.09 | 80.82 | 86.21 |

Table C-32
Culvert #3 load factors, factored loads and rating factors at critical sections for LA Type 6

| LA Type 6 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|----------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 0.50 | 0.50 | 1.35 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.64 | -0.84 | 0.03 | -0.05 | 0.27 | -0.72 | -0.04 | -0.07 | -0.09 | -0.13 | -0.16 |
| γ_{DW}^*DW | 0.47 | -0.65 | 0.03 | -0.04 | 0.23 | -0.53 | -0.03 | -0.04 | -0.04 | -0.09 | -0.09 |
| γ_{EV}^*EV | 0.41 | -0.54 | 0.02 | -0.04 | 0.17 | -0.46 | -0.02 | -0.03 | -0.03 | -0.08 | -0.07 |
| γ_{EH}^*EH | 0.61 | 0.40 | 0.15 | 0.01 | -0.09 | -1.25 | 0.01 | 0.02 | 0.02 | 0.03 | 0.00 |
| γ_{ES}^*ES | 0.08 | 0.05 | 0.02 | 0.00 | -0.01 | -0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.49 | 0.00 | 0.12 | 0.00 | 0.00 | -1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^*LL | 7.14 | -7.31 | 0.43 | -0.60 | 5.55 | -4.93 | -0.39 | -0.45 | -0.41 | -0.84 | -0.80 |
| $\phi_c\phi_s\phi R_n$ | 18.70 | -20.37 | 1.23 | -1.23 | 18.70 | -20.37 | -1.23 | -59.81 | -59.81 | -59.81 | -59.81 |
| RF | 2.16 | 2.57 | 1.76 | 1.85 | 3.27 | 2.90 | 2.98 | 131.73 | 144.92 | 70.58 | 73.92 |

Table C-33
Culvert #3 load factors, factored loads and rating factors at critical sections for LA Type 8

| LA Type 8 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|----------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 0.50 | 0.50 | 1.35 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.64 | -0.84 | 0.03 | -0.05 | 0.27 | -0.72 | -0.04 | -0.07 | -0.09 | -0.13 | -0.16 |
| γ_{DW}^*DW | 0.47 | -0.65 | 0.03 | -0.04 | 0.23 | -0.53 | -0.03 | -0.04 | -0.04 | -0.09 | -0.09 |
| γ_{EV}^*EV | 0.41 | -0.54 | 0.02 | -0.04 | 0.17 | -0.46 | -0.02 | -0.03 | -0.03 | -0.08 | -0.07 |
| γ_{EH}^*EH | 0.61 | 0.40 | 0.15 | 0.01 | -0.09 | -1.25 | 0.01 | 0.02 | 0.02 | 0.03 | 0.00 |
| γ_{ES}^*ES | 0.08 | 0.05 | 0.02 | 0.00 | -0.01 | -0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.49 | 0.00 | 0.12 | 0.00 | 0.00 | -1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^*LL | 6.94 | -6.69 | 0.49 | -0.60 | 4.90 | -5.77 | -0.38 | -0.60 | -0.54 | -0.88 | -0.84 |
| $\phi_c\phi_s\phi R_n$ | 18.70 | -20.37 | 1.23 | -1.23 | 18.70 | -20.37 | -1.23 | -59.81 | -59.81 | -59.81 | -59.81 |
| RF | 2.22 | 2.81 | 1.60 | 1.85 | 3.70 | 2.54 | 3.04 | 100.16 | 110.64 | 67.65 | 70.77 |

Table C-34
Culvert #3 load factors, factored loads and rating factors at critical sections for Type 3-3

| Type 3-3 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|---------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 0.50 | 0.50 | 1.35 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC*DC} | 0.64 | -0.84 | 0.03 | -0.05 | 0.27 | -0.72 | -0.04 | -0.07 | -0.09 | -0.13 | -0.16 |
| γ_{DW*DW} | 0.47 | -0.65 | 0.03 | -0.04 | 0.23 | -0.53 | -0.03 | -0.04 | -0.04 | -0.09 | -0.09 |
| γ_{EV*EV} | 0.41 | -0.54 | 0.02 | -0.04 | 0.17 | -0.46 | -0.02 | -0.03 | -0.03 | -0.08 | -0.07 |
| γ_{EH*EH} | 0.61 | 0.40 | 0.15 | 0.01 | -0.09 | -1.25 | 0.01 | 0.02 | 0.02 | 0.03 | 0.00 |
| γ_{ES*ES} | 0.08 | 0.05 | 0.02 | 0.00 | -0.01 | -0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS*LS} | 0.49 | 0.00 | 0.12 | 0.00 | 0.00 | -1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL*LL} | 6.00 | -5.30 | 0.36 | -0.46 | 4.51 | -4.58 | -0.30 | -0.45 | -0.41 | -0.64 | -0.61 |
| $\phi_c\phi_s\phi R_n$ | 18.70 | -20.37 | 1.23 | -1.23 | 18.70 | -20.37 | -1.23 | -59.81 | -59.81 | -59.81 | -59.81 |
| RF | 2.54 | 3.55 | 2.00 | 2.44 | 4.02 | 3.09 | 3.91 | 131.24 | 145.88 | 92.59 | 96.77 |

Table C-35
Culvert #3 load factors, factored loads and rating factors at critical sections for NRL

| NRL | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|------|-------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 0.50 | 0.50 | 1.35 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.64 | -0.84 | 0.03 | -0.05 | 0.27 | -0.72 | -0.04 | -0.07 | -0.09 | -0.13 | -0.16 |
| γ_{DW}^*DW | 0.47 | -0.65 | 0.03 | -0.04 | 0.23 | -0.53 | -0.03 | -0.04 | -0.04 | -0.09 | -0.09 |
| γ_{EV}^*EV | 0.41 | -0.54 | 0.02 | -0.04 | 0.17 | -0.46 | -0.02 | -0.03 | -0.03 | -0.08 | -0.07 |
| γ_{EH}^*EH | 0.61 | 0.40 | 0.15 | 0.01 | -0.09 | -1.25 | 0.01 | 0.02 | 0.02 | 0.03 | 0.00 |
| γ_{ES}^*ES | 0.08 | 0.05 | 0.02 | 0.00 | -0.01 | -0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.49 | 0.00 | 0.12 | 0.00 | 0.00 | -1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^*LL | 6.33 | -7.62 | 0.38 | -0.56 | 4.45 | -4.99 | -0.36 | -0.41 | -0.37 | -0.87 | -0.83 |
| $\phi_c\phi_s\phi R_n$ | 18.70 | -20.37 | 1.23 | -1.23 | 18.70 | -20.37 | -1.23 | -59.81 | -59.81 | -59.81 | -59.81 |
| RF | 2.42 | 2.47 | 1.94 | 1.98 | 4.08 | 2.87 | 3.20 | 145.20 | 160.12 | 68.42 | 71.41 |

Table C-36
Culvert #3 load factors, factored loads and rating factors at critical sections for SU4

| SU4 | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|------|-------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 0.50 | 0.50 | 1.35 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC*DC} | 0.64 | -0.84 | 0.03 | -0.05 | 0.27 | -0.72 | -0.04 | -0.07 | -0.09 | -0.13 | -0.16 |
| γ_{DW*DW} | 0.47 | -0.65 | 0.03 | -0.04 | 0.23 | -0.53 | -0.03 | -0.04 | -0.04 | -0.09 | -0.09 |
| γ_{EV*EV} | 0.41 | -0.54 | 0.02 | -0.04 | 0.17 | -0.46 | -0.02 | -0.03 | -0.03 | -0.08 | -0.07 |
| γ_{EH*EH} | 0.61 | 0.40 | 0.15 | 0.01 | -0.09 | -1.25 | 0.01 | 0.02 | 0.02 | 0.03 | 0.00 |
| γ_{ES*ES} | 0.08 | 0.05 | 0.02 | 0.00 | -0.01 | -0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS*LS} | 0.49 | 0.00 | 0.12 | 0.00 | 0.00 | -1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL*LL} | 6.57 | -6.96 | 0.40 | -0.55 | 5.03 | -5.04 | -0.35 | -0.42 | -0.38 | -0.84 | -0.80 |
| $\phi_c\phi_s\phi R_n$ | 18.70 | -20.37 | 1.23 | -1.23 | 18.70 | -20.37 | -1.23 | -59.81 | -59.81 | -59.81 | -59.81 |
| RF | 2.33 | 2.70 | 1.88 | 2.01 | 3.61 | 2.85 | 3.31 | 142.89 | 159.13 | 71.01 | 74.84 |

Table C-37
Culvert #3 load factors, factored loads and rating factors at critical sections for SU5

| SU5 | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|------|-------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 0.50 | 0.50 | 1.35 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.64 | -0.84 | 0.03 | -0.05 | 0.27 | -0.72 | -0.04 | -0.07 | -0.09 | -0.13 | -0.16 |
| γ_{DW}^*DW | 0.47 | -0.65 | 0.03 | -0.04 | 0.23 | -0.53 | -0.03 | -0.04 | -0.04 | -0.09 | -0.09 |
| γ_{EV}^*EV | 0.41 | -0.54 | 0.02 | -0.04 | 0.17 | -0.46 | -0.02 | -0.03 | -0.03 | -0.08 | -0.07 |
| γ_{EH}^*EH | 0.61 | 0.40 | 0.15 | 0.01 | -0.09 | -1.25 | 0.01 | 0.02 | 0.02 | 0.03 | 0.00 |
| γ_{ES}^*ES | 0.08 | 0.05 | 0.02 | 0.00 | -0.01 | -0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.49 | 0.00 | 0.12 | 0.00 | 0.00 | -1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^*LL | 6.57 | -6.96 | 0.40 | -0.55 | 5.03 | -5.04 | -0.35 | -0.42 | -0.38 | -0.84 | -0.80 |
| $\phi_c\phi_s\phi R_n$ | 18.70 | -20.37 | 1.23 | -1.23 | 18.70 | -20.37 | -1.23 | -59.81 | -59.81 | -59.81 | -59.81 |
| RF | 2.33 | 2.70 | 1.88 | 2.01 | 3.61 | 2.85 | 3.31 | 142.89 | 159.13 | 71.01 | 74.84 |

Table C-38
Culvert #3 load factors, factored loads and rating factors at critical sections for SU6

| SU6 | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|------|-------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 0.50 | 0.50 | 1.35 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.64 | -0.84 | 0.03 | -0.05 | 0.27 | -0.72 | -0.04 | -0.07 | -0.09 | -0.13 | -0.16 |
| γ_{DW}^*DW | 0.47 | -0.65 | 0.03 | -0.04 | 0.23 | -0.53 | -0.03 | -0.04 | -0.04 | -0.09 | -0.09 |
| γ_{EV}^*EV | 0.41 | -0.54 | 0.02 | -0.04 | 0.17 | -0.46 | -0.02 | -0.03 | -0.03 | -0.08 | -0.07 |
| γ_{EH}^*EH | 0.61 | 0.40 | 0.15 | 0.01 | -0.09 | -1.25 | 0.01 | 0.02 | 0.02 | 0.03 | 0.00 |
| γ_{ES}^*ES | 0.08 | 0.05 | 0.02 | 0.00 | -0.01 | -0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.49 | 0.00 | 0.12 | 0.00 | 0.00 | -1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^*LL | 6.36 | -7.42 | 0.38 | -0.56 | 4.49 | -5.40 | -0.35 | -0.41 | -0.37 | -0.87 | -0.83 |
| $\phi_c\phi_s\phi R_n$ | 18.70 | -20.37 | 1.23 | -1.23 | 18.70 | -20.37 | -1.23 | -59.81 | -59.81 | -59.81 | -59.81 |
| RF | 2.41 | 2.53 | 1.93 | 1.99 | 4.04 | 2.69 | 3.27 | 145.31 | 160.68 | 68.41 | 71.43 |

Table C-39
Culvert #3 load factors, factored loads and rating factors at critical sections for SU7

| SU7 | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|------|-------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 0.50 | 0.50 | 1.35 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.64 | -0.84 | 0.03 | -0.05 | 0.27 | -0.72 | -0.04 | -0.07 | -0.09 | -0.13 | -0.16 |
| γ_{DW}^*DW | 0.47 | -0.65 | 0.03 | -0.04 | 0.23 | -0.53 | -0.03 | -0.04 | -0.04 | -0.09 | -0.09 |
| γ_{EV}^*EV | 0.41 | -0.54 | 0.02 | -0.04 | 0.17 | -0.46 | -0.02 | -0.03 | -0.03 | -0.08 | -0.07 |
| γ_{EH}^*EH | 0.61 | 0.40 | 0.15 | 0.01 | -0.09 | -1.25 | 0.01 | 0.02 | 0.02 | 0.03 | 0.00 |
| γ_{ES}^*ES | 0.08 | 0.05 | 0.02 | 0.00 | -0.01 | -0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.49 | 0.00 | 0.12 | 0.00 | 0.00 | -1.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^*LL | 6.28 | -7.71 | 0.38 | -0.56 | 4.45 | -5.13 | -0.36 | -0.41 | -0.37 | -0.87 | -0.83 |
| $\phi_c\phi_s\phi R_n$ | 18.70 | -20.37 | 1.23 | -1.23 | 18.70 | -20.37 | -1.23 | -59.81 | -59.81 | -59.81 | -59.81 |
| RF | 2.44 | 2.44 | 1.94 | 1.98 | 4.08 | 2.81 | 3.20 | 145.31 | 160.68 | 68.41 | 71.43 |

Culvert #4

Table C-40

Culvert #4 un-factored dead and live loads at critical sections for each load type

| Loads Types | | | M(kip-in/in) - V(kip/in) - A (kip/in) at critical sections | | | | | | | | | | |
|--------------|------|-----------|--|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| Load | Type | GW (kips) | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
| DC | dead | - | 1.622 | -2.889 | -0.051 | 0.090 | 1.542 | -1.247 | -0.039 | -0.121 | -0.175 | -0.262 | -0.327 |
| DW | dead | - | 0.672 | -1.191 | -0.021 | 0.037 | 0.639 | -0.514 | -0.017 | -0.039 | -0.038 | -0.096 | -0.097 |
| EV | dead | - | 2.022 | -3.599 | -0.063 | 0.112 | 1.923 | -1.555 | -0.049 | -0.107 | -0.091 | -0.281 | -0.281 |
| EH | dead | - | 0.213 | 0.370 | -0.003 | -0.003 | 0.105 | 0.314 | -0.003 | -0.012 | -0.007 | -0.008 | 0.006 |
| ES | dead | - | 0.016 | 0.029 | 0.000 | 0.000 | 0.008 | 0.024 | 0.000 | -0.001 | -0.001 | -0.001 | 0.000 |
| LS | live | - | 0.067 | 0.117 | -0.001 | -0.001 | 0.033 | 0.099 | -0.001 | -0.004 | -0.002 | -0.003 | 0.002 |
| HL-93 | live | NA | 4.719 | -6.736 | -0.176 | 0.209 | 4.351 | -3.080 | -0.145 | -0.328 | -0.182 | -9.709 | -0.271 |
| HL-93 TD | live | NA | 5.145 | -7.686 | -0.196 | 0.236 | 4.871 | -3.240 | -0.155 | -0.388 | -0.208 | -0.568 | -0.321 |
| LA Type 3 | live | 41 | 3.027 | -4.450 | -0.111 | 0.139 | 2.813 | -1.870 | -0.091 | -0.218 | -0.115 | -0.339 | -0.187 |
| LA Type 3-S2 | live | 73 | 3.027 | -4.957 | -0.111 | 0.143 | 2.813 | -2.284 | -0.091 | -0.218 | -0.116 | -0.413 | -0.234 |
| LA Type 6 | live | 80 | 3.471 | -5.224 | -0.133 | 0.158 | 3.287 | -2.145 | -0.108 | -0.263 | -0.139 | -7.220 | -0.201 |
| LA Type 8 | live | 80 | 3.460 | -5.207 | -0.126 | 0.154 | 3.096 | -2.103 | -0.105 | -0.239 | -0.127 | -7.220 | -0.222 |
| Type 3-3 | live | 80 | 2.614 | -3.883 | -0.100 | 0.119 | 2.488 | -1.624 | -0.080 | -0.198 | -0.104 | -0.280 | -0.156 |
| NRL | live | 80 | 3.242 | -5.255 | -0.122 | 0.156 | 2.982 | -2.102 | -0.097 | -0.244 | -0.129 | -0.476 | -0.265 |
| SU 4 | live | 54 | 3.243 | -5.135 | -0.123 | 0.156 | 3.019 | -1.989 | -0.097 | -0.244 | -0.129 | -0.476 | -0.265 |
| SU 5 | live | 62 | 3.233 | -4.913 | -0.120 | 0.154 | 3.010 | -2.008 | -0.096 | -0.244 | -0.129 | -0.423 | -0.234 |
| SU 6 | live | 69.5 | 3.292 | -5.135 | -0.123 | 0.154 | 3.051 | -1.895 | -0.098 | -0.244 | -0.129 | -0.457 | -0.253 |
| SU 7 | live | 77.5 | 3.243 | -5.135 | -0.123 | 0.156 | 3.019 | -1.989 | -0.097 | -0.244 | -0.129 | -0.476 | -0.265 |

Table C-41
Culvert #4 load factors, factored loads and rating factors at critical sections for HL-93 inventory level

| HL-93 (INV) | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|-------|------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 0.50 | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 1.35 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 1.75 | 0.00 |
| γ_{LL} | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 |
| γ_{DC}^*DC | 2.03 | -3.61 | -0.06 | 0.11 | 1.93 | -1.56 | -0.05 | -0.15 | -0.22 | -0.33 | -0.41 |
| γ_{DW}^*DW | 1.01 | -1.79 | -0.03 | 0.06 | 0.96 | -0.77 | -0.03 | -0.06 | -0.06 | -0.14 | -0.15 |
| γ_{EV}^*EV | 2.63 | -4.68 | -0.08 | 0.15 | 2.50 | -2.02 | -0.06 | -0.14 | -0.12 | -0.37 | -0.37 |
| γ_{EH}^*EH | 0.29 | 0.19 | 0.00 | 0.00 | 0.14 | 0.16 | 0.00 | -0.02 | -0.01 | -0.01 | 0.00 |
| γ_{ES}^*ES | 0.02 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.12 | 0.00 | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^*LL | 13.51 | -20.18 | -0.51 | 0.62 | 12.79 | -8.50 | -0.41 | -1.02 | -0.55 | -25.49 | -0.84 |
| $\phi_c\phi_s\phi R_n$ | 36.02 | -38.01 | -1.69 | 1.69 | 36.02 | -38.01 | -1.69 | -89.71 | -89.71 | -89.71 | -89.71 |
| RF | 2.21 | 1.39 | 2.93 | 2.22 | 2.37 | 3.98 | 3.79 | 87.03 | 162.26 | 3.49 | 105.33 |

Table C-42
Culvert #4 load factors, factored loads and rating factors at critical sections for HL-93 operational level

| HL-93 (OPR) | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|-------|------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 0.50 | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 1.35 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 1.75 | 0.00 |
| γ_{LL} | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 |
| γ_{DC}^*DC | 2.03 | -3.61 | -0.06 | 0.11 | 1.93 | -1.56 | -0.05 | -0.15 | -0.22 | -0.33 | -0.41 |
| γ_{DW}^*DW | 1.01 | -1.79 | -0.03 | 0.06 | 0.96 | -0.77 | -0.03 | -0.06 | -0.06 | -0.14 | -0.15 |
| γ_{EV}^*EV | 2.63 | -4.68 | -0.08 | 0.15 | 2.50 | -2.02 | -0.06 | -0.14 | -0.12 | -0.37 | -0.37 |
| γ_{EH}^*EH | 0.29 | 0.19 | 0.00 | 0.00 | 0.14 | 0.16 | 0.00 | -0.02 | -0.01 | -0.01 | 0.00 |
| γ_{ES}^*ES | 0.02 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.12 | 0.00 | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^*LL | 10.42 | -15.56 | -0.40 | 0.48 | 9.86 | -6.56 | -0.31 | -0.79 | -0.42 | -19.66 | -0.65 |
| $\phi_c\phi_s\phi R_n$ | 36.02 | -38.01 | -1.69 | 1.69 | 36.02 | -38.01 | -1.69 | -89.71 | -89.71 | -89.71 | -89.71 |
| RF | 2.85 | 1.81 | 3.79 | 2.88 | 3.07 | 5.16 | 4.91 | 112.59 | 209.91 | 4.52 | 136.54 |

Table C-43
Culvert #4 load factors, factored loads and rating factors at critical sections for LA Type 3

| LA Type 3 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|----------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 0.50 | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 1.35 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 1.75 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC*DC} | 2.03 | -3.61 | -0.06 | 0.11 | 1.93 | -1.56 | -0.05 | -0.15 | -0.22 | -0.33 | -0.41 |
| γ_{DW*DW} | 1.01 | -1.79 | -0.03 | 0.06 | 0.96 | -0.77 | -0.03 | -0.06 | -0.06 | -0.14 | -0.15 |
| γ_{EV*EV} | 2.63 | -4.68 | -0.08 | 0.15 | 2.50 | -2.02 | -0.06 | -0.14 | -0.12 | -0.37 | -0.37 |
| γ_{EH*EH} | 0.29 | 0.19 | 0.00 | 0.00 | 0.14 | 0.16 | 0.00 | -0.02 | -0.01 | -0.01 | 0.00 |
| γ_{ES*ES} | 0.02 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS*LS} | 0.12 | 0.00 | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 |
| γ_{LL*LL} | 7.57 | -11.12 | -0.28 | 0.35 | 7.03 | -4.67 | -0.23 | -0.54 | -0.29 | -0.85 | -0.47 |
| $\phi_c\phi_s\phi_{R_n}$ | 36.02 | -38.01 | -1.69 | 1.69 | 36.02 | -38.01 | -1.69 | -89.71 | -89.71 | -89.71 | -89.71 |
| RF | 3.91 | 2.53 | 5.39 | 3.96 | 4.30 | 7.24 | 6.73 | 162.17 | 305.44 | 104.31 | 189.53 |

Table C-44
Culvert #4 load factors, factored loads and rating factors at critical sections for LA Type 3 S2

| LA Type 3 S2 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|-------------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 0.50 | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 1.35 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 1.75 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 2.03 | -3.61 | -0.06 | 0.11 | 1.93 | -1.56 | -0.05 | -0.15 | -0.22 | -0.33 | -0.41 |
| γ_{DW}^*DW | 1.01 | -1.79 | -0.03 | 0.06 | 0.96 | -0.77 | -0.03 | -0.06 | -0.06 | -0.14 | -0.15 |
| γ_{EV}^*EV | 2.63 | -4.68 | -0.08 | 0.15 | 2.50 | -2.02 | -0.06 | -0.14 | -0.12 | -0.37 | -0.37 |
| γ_{EH}^*EH | 0.29 | 0.19 | 0.00 | 0.00 | 0.14 | 0.16 | 0.00 | -0.02 | -0.01 | -0.01 | 0.00 |
| γ_{ES}^*ES | 0.02 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.12 | 0.00 | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^*LL | 7.57 | -12.39 | -0.28 | 0.36 | 7.03 | -5.71 | -0.23 | -0.54 | -0.29 | -1.03 | -0.58 |
| $\phi_c\phi_s\phi R_n$ | 36.02 | -38.01 | -1.69 | 1.69 | 36.02 | -38.01 | -1.69 | -89.71 | -89.71 | -89.71 | -89.71 |
| RF | 3.91 | 2.27 | 5.39 | 3.85 | 4.30 | 5.92 | 6.73 | 162.17 | 304.14 | 85.78 | 151.91 |

Table C-45
Culvert #4 load factors, factored loads and rating factors at critical sections for LA Type 6

| LA Type 6 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|----------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 0.50 | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 1.35 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 1.75 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 2.03 | -3.61 | -0.06 | 0.11 | 1.93 | -1.56 | -0.05 | -0.15 | -0.22 | -0.33 | -0.41 |
| γ_{DW}^*DW | 1.01 | -1.79 | -0.03 | 0.06 | 0.96 | -0.77 | -0.03 | -0.06 | -0.06 | -0.14 | -0.15 |
| γ_{EV}^*EV | 2.63 | -4.68 | -0.08 | 0.15 | 2.50 | -2.02 | -0.06 | -0.14 | -0.12 | -0.37 | -0.37 |
| γ_{EH}^*EH | 0.29 | 0.19 | 0.00 | 0.00 | 0.14 | 0.16 | 0.00 | -0.02 | -0.01 | -0.01 | 0.00 |
| γ_{ES}^*ES | 0.02 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.12 | 0.00 | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^*LL | 8.68 | -13.06 | -0.33 | 0.40 | 8.22 | -5.36 | -0.27 | -0.66 | -0.35 | -18.05 | -0.50 |
| $\phi_c\phi_s\phi R_n$ | 36.02 | -38.01 | -1.69 | 1.69 | 36.02 | -38.01 | -1.69 | -89.71 | -89.71 | -89.71 | -89.71 |
| RF | 3.42 | 2.15 | 4.52 | 3.48 | 3.68 | 6.31 | 5.68 | 134.37 | 254.79 | 4.92 | 176.75 |

Table C-46
Culvert #4 load factors, factored loads and rating factors at critical sections for LA Type 8

| LA Type 8 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|----------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 0.50 | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 1.35 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 1.75 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC*DC} | 2.03 | -3.61 | -0.06 | 0.11 | 1.93 | -1.56 | -0.05 | -0.15 | -0.22 | -0.33 | -0.41 |
| γ_{DW*DW} | 1.01 | -1.79 | -0.03 | 0.06 | 0.96 | -0.77 | -0.03 | -0.06 | -0.06 | -0.14 | -0.15 |
| γ_{EV*EV} | 2.63 | -4.68 | -0.08 | 0.15 | 2.50 | -2.02 | -0.06 | -0.14 | -0.12 | -0.37 | -0.37 |
| γ_{EH*EH} | 0.29 | 0.19 | 0.00 | 0.00 | 0.14 | 0.16 | 0.00 | -0.02 | -0.01 | -0.01 | 0.00 |
| γ_{ES*ES} | 0.02 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS*LS} | 0.12 | 0.00 | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 |
| γ_{LL*LL} | 8.65 | -13.02 | -0.32 | 0.39 | 7.74 | -5.26 | -0.26 | -0.60 | -0.32 | -18.05 | -0.55 |
| $\phi_c\phi_s\phi R_n$ | 36.02 | -38.01 | -1.69 | 1.69 | 36.02 | -38.01 | -1.69 | -89.71 | -89.71 | -89.71 | -89.71 |
| RF | 3.43 | 2.16 | 4.76 | 3.57 | 3.91 | 6.44 | 5.87 | 147.73 | 277.78 | 4.92 | 160.03 |

Table C-47
Culvert #4 load factors, factored loads and rating factors at critical sections for Type 3-3

| Type 3-3 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|---------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 0.50 | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 1.35 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 1.75 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC*DC} | 2.03 | -3.61 | -0.06 | 0.11 | 1.93 | -1.56 | -0.05 | -0.15 | -0.22 | -0.33 | -0.41 |
| γ_{DW*DW} | 1.01 | -1.79 | -0.03 | 0.06 | 0.96 | -0.77 | -0.03 | -0.06 | -0.06 | -0.14 | -0.15 |
| γ_{EV*EV} | 2.63 | -4.68 | -0.08 | 0.15 | 2.50 | -2.02 | -0.06 | -0.14 | -0.12 | -0.37 | -0.37 |
| γ_{EH*EH} | 0.29 | 0.19 | 0.00 | 0.00 | 0.14 | 0.16 | 0.00 | -0.02 | -0.01 | -0.01 | 0.00 |
| γ_{ES*ES} | 0.02 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS*LS} | 0.12 | 0.00 | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 |
| γ_{LL*LL} | 6.54 | -9.71 | -0.25 | 0.30 | 6.22 | -4.06 | -0.20 | -0.50 | -0.26 | -0.70 | -0.39 |
| $\phi_c\phi_s\phi R_n$ | 36.02 | -38.01 | -1.69 | 1.69 | 36.02 | -38.01 | -1.69 | -89.71 | -89.71 | -89.71 | -89.71 |
| RF | 4.52 | 2.90 | 5.97 | 4.61 | 4.86 | 8.33 | 7.72 | 177.74 | 338.43 | 126.05 | 227.97 |

Table C-48
Load factors, factored loads and rating factors at critical sections for NRL

| NRL | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|-------|------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 0.50 | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 1.35 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 1.75 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 2.03 | -3.61 | -0.06 | 0.11 | 1.93 | -1.56 | -0.05 | -0.15 | -0.22 | -0.33 | -0.41 |
| γ_{DW}^*DW | 1.01 | -1.79 | -0.03 | 0.06 | 0.96 | -0.77 | -0.03 | -0.06 | -0.06 | -0.14 | -0.15 |
| γ_{EV}^*EV | 2.63 | -4.68 | -0.08 | 0.15 | 2.50 | -2.02 | -0.06 | -0.14 | -0.12 | -0.37 | -0.37 |
| γ_{EH}^*EH | 0.29 | 0.19 | 0.00 | 0.00 | 0.14 | 0.16 | 0.00 | -0.02 | -0.01 | -0.01 | 0.00 |
| γ_{ES}^*ES | 0.02 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.12 | 0.00 | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^*LL | 8.10 | -13.14 | -0.30 | 0.39 | 7.45 | -5.26 | -0.24 | -0.61 | -0.32 | -1.19 | -0.66 |
| $\phi_c\phi_s\phi R_n$ | 36.02 | -38.01 | -1.69 | 1.69 | 36.02 | -38.01 | -1.69 | -89.71 | -89.71 | -89.71 | -89.71 |
| RF | 3.65 | 2.14 | 4.94 | 3.52 | 4.06 | 6.44 | 6.37 | 145.00 | 274.26 | 74.44 | 134.08 |

Table C-49
Culvert #4 load factors, factored loads and rating factors at critical sections for SU4

| SU4 | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|-------|------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 0.50 | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 1.35 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 1.75 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 2.03 | -3.61 | -0.06 | 0.11 | 1.93 | -1.56 | -0.05 | -0.15 | -0.22 | -0.33 | -0.41 |
| γ_{DW}^*DW | 1.01 | -1.79 | -0.03 | 0.06 | 0.96 | -0.77 | -0.03 | -0.06 | -0.06 | -0.14 | -0.15 |
| γ_{EV}^*EV | 2.63 | -4.68 | -0.08 | 0.15 | 2.50 | -2.02 | -0.06 | -0.14 | -0.12 | -0.37 | -0.37 |
| γ_{EH}^*EH | 0.29 | 0.19 | 0.00 | 0.00 | 0.14 | 0.16 | 0.00 | -0.02 | -0.01 | -0.01 | 0.00 |
| γ_{ES}^*ES | 0.02 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.12 | 0.00 | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^*LL | 8.11 | -12.84 | -0.31 | 0.39 | 7.55 | -4.97 | -0.24 | -0.61 | -0.32 | -1.19 | -0.66 |
| $\phi_c\phi_s\phi R_n$ | 36.02 | -38.01 | -1.69 | 1.69 | 36.02 | -38.01 | -1.69 | -89.71 | -89.71 | -89.71 | -89.71 |
| RF | 3.65 | 2.19 | 4.90 | 3.54 | 4.01 | 6.80 | 6.31 | 145.00 | 274.26 | 74.44 | 134.21 |

Table C-50
Culvert #4 load factors, factored loads and rating factors at critical sections for SU5

| SU5 | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|-------|------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 0.50 | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 1.35 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 1.75 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 2.03 | -3.61 | -0.06 | 0.11 | 1.93 | -1.56 | -0.05 | -0.15 | -0.22 | -0.33 | -0.41 |
| γ_{DW}^*DW | 1.01 | -1.79 | -0.03 | 0.06 | 0.96 | -0.77 | -0.03 | -0.06 | -0.06 | -0.14 | -0.15 |
| γ_{EV}^*EV | 2.63 | -4.68 | -0.08 | 0.15 | 2.50 | -2.02 | -0.06 | -0.14 | -0.12 | -0.37 | -0.37 |
| γ_{EH}^*EH | 0.29 | 0.19 | 0.00 | 0.00 | 0.14 | 0.16 | 0.00 | -0.02 | -0.01 | -0.01 | 0.00 |
| γ_{ES}^*ES | 0.02 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.12 | 0.00 | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^*LL | 8.08 | -12.28 | -0.30 | 0.39 | 7.52 | -5.02 | -0.24 | -0.61 | -0.32 | -1.06 | -0.58 |
| $\phi_c\phi_s\phi R_n$ | 36.02 | -38.01 | -1.69 | 1.69 | 36.02 | -38.01 | -1.69 | -89.71 | -89.71 | -89.71 | -89.71 |
| RF | 3.66 | 2.29 | 5.01 | 3.57 | 4.02 | 6.74 | 6.39 | 145.06 | 274.36 | 83.64 | 151.91 |

Table C-51
Culvert #4 load factors, factored loads and rating factors at critical sections for SU6

| SU6 | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|-------|------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 0.50 | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 1.35 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 1.75 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 2.03 | -3.61 | -0.06 | 0.11 | 1.93 | -1.56 | -0.05 | -0.15 | -0.22 | -0.33 | -0.41 |
| γ_{DW}^*DW | 1.01 | -1.79 | -0.03 | 0.06 | 0.96 | -0.77 | -0.03 | -0.06 | -0.06 | -0.14 | -0.15 |
| γ_{EV}^*EV | 2.63 | -4.68 | -0.08 | 0.15 | 2.50 | -2.02 | -0.06 | -0.14 | -0.12 | -0.37 | -0.37 |
| γ_{EH}^*EH | 0.29 | 0.19 | 0.00 | 0.00 | 0.14 | 0.16 | 0.00 | -0.02 | -0.01 | -0.01 | 0.00 |
| γ_{ES}^*ES | 0.02 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.12 | 0.00 | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^*LL | 8.23 | -12.84 | -0.31 | 0.39 | 7.63 | -4.74 | -0.25 | -0.61 | -0.32 | -1.14 | -0.63 |
| $\phi_c\phi_s\phi R_n$ | 36.02 | -38.01 | -1.69 | 1.69 | 36.02 | -38.01 | -1.69 | -89.71 | -89.71 | -89.71 | -89.71 |
| RF | 3.60 | 2.19 | 4.88 | 3.57 | 3.97 | 7.14 | 6.27 | 145.00 | 274.26 | 77.41 | 140.22 |

Table C-52
Culvert #4 load factors, factored loads and rating factors at critical sections for SU7

| SU7 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|----------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 0.50 | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 1.35 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 1.75 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC*DC} | 2.03 | -3.61 | -0.06 | 0.11 | 1.93 | -1.56 | -0.05 | -0.15 | -0.22 | -0.33 | -0.41 |
| γ_{DW*DW} | 1.01 | -1.79 | -0.03 | 0.06 | 0.96 | -0.77 | -0.03 | -0.06 | -0.06 | -0.14 | -0.15 |
| γ_{EV*EV} | 2.63 | -4.68 | -0.08 | 0.15 | 2.50 | -2.02 | -0.06 | -0.14 | -0.12 | -0.37 | -0.37 |
| γ_{EH*EH} | 0.29 | 0.19 | 0.00 | 0.00 | 0.14 | 0.16 | 0.00 | -0.02 | -0.01 | -0.01 | 0.00 |
| γ_{ES*ES} | 0.02 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS*LS} | 0.12 | 0.00 | 0.00 | 0.00 | 0.06 | 0.00 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 |
| γ_{LL*LL} | 8.11 | -12.84 | -0.31 | 0.39 | 7.55 | -4.97 | -0.24 | -0.61 | -0.32 | -1.19 | -0.66 |
| $\phi_c\phi_s\phi R_n$ | 36.02 | -38.01 | -1.69 | 1.69 | 36.02 | -38.01 | -1.69 | -89.71 | -89.71 | -89.71 | -89.71 |
| RF | 3.65 | 2.19 | 4.90 | 3.54 | 4.01 | 6.80 | 6.31 | 145.00 | 274.26 | 74.44 | 134.21 |

Culvert #5

Table C-53

Culvert #5 un-factored dead and live loads at critical sections for each load type

| Loads Types | | | M(kip-in/in) - V(kip/in) - A (kip/in) at critical sections | | | | | | | | | | |
|--------------|------|-----------|--|--------|--------|--------|-------|--------|--------|--------|--------|--------|--------|
| Load | Type | GW (kips) | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
| | | | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| DC | dead | - | 0.395 | -0.541 | -0.019 | 0.031 | 0.151 | -0.516 | -0.025 | -0.042 | -0.058 | -0.092 | -0.108 |
| DW | dead | - | 0.235 | -0.326 | -0.011 | 0.018 | 0.104 | -0.300 | -0.016 | -0.019 | -0.019 | -0.050 | -0.050 |
| EV | dead | - | 1.470 | -2.029 | -0.070 | 0.116 | 0.600 | -1.900 | -0.095 | -0.119 | -0.119 | -0.311 | -0.310 |
| EH | dead | - | 0.161 | 0.263 | -0.003 | -0.004 | 0.146 | 0.209 | 0.002 | -0.004 | -0.007 | 0.002 | -0.004 |
| ES | dead | - | 0.014 | 0.023 | 0.000 | 0.000 | 0.013 | 0.019 | 0.000 | 0.000 | -0.001 | 0.000 | 0.000 |
| LS | live | - | 0.064 | 0.106 | 0.001 | 0.001 | 0.060 | 0.089 | 0.001 | -0.002 | -0.002 | 0.001 | -0.001 |
| HL-93 | live | NA | 2.105 | -2.223 | -0.011 | -0.002 | 1.341 | -2.183 | -0.133 | -0.178 | -0.165 | -0.409 | -0.383 |
| HL-93 TD | live | NA | 2.125 | -2.495 | -0.119 | -0.158 | 1.435 | -2.494 | -0.142 | -0.193 | -0.187 | -0.457 | -0.436 |
| LA Type 3 | live | 41 | 0.752 | -0.832 | -0.043 | -0.053 | 0.583 | -0.826 | -0.049 | -0.070 | -0.066 | -0.155 | -0.143 |
| LA Type 3-S2 | live | 73 | 0.755 | -0.883 | -0.043 | -0.055 | 0.540 | -0.877 | -0.050 | -0.070 | -0.066 | -0.157 | -0.146 |
| LA Type 6 | live | 80 | 0.873 | -0.953 | -0.051 | -0.061 | 0.699 | -0.935 | -0.057 | -0.081 | -0.077 | -0.180 | -0.165 |
| LA Type 8 | live | 80 | 0.868 | -0.938 | -0.051 | -0.060 | 0.686 | -0.928 | -0.056 | -0.081 | -0.076 | -0.179 | -0.164 |
| Type 3-3 | live | 80 | 0.660 | -0.722 | -0.039 | -0.046 | 0.526 | -0.706 | -0.043 | -0.062 | -0.058 | -0.136 | -0.125 |
| NRL | live | 80 | 0.653 | -0.821 | -0.036 | -0.049 | 0.442 | -0.829 | -0.045 | -0.059 | -0.058 | -0.145 | -0.141 |
| SU 4 | live | 54 | 0.715 | -0.869 | -0.039 | -0.052 | 0.517 | -0.863 | -0.047 | -0.065 | -0.064 | -0.153 | -0.146 |
| SU 5 | live | 62 | 0.653 | -0.820 | -0.036 | -0.048 | 0.456 | -0.819 | -0.044 | -0.059 | -0.058 | -0.143 | -0.138 |
| SU 6 | live | 69.5 | 0.643 | -0.809 | -0.035 | -0.048 | 0.436 | -0.815 | -0.043 | -0.058 | -0.057 | -0.142 | -0.138 |
| SU 7 | live | 77.5 | 0.634 | -0.797 | -0.034 | -0.047 | 0.430 | -0.803 | -0.043 | -0.057 | -0.056 | -0.139 | -0.136 |

Table C-54
Culvert #5 load factors, factored loads and rating factors at critical sections for HL-93 inventory level

| HL-93 (INV) | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|-------|-------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 0.90 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 0.65 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 0.50 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 0.50 | 1.35 |
| γ_{ES} | 1.50 | 0.50 | 0.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 0.50 | 1.50 |
| γ_{LS} | 1.75 | 0.00 | 0.00 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 0.00 | 1.75 |
| γ_{LL} | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 |
| γ_{DC}^{*DC} | 0.49 | -0.68 | -0.02 | 0.03 | 0.19 | -0.64 | -0.03 | -0.05 | -0.07 | -0.12 | -0.14 |
| γ_{DW}^{*DW} | 0.35 | -0.49 | -0.02 | 0.01 | 0.16 | -0.45 | -0.02 | -0.03 | -0.03 | -0.08 | -0.08 |
| γ_{EV}^{*EV} | 1.91 | -2.64 | -0.09 | 0.06 | 0.78 | -2.47 | -0.12 | -0.15 | -0.15 | -0.40 | -0.40 |
| γ_{EH}^{*EH} | 0.22 | 0.13 | 0.00 | 0.00 | 0.20 | 0.10 | 0.00 | -0.01 | -0.01 | 0.00 | -0.01 |
| γ_{ES}^{*ES} | 0.02 | 0.01 | 0.00 | 0.00 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^{*LS} | 0.11 | 0.00 | 0.00 | 0.00 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^{*LL} | 5.62 | -6.60 | -0.32 | -0.42 | 3.80 | -6.60 | -0.38 | -0.51 | -0.49 | -1.21 | -1.15 |
| $\phi_c\phi_s\phi R_n$ | 16.16 | -17.86 | -1.31 | -1.31 | 16.16 | -17.86 | -1.31 | -65.27 | -65.27 | -65.27 | -65.27 |
| RF | 2.30 | 2.15 | 3.71 | 3.34 | 3.80 | 2.18 | 3.01 | 126.61 | 130.24 | 53.52 | 55.85 |

Table C-55
Culvert #5 load factors, factored loads and rating factors at critical sections for HL-93 operational level

| HL-93 (OPR) | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|-------|-------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 0.90 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 0.65 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 0.50 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 0.50 | 1.35 |
| γ_{ES} | 1.50 | 0.50 | 0.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 0.50 | 1.50 |
| γ_{LS} | 1.75 | 0.00 | 0.00 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 0.00 | 1.75 |
| γ_{LL} | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 |
| γ_{DC}^*DC | 0.49 | -0.68 | -0.02 | 0.03 | 0.19 | -0.64 | -0.03 | -0.05 | -0.07 | -0.12 | -0.14 |
| γ_{DW}^*DW | 0.35 | -0.49 | -0.02 | 0.01 | 0.16 | -0.45 | -0.02 | -0.03 | -0.03 | -0.08 | -0.08 |
| γ_{EV}^*EV | 1.91 | -2.64 | -0.09 | 0.06 | 0.78 | -2.47 | -0.12 | -0.15 | -0.15 | -0.40 | -0.40 |
| γ_{EH}^*EH | 0.22 | 0.13 | 0.00 | 0.00 | 0.20 | 0.10 | 0.00 | -0.01 | -0.01 | 0.00 | -0.01 |
| γ_{ES}^*ES | 0.02 | 0.01 | 0.00 | 0.00 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.11 | 0.00 | 0.00 | 0.00 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^*LL | 4.34 | -5.09 | -0.24 | -0.32 | 2.93 | -5.09 | -0.29 | -0.39 | -0.38 | -0.93 | -0.89 |
| $\phi_c\phi_s\phi R_n$ | 16.16 | -17.86 | -1.31 | -1.31 | 16.16 | -17.86 | -1.31 | -65.27 | -65.27 | -65.27 | -65.27 |
| RF | 2.96 | 2.79 | 4.81 | 4.33 | 4.88 | 2.83 | 3.90 | 163.87 | 168.40 | 69.37 | 72.36 |

Table C-56
Culvert #5 load factors, factored loads and rating factors at critical sections for LA Type 3

| LA Type 3 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|----------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 0.90 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 0.65 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 0.50 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 0.50 | 1.35 |
| γ_{ES} | 1.50 | 0.50 | 0.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 0.50 | 1.50 |
| γ_{LS} | 1.75 | 0.00 | 0.00 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 0.00 | 1.75 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC*DC} | 0.49 | -0.68 | -0.02 | 0.03 | 0.19 | -0.64 | -0.03 | -0.05 | -0.07 | -0.12 | -0.14 |
| γ_{DW*DW} | 0.35 | -0.49 | -0.02 | 0.01 | 0.16 | -0.45 | -0.02 | -0.03 | -0.03 | -0.08 | -0.08 |
| γ_{EV*EV} | 1.91 | -2.64 | -0.09 | 0.06 | 0.78 | -2.47 | -0.12 | -0.15 | -0.15 | -0.40 | -0.40 |
| γ_{EH*EH} | 0.22 | 0.13 | 0.00 | 0.00 | 0.20 | 0.10 | 0.00 | -0.01 | -0.01 | 0.00 | -0.01 |
| γ_{ES*ES} | 0.02 | 0.01 | 0.00 | 0.00 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS*LS} | 0.11 | 0.00 | 0.00 | 0.00 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL*LL} | 1.90 | -2.10 | -0.11 | -0.13 | 1.47 | -2.08 | -0.12 | -0.18 | -0.17 | -0.39 | -0.36 |
| $\phi_c\phi_s\phi R_n$ | 16.16 | -17.86 | -1.31 | -1.31 | 16.16 | -17.86 | -1.31 | -65.27 | -65.27 | -65.27 | -65.27 |
| RF | 6.56 | 6.77 | 10.69 | 10.48 | 9.42 | 6.92 | 9.24 | 363.69 | 380.72 | 165.13 | 177.80 |

Table C-57
Culvert #5 load factors, factored loads and rating factors at critical sections for LA Type 3 S2

| LA Type 3 S2 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|-------------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 0.90 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 0.65 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 0.50 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 0.50 | 1.35 |
| γ_{ES} | 1.50 | 0.50 | 0.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 0.50 | 1.50 |
| γ_{LS} | 1.75 | 0.00 | 0.00 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 0.00 | 1.75 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.49 | -0.68 | -0.02 | 0.03 | 0.19 | -0.64 | -0.03 | -0.05 | -0.07 | -0.12 | -0.14 |
| γ_{DW}^*DW | 0.35 | -0.49 | -0.02 | 0.01 | 0.16 | -0.45 | -0.02 | -0.03 | -0.03 | -0.08 | -0.08 |
| γ_{EV}^*EV | 1.91 | -2.64 | -0.09 | 0.06 | 0.78 | -2.47 | -0.12 | -0.15 | -0.15 | -0.40 | -0.40 |
| γ_{EH}^*EH | 0.22 | 0.13 | 0.00 | 0.00 | 0.20 | 0.10 | 0.00 | -0.01 | -0.01 | 0.00 | -0.01 |
| γ_{ES}^*ES | 0.02 | 0.01 | 0.00 | 0.00 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.11 | 0.00 | 0.00 | 0.00 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^*LL | 1.90 | -2.23 | -0.11 | -0.14 | 1.36 | -2.21 | -0.13 | -0.18 | -0.17 | -0.40 | -0.37 |
| $\phi_c\phi_s\phi R_n$ | 16.16 | -17.86 | -1.31 | -1.31 | 16.16 | -17.86 | -1.31 | -65.27 | -65.27 | -65.27 | -65.27 |
| RF | 6.54 | 6.38 | 10.71 | 10.15 | 10.11 | 6.52 | 8.95 | 363.82 | 380.02 | 163.57 | 174.56 |

Table C-58
Culvert #5 load factors, factored loads and rating factors at critical sections for LA Type 6

| LA Type 6 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|----------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 0.90 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 0.65 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 0.50 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 0.50 | 1.35 |
| γ_{ES} | 1.50 | 0.50 | 0.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 0.50 | 1.50 |
| γ_{LS} | 1.75 | 0.00 | 0.00 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 0.00 | 1.75 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.49 | -0.68 | -0.02 | 0.03 | 0.19 | -0.64 | -0.03 | -0.05 | -0.07 | -0.12 | -0.14 |
| γ_{DW}^*DW | 0.35 | -0.49 | -0.02 | 0.01 | 0.16 | -0.45 | -0.02 | -0.03 | -0.03 | -0.08 | -0.08 |
| γ_{EV}^*EV | 1.91 | -2.64 | -0.09 | 0.06 | 0.78 | -2.47 | -0.12 | -0.15 | -0.15 | -0.40 | -0.40 |
| γ_{EH}^*EH | 0.22 | 0.13 | 0.00 | 0.00 | 0.20 | 0.10 | 0.00 | -0.01 | -0.01 | 0.00 | -0.01 |
| γ_{ES}^*ES | 0.02 | 0.01 | 0.00 | 0.00 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.11 | 0.00 | 0.00 | 0.00 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^*LL | 2.20 | -2.40 | -0.13 | -0.15 | 1.76 | -2.36 | -0.14 | -0.20 | -0.19 | -0.45 | -0.42 |
| $\phi_c\phi_s\phi R_n$ | 16.16 | -17.86 | -1.31 | -1.31 | 16.16 | -17.86 | -1.31 | -65.27 | -65.27 | -65.27 | -65.27 |
| RF | 5.69 | 5.91 | 9.08 | 9.12 | 7.94 | 6.12 | 7.93 | 313.44 | 328.17 | 142.96 | 154.46 |

Table C-59
Culvert #5 load factors, factored loads and rating factors at critical sections for LA Type 8

| LA Type 8 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|----------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 0.90 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 0.65 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 0.50 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 0.50 | 1.35 |
| γ_{ES} | 1.50 | 0.50 | 0.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 0.50 | 1.50 |
| γ_{LS} | 1.75 | 0.00 | 0.00 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 0.00 | 1.75 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.49 | -0.68 | -0.02 | 0.03 | 0.19 | -0.64 | -0.03 | -0.05 | -0.07 | -0.12 | -0.14 |
| γ_{DW}^*DW | 0.35 | -0.49 | -0.02 | 0.01 | 0.16 | -0.45 | -0.02 | -0.03 | -0.03 | -0.08 | -0.08 |
| γ_{EV}^*EV | 1.91 | -2.64 | -0.09 | 0.06 | 0.78 | -2.47 | -0.12 | -0.15 | -0.15 | -0.40 | -0.40 |
| γ_{EH}^*EH | 0.22 | 0.13 | 0.00 | 0.00 | 0.20 | 0.10 | 0.00 | -0.01 | -0.01 | 0.00 | -0.01 |
| γ_{ES}^*ES | 0.02 | 0.01 | 0.00 | 0.00 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.11 | 0.00 | 0.00 | 0.00 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^*LL | 2.19 | -2.36 | -0.13 | -0.15 | 1.73 | -2.34 | -0.14 | -0.20 | -0.19 | -0.45 | -0.41 |
| $\phi_c\phi_s\phi R_n$ | 16.16 | -17.86 | -1.31 | -1.31 | 16.16 | -17.86 | -1.31 | -65.27 | -65.27 | -65.27 | -65.27 |
| RF | 5.73 | 6.01 | 9.11 | 9.21 | 8.08 | 6.16 | 7.94 | 314.30 | 330.16 | 143.10 | 155.05 |

Table C-60
Culvert #5 load factors, factored loads and rating factors at critical sections for Type 3-3

| Type 3-3 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|---------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 0.90 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 0.65 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 0.50 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 0.50 | 1.35 |
| γ_{ES} | 1.50 | 0.50 | 0.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 0.50 | 1.50 |
| γ_{LS} | 1.75 | 0.00 | 0.00 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 0.00 | 1.75 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.49 | -0.68 | -0.02 | 0.03 | 0.19 | -0.64 | -0.03 | -0.05 | -0.07 | -0.12 | -0.14 |
| γ_{DW}^*DW | 0.35 | -0.49 | -0.02 | 0.01 | 0.16 | -0.45 | -0.02 | -0.03 | -0.03 | -0.08 | -0.08 |
| γ_{EV}^*EV | 1.91 | -2.64 | -0.09 | 0.06 | 0.78 | -2.47 | -0.12 | -0.15 | -0.15 | -0.40 | -0.40 |
| γ_{EH}^*EH | 0.22 | 0.13 | 0.00 | 0.00 | 0.20 | 0.10 | 0.00 | -0.01 | -0.01 | 0.00 | -0.01 |
| γ_{ES}^*ES | 0.02 | 0.01 | 0.00 | 0.00 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.11 | 0.00 | 0.00 | 0.00 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^*LL | 1.66 | -1.82 | -0.10 | -0.12 | 1.33 | -1.78 | -0.11 | -0.15 | -0.15 | -0.34 | -0.31 |
| $\phi_c\phi_s\phi R_n$ | 16.16 | -17.86 | -1.31 | -1.31 | 16.16 | -17.86 | -1.31 | -65.27 | -65.27 | -65.27 | -65.27 |
| RF | 7.42 | 7.81 | 11.94 | 12.01 | 10.36 | 8.10 | 10.45 | 412.37 | 430.98 | 188.78 | 204.03 |

Table C-61
Culvert #5 load factors, factored loads and rating factors at critical sections for NRL

| NRL | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|-------|-------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 0.90 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 0.65 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 0.50 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 0.50 | 1.35 |
| γ_{ES} | 1.50 | 0.50 | 0.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 0.50 | 1.50 |
| γ_{LS} | 1.75 | 0.00 | 0.00 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 0.00 | 1.75 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.49 | -0.68 | -0.02 | 0.03 | 0.19 | -0.64 | -0.03 | -0.05 | -0.07 | -0.12 | -0.14 |
| γ_{DW}^*DW | 0.35 | -0.49 | -0.02 | 0.01 | 0.16 | -0.45 | -0.02 | -0.03 | -0.03 | -0.08 | -0.08 |
| γ_{EV}^*EV | 1.91 | -2.64 | -0.09 | 0.06 | 0.78 | -2.47 | -0.12 | -0.15 | -0.15 | -0.40 | -0.40 |
| γ_{EH}^*EH | 0.22 | 0.13 | 0.00 | 0.00 | 0.20 | 0.10 | 0.00 | -0.01 | -0.01 | 0.00 | -0.01 |
| γ_{ES}^*ES | 0.02 | 0.01 | 0.00 | 0.00 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.11 | 0.00 | 0.00 | 0.00 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^*LL | 1.65 | -2.07 | -0.09 | -0.12 | 1.11 | -2.09 | -0.11 | -0.15 | -0.15 | -0.36 | -0.36 |
| $\phi_c\phi_s\phi R_n$ | 16.16 | -17.86 | -1.31 | -1.31 | 16.16 | -17.86 | -1.31 | -65.27 | -65.27 | -65.27 | -65.27 |
| RF | 7.49 | 6.86 | 12.83 | 11.35 | 12.17 | 6.90 | 9.90 | 433.13 | 432.42 | 177.49 | 180.55 |

Table C-62
Culvert #5 load factors, factored loads and rating factors at critical sections for SU4

| SU4 | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|-------|-------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 0.90 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 0.65 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 0.50 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 0.50 | 1.35 |
| γ_{ES} | 1.50 | 0.50 | 0.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 0.50 | 1.50 |
| γ_{LS} | 1.75 | 0.00 | 0.00 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 0.00 | 1.75 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.49 | -0.68 | -0.02 | 0.03 | 0.19 | -0.64 | -0.03 | -0.05 | -0.07 | -0.12 | -0.14 |
| γ_{DW}^*DW | 0.35 | -0.49 | -0.02 | 0.01 | 0.16 | -0.45 | -0.02 | -0.03 | -0.03 | -0.08 | -0.08 |
| γ_{EV}^*EV | 1.91 | -2.64 | -0.09 | 0.06 | 0.78 | -2.47 | -0.12 | -0.15 | -0.15 | -0.40 | -0.40 |
| γ_{EH}^*EH | 0.22 | 0.13 | 0.00 | 0.00 | 0.20 | 0.10 | 0.00 | -0.01 | -0.01 | 0.00 | -0.01 |
| γ_{ES}^*ES | 0.02 | 0.01 | 0.00 | 0.00 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.11 | 0.00 | 0.00 | 0.00 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^*LL | 1.80 | -2.19 | -0.10 | -0.13 | 1.30 | -2.17 | -0.12 | -0.16 | -0.16 | -0.39 | -0.37 |
| $\phi_c\phi_s\phi R_n$ | 16.16 | -17.86 | -1.31 | -1.31 | 16.16 | -17.86 | -1.31 | -65.27 | -65.27 | -65.27 | -65.27 |
| RF | 6.88 | 6.48 | 11.82 | 10.77 | 10.52 | 6.63 | 9.52 | 391.26 | 394.40 | 167.82 | 175.07 |

Table C-63
Culvert #5 load factors, factored loads and rating factors at critical sections for SU5

| SU5 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|----------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 0.90 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 0.65 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 0.50 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 0.50 | 1.35 |
| γ_{ES} | 1.50 | 0.50 | 0.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 0.50 | 1.50 |
| γ_{LS} | 1.75 | 0.00 | 0.00 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 0.00 | 1.75 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.49 | -0.68 | -0.02 | 0.03 | 0.19 | -0.64 | -0.03 | -0.05 | -0.07 | -0.12 | -0.14 |
| γ_{DW}^*DW | 0.35 | -0.49 | -0.02 | 0.01 | 0.16 | -0.45 | -0.02 | -0.03 | -0.03 | -0.08 | -0.08 |
| γ_{EV}^*EV | 1.91 | -2.64 | -0.09 | 0.06 | 0.78 | -2.47 | -0.12 | -0.15 | -0.15 | -0.40 | -0.40 |
| γ_{EH}^*EH | 0.22 | 0.13 | 0.00 | 0.00 | 0.20 | 0.10 | 0.00 | -0.01 | -0.01 | 0.00 | -0.01 |
| γ_{ES}^*ES | 0.02 | 0.01 | 0.00 | 0.00 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.11 | 0.00 | 0.00 | 0.00 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^*LL | 1.65 | -2.07 | -0.09 | -0.12 | 1.15 | -2.06 | -0.11 | -0.15 | -0.15 | -0.36 | -0.35 |
| $\phi_c\phi_s\phi R_n$ | 16.16 | -17.86 | -1.31 | -1.31 | 16.16 | -17.86 | -1.31 | -65.27 | -65.27 | -65.27 | -65.27 |
| RF | 7.49 | 6.87 | 12.98 | 11.54 | 11.83 | 6.98 | 10.26 | 433.13 | 432.42 | 179.66 | 184.65 |

Table C-64
Culvert #5 load factors, factored loads and rating factors at critical sections for SU6

| SU6 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|----------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 0.90 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 0.65 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 0.50 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 0.50 | 1.35 |
| γ_{ES} | 1.50 | 0.50 | 0.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 0.50 | 1.50 |
| γ_{LS} | 1.75 | 0.00 | 0.00 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 0.00 | 1.75 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^{*DC} | 0.49 | -0.68 | -0.02 | 0.03 | 0.19 | -0.64 | -0.03 | -0.05 | -0.07 | -0.12 | -0.14 |
| γ_{DW}^{*DW} | 0.35 | -0.49 | -0.02 | 0.01 | 0.16 | -0.45 | -0.02 | -0.03 | -0.03 | -0.08 | -0.08 |
| γ_{EV}^{*EV} | 1.91 | -2.64 | -0.09 | 0.06 | 0.78 | -2.47 | -0.12 | -0.15 | -0.15 | -0.40 | -0.40 |
| γ_{EH}^{*EH} | 0.22 | 0.13 | 0.00 | 0.00 | 0.20 | 0.10 | 0.00 | -0.01 | -0.01 | 0.00 | -0.01 |
| γ_{ES}^{*ES} | 0.02 | 0.01 | 0.00 | 0.00 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^{*LS} | 0.11 | 0.00 | 0.00 | 0.00 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^{*LL} | 1.62 | -2.04 | -0.09 | -0.12 | 1.10 | -2.05 | -0.11 | -0.15 | -0.14 | -0.36 | -0.35 |
| $\phi_c\phi_s\phi R_n$ | 16.16 | -17.86 | -1.31 | -1.31 | 16.16 | -17.86 | -1.31 | -65.27 | -65.27 | -65.27 | -65.27 |
| RF | 7.60 | 6.96 | 13.28 | 11.57 | 12.31 | 7.02 | 10.34 | 439.21 | 439.04 | 181.34 | 185.11 |

Table C-65
Culvert #5 load factors, factored loads and rating factors at critical sections for SU7

| SU7 | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|-------|-------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 0.90 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 0.65 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 0.50 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 0.50 | 1.35 |
| γ_{ES} | 1.50 | 0.50 | 0.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 0.50 | 1.50 |
| γ_{LS} | 1.75 | 0.00 | 0.00 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 0.00 | 1.75 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.49 | -0.68 | -0.02 | 0.03 | 0.19 | -0.64 | -0.03 | -0.05 | -0.07 | -0.12 | -0.14 |
| γ_{DW}^*DW | 0.35 | -0.49 | -0.02 | 0.01 | 0.16 | -0.45 | -0.02 | -0.03 | -0.03 | -0.08 | -0.08 |
| γ_{EV}^*EV | 1.91 | -2.64 | -0.09 | 0.06 | 0.78 | -2.47 | -0.12 | -0.15 | -0.15 | -0.40 | -0.40 |
| γ_{EH}^*EH | 0.22 | 0.13 | 0.00 | 0.00 | 0.20 | 0.10 | 0.00 | -0.01 | -0.01 | 0.00 | -0.01 |
| γ_{ES}^*ES | 0.02 | 0.01 | 0.00 | 0.00 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.11 | 0.00 | 0.00 | 0.00 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^*LL | 1.60 | -2.01 | -0.09 | -0.12 | 1.08 | -2.02 | -0.11 | -0.14 | -0.14 | -0.35 | -0.34 |
| $\phi_c\phi_s\phi R_n$ | 16.16 | -17.86 | -1.31 | -1.31 | 16.16 | -17.86 | -1.31 | -65.27 | -65.27 | -65.27 | -65.27 |
| RF | 7.70 | 7.07 | 13.47 | 11.74 | 12.47 | 7.12 | 10.49 | 445.85 | 445.11 | 184.04 | 187.82 |

Culvert #6

Table C-66

Culvert #6 un-factored dead and live loads at critical sections for each load type

| Loads Types | | | M(kip-in/in) - V(kip/in) - A (kip/in) at critical sections | | | | | | | | | | |
|--------------|------|-----------|--|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| Load | Type | GW (kips) | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
| DC | dead | - | 0.143 | -0.212 | -0.009 | 0.016 | 0.062 | -0.190 | 0.012 | -0.027 | -0.027 | -0.064 | -0.064 |
| DW | dead | - | 0.107 | -0.160 | -0.007 | 0.012 | 0.048 | -0.140 | -0.009 | -0.014 | -0.014 | -0.035 | -0.035 |
| EV | dead | - | 0.238 | -0.353 | -0.015 | 0.026 | 0.103 | -0.317 | 0.020 | -0.030 | -0.030 | -0.077 | -0.077 |
| EH | dead | - | -0.174 | -0.284 | 0.005 | 0.012 | 0.080 | 0.356 | 0.012 | -0.018 | -0.018 | 0.006 | 0.006 |
| ES | dead | - | -0.027 | -0.044 | 0.001 | 0.002 | 0.012 | 0.055 | 0.002 | -0.003 | -0.003 | 0.001 | 0.001 |
| LS | live | - | -0.165 | -0.283 | 0.005 | 0.011 | 0.077 | 0.341 | 0.011 | -0.016 | -0.016 | 0.006 | 0.006 |
| HL-93 | live | NA | 1.440 | -1.372 | -0.100 | 0.128 | 1.126 | -1.195 | 0.114 | -0.194 | -0.194 | -0.318 | -0.318 |
| HL-93 TD | live | NA | 1.341 | -1.417 | -0.089 | 0.119 | 0.998 | -1.351 | 0.103 | -0.171 | -0.171 | -0.363 | -0.363 |
| LA Type 3 | live | 41 | 0.797 | -0.829 | -0.052 | 0.069 | 0.591 | -0.801 | 0.062 | -0.100 | -0.100 | -0.213 | -0.213 |
| LA Type 3-S2 | live | 73 | 0.812 | -0.851 | -0.054 | 0.070 | 0.587 | -0.821 | 0.063 | -0.103 | -0.103 | -0.216 | -0.216 |
| LA Type 6 | live | 80 | 0.948 | -0.979 | -0.062 | 0.081 | 0.713 | -0.928 | 0.072 | -0.118 | -0.118 | -0.252 | -0.252 |
| LA Type 8 | live | 80 | 0.940 | -0.979 | -0.061 | 0.080 | 0.700 | -0.950 | 0.073 | -0.119 | -0.119 | -0.247 | -0.247 |
| Type 3-3 | live | 80 | 0.719 | -0.737 | -0.049 | 0.062 | 0.560 | -0.704 | 0.056 | -0.091 | -0.091 | -0.191 | -0.191 |
| NRL | live | 80 | 0.831 | -0.938 | -0.057 | 0.079 | 0.575 | -0.881 | 0.066 | -0.109 | -0.109 | -0.239 | -0.239 |
| SU 4 | live | 54 | 0.861 | -0.927 | -0.057 | 0.077 | 0.625 | -0.889 | 0.066 | -0.109 | -0.109 | -0.237 | -0.237 |
| SU 5 | live | 62 | 0.857 | -0.937 | -0.056 | 0.076 | 0.605 | -0.893 | 0.066 | -0.107 | -0.107 | -0.236 | -0.236 |
| SU 6 | live | 69.5 | 0.831 | -0.938 | -0.057 | 0.079 | 0.575 | -0.881 | 0.066 | -0.109 | -0.109 | -0.239 | -0.239 |
| SU 7 | live | 77.5 | 0.831 | -0.938 | -0.057 | 0.079 | 0.575 | -0.881 | 0.066 | -0.109 | -0.109 | -0.239 | -0.239 |

Table C-67
Culvert #6 load factors, factored loads and rating factors at critical sections for HL-93 inventory level

| HL-93 (INV) | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|-------|------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.65 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 0.50 | 1.35 | 0.50 | 1.35 | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 0.50 |
| γ_{ES} | 0.50 | 1.50 | 0.50 | 1.50 | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 0.50 | 0.50 |
| γ_{LS} | 0.00 | 1.75 | 0.00 | 1.75 | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 0.00 | 0.00 |
| γ_{LL} | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 |
| γ_{DC}^{*DC} | 0.18 | -0.27 | -0.01 | 0.02 | 0.08 | -0.24 | 0.02 | -0.03 | -0.03 | -0.08 | -0.08 |
| γ_{DW}^{*DW} | 0.16 | -0.24 | -0.01 | 0.02 | 0.07 | -0.21 | -0.01 | -0.02 | -0.02 | -0.05 | -0.05 |
| γ_{EV}^{*EV} | 0.31 | -0.46 | -0.02 | 0.03 | 0.13 | -0.41 | 0.03 | -0.04 | -0.04 | -0.10 | -0.10 |
| γ_{EH}^{*EH} | -0.09 | -0.38 | 0.00 | 0.02 | 0.11 | 0.18 | 0.02 | -0.02 | -0.02 | 0.00 | 0.00 |
| γ_{ES}^{*ES} | -0.01 | -0.07 | 0.00 | 0.00 | 0.02 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^{*LS} | 0.00 | -0.50 | 0.00 | 0.02 | 0.13 | 0.00 | 0.02 | -0.03 | -0.03 | 0.00 | 0.00 |
| γ_{LL}^{*LL} | 3.81 | -3.75 | -0.27 | 0.34 | 2.98 | -3.58 | 0.30 | -0.51 | -0.51 | -0.96 | -0.96 |
| $\phi_c\phi_s\phi R_n$ | 12.34 | -13.83 | -1.01 | 1.01 | 12.34 | -13.83 | 1.01 | -45.45 | -45.45 | -45.45 | -45.45 |
| RF | 3.10 | 2.92 | 3.67 | 2.57 | 3.83 | 3.68 | 2.98 | 83.78 | 83.78 | 47.12 | 47.12 |

Table C-68
Culvert #6 load factors, factored loads and rating factors at critical sections for HL-93 operational level

| HL-93 (OPR) | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|--------------------------|-------|--------|-------|------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.65 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 0.50 | 1.35 | 0.50 | 1.35 | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 0.50 |
| γ_{ES} | 0.50 | 1.50 | 0.50 | 1.50 | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 0.50 | 0.50 |
| γ_{LS} | 0.00 | 1.75 | 0.00 | 1.75 | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 0.00 | 0.00 |
| γ_{LL} | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 |
| γ_{DC}^{*DC} | 0.18 | -0.27 | -0.01 | 0.02 | 0.08 | -0.24 | 0.02 | -0.03 | -0.03 | -0.08 | -0.08 |
| γ_{DW}^{*DW} | 0.16 | -0.24 | -0.01 | 0.02 | 0.07 | -0.21 | -0.01 | -0.02 | -0.02 | -0.05 | -0.05 |
| γ_{EV}^{*EV} | 0.31 | -0.46 | -0.02 | 0.03 | 0.13 | -0.41 | 0.03 | -0.04 | -0.04 | -0.10 | -0.10 |
| γ_{EH}^{*EH} | -0.09 | -0.38 | 0.00 | 0.02 | 0.11 | 0.18 | 0.02 | -0.02 | -0.02 | 0.00 | 0.00 |
| γ_{ES}^{*ES} | -0.01 | -0.07 | 0.00 | 0.00 | 0.02 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^{*LS} | 0.00 | -0.50 | 0.00 | 0.02 | 0.13 | 0.00 | 0.02 | -0.03 | -0.03 | 0.00 | 0.00 |
| γ_{LL}^{*LL} | 2.94 | -2.89 | -0.20 | 0.26 | 2.30 | -2.76 | 0.23 | -0.40 | -0.40 | -0.74 | -0.74 |
| $\phi_c\phi_s\phi_{R_n}$ | 12.34 | -13.83 | -1.01 | 1.01 | 12.34 | -13.83 | 1.01 | -45.45 | -45.45 | -45.45 | -45.45 |
| RF | 4.01 | 3.66 | 4.76 | 3.29 | 4.91 | 4.78 | 3.80 | 106.97 | 106.97 | 61.08 | 61.08 |

Table C-69
Culvert #6 load factors, factored loads and rating factors at critical sections for LA Type 3

| LA Type 3 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|----------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.65 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 0.50 | 1.35 | 0.50 | 1.35 | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 0.50 |
| γ_{ES} | 0.50 | 1.50 | 0.50 | 1.50 | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 0.50 | 0.50 |
| γ_{LS} | 0.00 | 1.75 | 0.00 | 1.75 | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.18 | -0.27 | -0.01 | 0.02 | 0.08 | -0.24 | 0.02 | -0.03 | -0.03 | -0.08 | -0.08 |
| γ_{DW}^*DW | 0.16 | -0.24 | -0.01 | 0.02 | 0.07 | -0.21 | -0.01 | -0.02 | -0.02 | -0.05 | -0.05 |
| γ_{EV}^*EV | 0.31 | -0.46 | -0.02 | 0.03 | 0.13 | -0.41 | 0.03 | -0.04 | -0.04 | -0.10 | -0.10 |
| γ_{EH}^*EH | -0.09 | -0.38 | 0.00 | 0.02 | 0.11 | 0.18 | 0.02 | -0.02 | -0.02 | 0.00 | 0.00 |
| γ_{ES}^*ES | -0.01 | -0.07 | 0.00 | 0.00 | 0.02 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.00 | -0.50 | 0.00 | 0.02 | 0.13 | 0.00 | 0.02 | -0.03 | -0.03 | 0.00 | 0.00 |
| γ_{LL}^*LL | 2.01 | -2.09 | -0.13 | 0.17 | 1.49 | -2.02 | 0.16 | -0.25 | -0.25 | -0.54 | -0.54 |
| $\phi_c\phi_s\phi R_n$ | 12.34 | -13.83 | -1.01 | 1.01 | 12.34 | -13.83 | 1.01 | -45.45 | -45.45 | -45.45 | -45.45 |
| RF | 5.87 | 4.80 | 7.45 | 4.79 | 7.35 | 6.53 | 5.49 | 161.36 | 161.36 | 84.15 | 84.15 |

Table C-70
Culvert #6 load factors, factored loads and rating factors at critical sections for LA Type 3 S2

| LA Type 3 S2 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|-------------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.65 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 0.50 | 1.35 | 0.50 | 1.35 | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 0.50 |
| γ_{ES} | 0.50 | 1.50 | 0.50 | 1.50 | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 0.50 | 0.50 |
| γ_{LS} | 0.00 | 1.75 | 0.00 | 1.75 | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC*DC} | 0.18 | -0.27 | -0.01 | 0.02 | 0.08 | -0.24 | 0.02 | -0.03 | -0.03 | -0.08 | -0.08 |
| γ_{DW*DW} | 0.16 | -0.24 | -0.01 | 0.02 | 0.07 | -0.21 | -0.01 | -0.02 | -0.02 | -0.05 | -0.05 |
| γ_{EV*EV} | 0.31 | -0.46 | -0.02 | 0.03 | 0.13 | -0.41 | 0.03 | -0.04 | -0.04 | -0.10 | -0.10 |
| γ_{EH*EH} | -0.09 | -0.38 | 0.00 | 0.02 | 0.11 | 0.18 | 0.02 | -0.02 | -0.02 | 0.00 | 0.00 |
| γ_{ES*ES} | -0.01 | -0.07 | 0.00 | 0.00 | 0.02 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS*LS} | 0.00 | -0.50 | 0.00 | 0.02 | 0.13 | 0.00 | 0.02 | -0.03 | -0.03 | 0.00 | 0.00 |
| γ_{LL*LL} | 2.05 | -2.15 | -0.13 | 0.18 | 1.48 | -2.07 | 0.16 | -0.26 | -0.26 | -0.55 | -0.55 |
| $\phi_c\phi_s\phi_{R_n}$ | 12.34 | -13.83 | -1.01 | 1.01 | 12.34 | -13.83 | 1.01 | -45.45 | -45.45 | -45.45 | -45.45 |
| RF | 5.77 | 4.70 | 7.22 | 4.69 | 7.40 | 6.37 | 5.38 | 157.96 | 157.96 | 82.91 | 82.91 |

Table C-71
Culvert #6 load factors, factored loads and rating factors at critical sections for LA Type 6

| LA Type 6 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|----------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.65 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 0.50 | 1.35 | 0.50 | 1.35 | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 0.50 |
| γ_{ES} | 0.50 | 1.50 | 0.50 | 1.50 | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 0.50 | 0.50 |
| γ_{LS} | 0.00 | 1.75 | 0.00 | 1.75 | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.18 | -0.27 | -0.01 | 0.02 | 0.08 | -0.24 | 0.02 | -0.03 | -0.03 | -0.08 | -0.08 |
| γ_{DW}^*DW | 0.16 | -0.24 | -0.01 | 0.02 | 0.07 | -0.21 | -0.01 | -0.02 | -0.02 | -0.05 | -0.05 |
| γ_{EV}^*EV | 0.31 | -0.46 | -0.02 | 0.03 | 0.13 | -0.41 | 0.03 | -0.04 | -0.04 | -0.10 | -0.10 |
| γ_{EH}^*EH | -0.09 | -0.38 | 0.00 | 0.02 | 0.11 | 0.18 | 0.02 | -0.02 | -0.02 | 0.00 | 0.00 |
| γ_{ES}^*ES | -0.01 | -0.07 | 0.00 | 0.00 | 0.02 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.00 | -0.50 | 0.00 | 0.02 | 0.13 | 0.00 | 0.02 | -0.03 | -0.03 | 0.00 | 0.00 |
| γ_{LL}^*LL | 2.39 | -2.47 | -0.16 | 0.20 | 1.80 | -2.34 | 0.18 | -0.30 | -0.30 | -0.64 | -0.64 |
| $\phi_c\phi_s\phi_{R_n}$ | 12.34 | -13.83 | -1.01 | 1.01 | 12.34 | -13.83 | 1.01 | -45.45 | -45.45 | -45.45 | -45.45 |
| RF | 4.94 | 4.19 | 6.20 | 4.12 | 6.18 | 5.64 | 4.79 | 139.54 | 139.54 | 71.08 | 71.08 |

Table C-72
Culvert #6 load factors, factored loads and rating factors at critical sections for LA Type 8

| LA Type 8 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|----------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.65 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 0.50 | 1.35 | 0.50 | 1.35 | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 0.50 |
| γ_{ES} | 0.50 | 1.50 | 0.50 | 1.50 | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 0.50 | 0.50 |
| γ_{LS} | 0.00 | 1.75 | 0.00 | 1.75 | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.18 | -0.27 | -0.01 | 0.02 | 0.08 | -0.24 | 0.02 | -0.03 | -0.03 | -0.08 | -0.08 |
| γ_{DW}^*DW | 0.16 | -0.24 | -0.01 | 0.02 | 0.07 | -0.21 | -0.01 | -0.02 | -0.02 | -0.05 | -0.05 |
| γ_{EV}^*EV | 0.31 | -0.46 | -0.02 | 0.03 | 0.13 | -0.41 | 0.03 | -0.04 | -0.04 | -0.10 | -0.10 |
| γ_{EH}^*EH | -0.09 | -0.38 | 0.00 | 0.02 | 0.11 | 0.18 | 0.02 | -0.02 | -0.02 | 0.00 | 0.00 |
| γ_{ES}^*ES | -0.01 | -0.07 | 0.00 | 0.00 | 0.02 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.00 | -0.50 | 0.00 | 0.02 | 0.13 | 0.00 | 0.02 | -0.03 | -0.03 | 0.00 | 0.00 |
| γ_{LL}^*LL | 2.37 | -2.47 | -0.15 | 0.20 | 1.76 | -2.39 | 0.18 | -0.30 | -0.30 | -0.62 | -0.62 |
| $\phi_c\phi_s\phi_{R_n}$ | 12.34 | -13.83 | -1.01 | 1.01 | 12.34 | -13.83 | 1.01 | -45.45 | -45.45 | -45.45 | -45.45 |
| RF | 4.98 | 4.19 | 6.32 | 4.16 | 6.28 | 5.50 | 4.72 | 138.58 | 138.58 | 72.53 | 72.53 |

Table C-73
Culvert #6 load factors, factored loads and rating factors at critical sections for Type 3-3

| Type 3-3 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|---------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.65 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 0.50 | 1.35 | 0.50 | 1.35 | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 0.50 |
| γ_{ES} | 0.50 | 1.50 | 0.50 | 1.50 | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 0.50 | 0.50 |
| γ_{LS} | 0.00 | 1.75 | 0.00 | 1.75 | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.18 | -0.27 | -0.01 | 0.02 | 0.08 | -0.24 | 0.02 | -0.03 | -0.03 | -0.08 | -0.08 |
| γ_{DW}^*DW | 0.16 | -0.24 | -0.01 | 0.02 | 0.07 | -0.21 | -0.01 | -0.02 | -0.02 | -0.05 | -0.05 |
| γ_{EV}^*EV | 0.31 | -0.46 | -0.02 | 0.03 | 0.13 | -0.41 | 0.03 | -0.04 | -0.04 | -0.10 | -0.10 |
| γ_{EH}^*EH | -0.09 | -0.38 | 0.00 | 0.02 | 0.11 | 0.18 | 0.02 | -0.02 | -0.02 | 0.00 | 0.00 |
| γ_{ES}^*ES | -0.01 | -0.07 | 0.00 | 0.00 | 0.02 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.00 | -0.50 | 0.00 | 0.02 | 0.13 | 0.00 | 0.02 | -0.03 | -0.03 | 0.00 | 0.00 |
| γ_{LL}^*LL | 1.81 | -1.86 | -0.12 | 0.16 | 1.41 | -1.77 | 0.14 | -0.23 | -0.23 | -0.48 | -0.48 |
| $\phi_c\phi_s\phi R_n$ | 12.34 | -13.83 | -1.01 | 1.01 | 12.34 | -13.83 | 1.01 | -45.45 | -45.45 | -45.45 | -45.45 |
| RF | 6.51 | 5.28 | 7.88 | 5.25 | 7.72 | 7.43 | 5.97 | 177.00 | 177.00 | 94.16 | 94.16 |

Table C-74
Culvert #6 load factors, factored loads and rating factors at critical sections for NRL

| NRL Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|----------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.65 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 0.50 | 1.35 | 0.50 | 1.35 | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 0.50 |
| γ_{ES} | 0.50 | 1.50 | 0.50 | 1.50 | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 0.50 | 0.50 |
| γ_{LS} | 0.00 | 1.75 | 0.00 | 1.75 | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC*DC} | 0.18 | -0.27 | -0.01 | 0.02 | 0.08 | -0.24 | 0.02 | -0.03 | -0.03 | -0.08 | -0.08 |
| γ_{DW*DW} | 0.16 | -0.24 | -0.01 | 0.02 | 0.07 | -0.21 | -0.01 | -0.02 | -0.02 | -0.05 | -0.05 |
| γ_{EV*EV} | 0.31 | -0.46 | -0.02 | 0.03 | 0.13 | -0.41 | 0.03 | -0.04 | -0.04 | -0.10 | -0.10 |
| γ_{EH*EH} | -0.09 | -0.38 | 0.00 | 0.02 | 0.11 | 0.18 | 0.02 | -0.02 | -0.02 | 0.00 | 0.00 |
| γ_{ES*ES} | -0.01 | -0.07 | 0.00 | 0.00 | 0.02 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS*LS} | 0.00 | -0.50 | 0.00 | 0.02 | 0.13 | 0.00 | 0.02 | -0.03 | -0.03 | 0.00 | 0.00 |
| γ_{LL*LL} | 2.09 | -2.36 | -0.14 | 0.20 | 1.45 | -2.22 | 0.17 | -0.27 | -0.27 | -0.60 | -0.60 |
| $\phi_c\phi_s\phi R_n$ | 12.34 | -13.83 | -1.01 | 1.01 | 12.34 | -13.83 | 1.01 | -45.45 | -45.45 | -45.45 | -45.45 |
| RF | 5.63 | 4.34 | 6.83 | 4.25 | 7.54 | 5.93 | 5.13 | 149.99 | 149.99 | 74.97 | 74.97 |

Table C-75
Culvert #6 load factors, factored loads and rating factors at critical sections for SU4

| SU4 | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|-------|------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.65 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 0.50 | 1.35 | 0.50 | 1.35 | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 0.50 |
| γ_{ES} | 0.50 | 1.50 | 0.50 | 1.50 | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 0.50 | 0.50 |
| γ_{LS} | 0.00 | 1.75 | 0.00 | 1.75 | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.18 | -0.27 | -0.01 | 0.02 | 0.08 | -0.24 | 0.02 | -0.03 | -0.03 | -0.08 | -0.08 |
| γ_{DW}^*DW | 0.16 | -0.24 | -0.01 | 0.02 | 0.07 | -0.21 | -0.01 | -0.02 | -0.02 | -0.05 | -0.05 |
| γ_{EV}^*EV | 0.31 | -0.46 | -0.02 | 0.03 | 0.13 | -0.41 | 0.03 | -0.04 | -0.04 | -0.10 | -0.10 |
| γ_{EH}^*EH | -0.09 | -0.38 | 0.00 | 0.02 | 0.11 | 0.18 | 0.02 | -0.02 | -0.02 | 0.00 | 0.00 |
| γ_{ES}^*ES | -0.01 | -0.07 | 0.00 | 0.00 | 0.02 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.00 | -0.50 | 0.00 | 0.02 | 0.13 | 0.00 | 0.02 | -0.03 | -0.03 | 0.00 | 0.00 |
| γ_{LL}^*LL | 2.17 | -2.34 | -0.14 | 0.19 | 1.58 | -2.24 | 0.17 | -0.27 | -0.27 | -0.60 | -0.60 |
| $\phi_c\phi_s\phi R_n$ | 12.34 | -13.83 | -1.01 | 1.01 | 12.34 | -13.83 | 1.01 | -45.45 | -45.45 | -45.45 | -45.45 |
| RF | 5.44 | 4.39 | 6.72 | 4.31 | 6.98 | 5.88 | 5.14 | 149.96 | 149.96 | 75.58 | 75.58 |

Table C-76
Culvert #6 load factors, factored loads and rating factors at critical sections for SU5

| SU5 | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|-------|------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.65 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 0.50 | 1.35 | 0.50 | 1.35 | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 0.50 |
| γ_{ES} | 0.50 | 1.50 | 0.50 | 1.50 | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 0.50 | 0.50 |
| γ_{LS} | 0.00 | 1.75 | 0.00 | 1.75 | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.18 | -0.27 | -0.01 | 0.02 | 0.08 | -0.24 | 0.02 | -0.03 | -0.03 | -0.08 | -0.08 |
| γ_{DW}^*DW | 0.16 | -0.24 | -0.01 | 0.02 | 0.07 | -0.21 | -0.01 | -0.02 | -0.02 | -0.05 | -0.05 |
| γ_{EV}^*EV | 0.31 | -0.46 | -0.02 | 0.03 | 0.13 | -0.41 | 0.03 | -0.04 | -0.04 | -0.10 | -0.10 |
| γ_{EH}^*EH | -0.09 | -0.38 | 0.00 | 0.02 | 0.11 | 0.18 | 0.02 | -0.02 | -0.02 | 0.00 | 0.00 |
| γ_{ES}^*ES | -0.01 | -0.07 | 0.00 | 0.00 | 0.02 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.00 | -0.50 | 0.00 | 0.02 | 0.13 | 0.00 | 0.02 | -0.03 | -0.03 | 0.00 | 0.00 |
| γ_{LL}^*LL | 2.16 | -2.36 | -0.14 | 0.19 | 1.52 | -2.25 | 0.17 | -0.27 | -0.27 | -0.60 | -0.60 |
| $\phi_c\phi_s\phi R_n$ | 12.34 | -13.83 | -1.01 | 1.01 | 12.34 | -13.83 | 1.01 | -45.45 | -45.45 | -45.45 | -45.45 |
| RF | 5.46 | 4.35 | 6.90 | 4.40 | 7.19 | 5.86 | 5.18 | 152.21 | 152.21 | 76.00 | 76.00 |

Table C-77
Culvert #6 load factors, factored loads and rating factors at critical sections for SU6

| SU6 | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|-------|------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.65 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 0.50 | 1.35 | 0.50 | 1.35 | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 0.50 |
| γ_{ES} | 0.50 | 1.50 | 0.50 | 1.50 | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 0.50 | 0.50 |
| γ_{LS} | 0.00 | 1.75 | 0.00 | 1.75 | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.18 | -0.27 | -0.01 | 0.02 | 0.08 | -0.24 | 0.02 | -0.03 | -0.03 | -0.08 | -0.08 |
| γ_{DW}^*DW | 0.16 | -0.24 | -0.01 | 0.02 | 0.07 | -0.21 | -0.01 | -0.02 | -0.02 | -0.05 | -0.05 |
| γ_{EV}^*EV | 0.31 | -0.46 | -0.02 | 0.03 | 0.13 | -0.41 | 0.03 | -0.04 | -0.04 | -0.10 | -0.10 |
| γ_{EH}^*EH | -0.09 | -0.38 | 0.00 | 0.02 | 0.11 | 0.18 | 0.02 | -0.02 | -0.02 | 0.00 | 0.00 |
| γ_{ES}^*ES | -0.01 | -0.07 | 0.00 | 0.00 | 0.02 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.00 | -0.50 | 0.00 | 0.02 | 0.13 | 0.00 | 0.02 | -0.03 | -0.03 | 0.00 | 0.00 |
| γ_{LL}^*LL | 2.09 | -2.36 | -0.14 | 0.20 | 1.45 | -2.22 | 0.17 | -0.27 | -0.27 | -0.60 | -0.60 |
| $\phi_c\phi_s\phi R_n$ | 12.34 | -13.83 | -1.01 | 1.01 | 12.34 | -13.83 | 1.01 | -45.45 | -45.45 | -45.45 | -45.45 |
| RF | 5.63 | 4.34 | 6.83 | 4.25 | 7.54 | 5.93 | 5.13 | 149.99 | 149.99 | 74.97 | 74.97 |

Table C-78
Culvert #6 load factors, factored loads and rating factors at critical sections for SU7

| SU7 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|----------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.65 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 0.50 | 1.35 | 0.50 | 1.35 | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 0.50 |
| γ_{ES} | 0.50 | 1.50 | 0.50 | 1.50 | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 0.50 | 0.50 |
| γ_{LS} | 0.00 | 1.75 | 0.00 | 1.75 | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC*DC} | 0.18 | -0.27 | -0.01 | 0.02 | 0.08 | -0.24 | 0.02 | -0.03 | -0.03 | -0.08 | -0.08 |
| γ_{DW*DW} | 0.16 | -0.24 | -0.01 | 0.02 | 0.07 | -0.21 | -0.01 | -0.02 | -0.02 | -0.05 | -0.05 |
| γ_{EV*EV} | 0.31 | -0.46 | -0.02 | 0.03 | 0.13 | -0.41 | 0.03 | -0.04 | -0.04 | -0.10 | -0.10 |
| γ_{EH*EH} | -0.09 | -0.38 | 0.00 | 0.02 | 0.11 | 0.18 | 0.02 | -0.02 | -0.02 | 0.00 | 0.00 |
| γ_{ES*ES} | -0.01 | -0.07 | 0.00 | 0.00 | 0.02 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS*LS} | 0.00 | -0.50 | 0.00 | 0.02 | 0.13 | 0.00 | 0.02 | -0.03 | -0.03 | 0.00 | 0.00 |
| γ_{LL*LL} | 2.09 | -2.36 | -0.14 | 0.20 | 1.45 | -2.22 | 0.17 | -0.27 | -0.27 | -0.60 | -0.60 |
| $\phi_c\phi_s\phi R_n$ | 12.34 | -13.83 | -1.01 | 1.01 | 12.34 | -13.83 | 1.01 | -45.45 | -45.45 | -45.45 | -45.45 |
| RF | 5.63 | 4.34 | 6.83 | 4.25 | 7.54 | 5.93 | 5.13 | 149.99 | 149.99 | 74.97 | 74.97 |

Culvert #7

Table C-79

Culvert #7 un-factored dead and live loads at critical sections for each load type

| Loads Types | | | M(kip-in/in) - V(kip/in) - A (kip/in) at critical sections | | | | | | | | | | |
|--------------|------|-----------|--|--------|--------|--------|-------|--------|--------|--------|--------|--------|--------|
| Load | Type | GW (kips) | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
| | | | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| DC | dead | - | 0.271 | -0.408 | -0.015 | 0.028 | 0.059 | -0.382 | -0.020 | -0.110 | -0.123 | -0.194 | -0.209 |
| DW | dead | - | 0.390 | -0.529 | -0.020 | -0.038 | 0.113 | -0.472 | -0.026 | -0.041 | -0.035 | -0.090 | -0.091 |
| EV | dead | - | 0.049 | -0.081 | -0.003 | -0.005 | 0.010 | -0.076 | -0.004 | -0.006 | -0.004 | -0.012 | -0.012 |
| EH | dead | - | 0.188 | 0.292 | -0.007 | -0.005 | 0.138 | 0.232 | -0.004 | -0.018 | -0.017 | -0.015 | 0.006 |
| ES | dead | - | 0.064 | 0.104 | -0.003 | -0.002 | 0.053 | 0.078 | -0.001 | -0.005 | -0.005 | -0.005 | 0.002 |
| LS | live | - | 0.175 | 0.283 | -0.007 | -0.005 | 0.144 | 0.213 | -0.003 | -0.014 | -0.012 | -0.014 | 0.006 |
| HL-93 | live | NA | 3.332 | -3.142 | -0.151 | -0.232 | 2.764 | -2.376 | -0.221 | -0.245 | -0.201 | -0.379 | -0.363 |
| HL-93 TD | live | NA | 2.646 | -2.778 | -0.130 | -0.226 | 2.065 | -2.383 | -0.168 | -0.222 | -0.188 | -0.437 | -0.424 |
| LA Type 3 | live | 41 | 1.597 | -1.865 | -0.078 | -0.109 | 0.993 | -1.513 | -0.105 | -0.124 | -0.104 | -0.252 | -0.235 |
| LA Type 3-S2 | live | 73 | 1.679 | -1.759 | -0.083 | -0.133 | 1.327 | -1.513 | -0.115 | -0.131 | -0.110 | -0.254 | -0.240 |
| LA Type 6 | live | 80 | 1.946 | -2.161 | -0.098 | -0.154 | 1.612 | -1.754 | -0.134 | -0.152 | -0.128 | -0.304 | -0.287 |
| LA Type 8 | live | 80 | 1.883 | -1.934 | -0.102 | -0.159 | 1.488 | -1.639 | -0.118 | -0.157 | -0.132 | -0.300 | -0.292 |
| Type 3-3 | live | 80 | 1.466 | -1.382 | -0.077 | -0.116 | 1.351 | -1.167 | -0.105 | -0.115 | -0.096 | -0.230 | -0.218 |
| NRL | live | 80 | 1.636 | -2.001 | -0.081 | -0.115 | 0.911 | -1.674 | -0.111 | -0.130 | -0.109 | -0.276 | -0.262 |
| SU 4 | live | 54 | 1.725 | -1.836 | -0.094 | -0.148 | 1.233 | -1.531 | -0.110 | -0.141 | -0.119 | -0.295 | -0.277 |
| SU 5 | live | 62 | 1.699 | -1.994 | -0.082 | -0.116 | 1.029 | -1.735 | -0.109 | -0.130 | -0.109 | -0.279 | -0.268 |
| SU 6 | live | 69.5 | 1.662 | -2.083 | -0.082 | -0.116 | 0.937 | -1.736 | -0.111 | -0.130 | -0.109 | -0.281 | -0.270 |
| SU 7 | live | 77.5 | 1.610 | -2.026 | -0.082 | -0.116 | 0.899 | -1.736 | -0.111 | -0.130 | -0.109 | -0.281 | -0.270 |

Table C-80 Culvert #7 load factors, factored loads and rating factors at critical sections for HL-93 inventory level

| HL-93 (INV) | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|--------------------------|-------|--------|-------|-------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 0.90 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 1.35 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 1.75 | 0.00 |
| γ_{LL} | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 |
| γ_{DC}^{*DC} | 0.34 | -0.51 | -0.02 | 0.03 | 0.07 | -0.48 | -0.02 | -0.14 | -0.15 | -0.24 | -0.26 |
| γ_{DW}^{*DW} | 0.58 | -0.79 | -0.03 | -0.06 | 0.17 | -0.71 | -0.04 | -0.06 | -0.05 | -0.14 | -0.14 |
| γ_{EV}^{*EV} | 0.06 | -0.11 | 0.00 | -0.01 | 0.01 | -0.10 | 0.00 | -0.01 | -0.01 | -0.02 | -0.02 |
| γ_{EH}^{*EH} | 0.25 | 0.15 | -0.01 | -0.01 | 0.19 | 0.12 | -0.01 | -0.02 | -0.02 | -0.02 | 0.00 |
| γ_{ES}^{*ES} | 0.10 | 0.05 | 0.00 | 0.00 | 0.08 | 0.04 | 0.00 | -0.01 | -0.01 | -0.01 | 0.00 |
| γ_{LS}^{*LS} | 0.31 | 0.00 | -0.01 | -0.01 | 0.25 | 0.00 | -0.01 | -0.02 | -0.02 | -0.02 | 0.00 |
| γ_{LL}^{*LL} | 8.82 | -8.31 | -0.40 | -0.62 | 7.31 | -6.30 | -0.58 | -0.65 | -0.53 | -1.16 | -1.12 |
| $\phi_c\phi_s\phi_{R_n}$ | 16.06 | -17.75 | -1.09 | -1.09 | 16.06 | -17.75 | -1.09 | -46.37 | -46.37 | -46.37 | -46.37 |
| RF | 1.61 | 1.99 | 2.49 | 1.67 | 2.05 | 2.64 | 1.72 | 68.69 | 83.19 | 38.93 | 40.94 |

Table C-81
Culvert #7 load factors, factored loads and rating factors at critical sections for HL-93 operational level

| HL-93 (OPR) | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|-------|-------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 0.90 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 1.35 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 1.75 | 0.00 |
| γ_{LL} | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 |
| γ_{DC}^*DC | 0.34 | -0.51 | -0.02 | 0.03 | 0.07 | -0.48 | -0.02 | -0.14 | -0.15 | -0.24 | -0.26 |
| γ_{DW}^*DW | 0.58 | -0.79 | -0.03 | -0.06 | 0.17 | -0.71 | -0.04 | -0.06 | -0.05 | -0.14 | -0.14 |
| γ_{EV}^*EV | 0.06 | -0.11 | 0.00 | -0.01 | 0.01 | -0.10 | 0.00 | -0.01 | -0.01 | -0.02 | -0.02 |
| γ_{EH}^*EH | 0.25 | 0.15 | -0.01 | -0.01 | 0.19 | 0.12 | -0.01 | -0.02 | -0.02 | -0.02 | 0.00 |
| γ_{ES}^*ES | 0.10 | 0.05 | 0.00 | 0.00 | 0.08 | 0.04 | 0.00 | -0.01 | -0.01 | -0.01 | 0.00 |
| γ_{LS}^*LS | 0.31 | 0.00 | -0.01 | -0.01 | 0.25 | 0.00 | -0.01 | -0.02 | -0.02 | -0.02 | 0.00 |
| γ_{LL}^*LL | 6.80 | -6.41 | -0.31 | -0.47 | 5.64 | -4.86 | -0.45 | -0.50 | -0.41 | -0.89 | -0.87 |
| $\phi_c\phi_s\phi R_n$ | 16.06 | -17.75 | -1.09 | -1.09 | 16.06 | -17.75 | -1.09 | -46.37 | -46.37 | -46.37 | -46.37 |
| RF | 2.07 | 2.58 | 3.20 | 2.16 | 2.64 | 3.42 | 2.22 | 88.09 | 106.61 | 50.17 | 53.07 |

Table C-82
Culvert #7 load factors, factored loads and rating factors at critical sections for LA Type 3

| LA Type 3 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|----------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 0.90 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 1.35 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 1.75 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC*DC} | 0.34 | -0.51 | -0.02 | 0.03 | 0.07 | -0.48 | -0.02 | -0.14 | -0.15 | -0.24 | -0.26 |
| γ_{DW*DW} | 0.58 | -0.79 | -0.03 | -0.06 | 0.17 | -0.71 | -0.04 | -0.06 | -0.05 | -0.14 | -0.14 |
| γ_{EV*EV} | 0.06 | -0.11 | 0.00 | -0.01 | 0.01 | -0.10 | 0.00 | -0.01 | -0.01 | -0.02 | -0.02 |
| γ_{EH*EH} | 0.25 | 0.15 | -0.01 | -0.01 | 0.19 | 0.12 | -0.01 | -0.02 | -0.02 | -0.02 | 0.00 |
| γ_{ES*ES} | 0.10 | 0.05 | 0.00 | 0.00 | 0.08 | 0.04 | 0.00 | -0.01 | -0.01 | -0.01 | 0.00 |
| γ_{LS*LS} | 0.31 | 0.00 | -0.01 | -0.01 | 0.25 | 0.00 | -0.01 | -0.02 | -0.02 | -0.02 | 0.00 |
| γ_{LL*LL} | 4.02 | -4.70 | -0.20 | -0.27 | 2.50 | -3.81 | -0.26 | -0.31 | -0.26 | -0.63 | -0.59 |
| $\phi_c\phi_s\phi_{R_n}$ | 16.06 | -17.75 | -1.09 | -1.09 | 16.06 | -17.75 | -1.09 | -46.37 | -46.37 | -46.37 | -46.37 |
| RF | 3.40 | 3.52 | 4.92 | 3.69 | 5.64 | 4.36 | 3.77 | 136.52 | 162.91 | 69.83 | 77.72 |

Table C-83
Culvert #7 load factors, factored loads and rating factors at critical sections for LA Type 3 S2

| LA Type 3 S2 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|-------------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 0.90 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 1.35 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 1.75 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.34 | -0.51 | -0.02 | 0.03 | 0.07 | -0.48 | -0.02 | -0.14 | -0.15 | -0.24 | -0.26 |
| γ_{DW}^*DW | 0.58 | -0.79 | -0.03 | -0.06 | 0.17 | -0.71 | -0.04 | -0.06 | -0.05 | -0.14 | -0.14 |
| γ_{EV}^*EV | 0.06 | -0.11 | 0.00 | -0.01 | 0.01 | -0.10 | 0.00 | -0.01 | -0.01 | -0.02 | -0.02 |
| γ_{EH}^*EH | 0.25 | 0.15 | -0.01 | -0.01 | 0.19 | 0.12 | -0.01 | -0.02 | -0.02 | -0.02 | 0.00 |
| γ_{ES}^*ES | 0.10 | 0.05 | 0.00 | 0.00 | 0.08 | 0.04 | 0.00 | -0.01 | -0.01 | -0.01 | 0.00 |
| γ_{LS}^*LS | 0.31 | 0.00 | -0.01 | -0.01 | 0.25 | 0.00 | -0.01 | -0.02 | -0.02 | -0.02 | 0.00 |
| γ_{LL}^*LL | 4.23 | -4.43 | -0.21 | -0.33 | 3.34 | -3.81 | -0.29 | -0.33 | -0.28 | -0.64 | -0.60 |
| $\phi_c\phi_s\phi R_n$ | 16.06 | -17.75 | -1.09 | -1.09 | 16.06 | -17.75 | -1.09 | -46.37 | -46.37 | -46.37 | -46.37 |
| RF | 3.24 | 3.73 | 4.64 | 3.04 | 4.32 | 4.36 | 3.45 | 130.07 | 154.23 | 69.32 | 76.12 |

Table C-84
Culvert #7 load factors, factored loads and rating factors at critical sections for LA Type 6

| LA Type 6 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|----------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 0.90 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 1.35 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 1.75 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC*DC} | 0.34 | -0.51 | -0.02 | 0.03 | 0.07 | -0.48 | -0.02 | -0.14 | -0.15 | -0.24 | -0.26 |
| γ_{DW*DW} | 0.58 | -0.79 | -0.03 | -0.06 | 0.17 | -0.71 | -0.04 | -0.06 | -0.05 | -0.14 | -0.14 |
| γ_{EV*EV} | 0.06 | -0.11 | 0.00 | -0.01 | 0.01 | -0.10 | 0.00 | -0.01 | -0.01 | -0.02 | -0.02 |
| γ_{EH*EH} | 0.25 | 0.15 | -0.01 | -0.01 | 0.19 | 0.12 | -0.01 | -0.02 | -0.02 | -0.02 | 0.00 |
| γ_{ES*ES} | 0.10 | 0.05 | 0.00 | 0.00 | 0.08 | 0.04 | 0.00 | -0.01 | -0.01 | -0.01 | 0.00 |
| γ_{LS*LS} | 0.31 | 0.00 | -0.01 | -0.01 | 0.25 | 0.00 | -0.01 | -0.02 | -0.02 | -0.02 | 0.00 |
| γ_{LL*LL} | 4.90 | -5.45 | -0.25 | -0.39 | 4.06 | -4.42 | -0.34 | -0.38 | -0.32 | -0.76 | -0.72 |
| $\phi_c\phi_s\phi_{R_n}$ | 16.06 | -17.75 | -1.09 | -1.09 | 16.06 | -17.75 | -1.09 | -46.37 | -46.37 | -46.37 | -46.37 |
| RF | 2.83 | 3.04 | 3.96 | 2.63 | 3.60 | 3.76 | 2.95 | 113.04 | 133.96 | 58.26 | 63.50 |

Table C-85
Culvert #7 load factors, factored loads and rating factors at critical sections for LA Type 8

| LA Type 8 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|----------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 0.90 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 1.35 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 1.75 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC*DC} | 0.34 | -0.51 | -0.02 | 0.03 | 0.07 | -0.48 | -0.02 | -0.14 | -0.15 | -0.24 | -0.26 |
| γ_{DW*DW} | 0.58 | -0.79 | -0.03 | -0.06 | 0.17 | -0.71 | -0.04 | -0.06 | -0.05 | -0.14 | -0.14 |
| γ_{EV*EV} | 0.06 | -0.11 | 0.00 | -0.01 | 0.01 | -0.10 | 0.00 | -0.01 | -0.01 | -0.02 | -0.02 |
| γ_{EH*EH} | 0.25 | 0.15 | -0.01 | -0.01 | 0.19 | 0.12 | -0.01 | -0.02 | -0.02 | -0.02 | 0.00 |
| γ_{ES*ES} | 0.10 | 0.05 | 0.00 | 0.00 | 0.08 | 0.04 | 0.00 | -0.01 | -0.01 | -0.01 | 0.00 |
| γ_{LS*LS} | 0.31 | 0.00 | -0.01 | -0.01 | 0.25 | 0.00 | -0.01 | -0.02 | -0.02 | -0.02 | 0.00 |
| γ_{LL*LL} | 4.74 | -4.87 | -0.26 | -0.40 | 3.75 | -4.13 | -0.30 | -0.39 | -0.33 | -0.76 | -0.74 |
| $\phi_c\phi_s\phi_{R_n}$ | 16.06 | -17.75 | -1.09 | -1.09 | 16.06 | -17.75 | -1.09 | -46.37 | -46.37 | -46.37 | -46.37 |
| RF | 2.91 | 3.40 | 3.80 | 2.55 | 3.88 | 4.03 | 3.35 | 110.05 | 130.60 | 58.92 | 62.52 |

Table C-86
Culvert #7 load factors, factored loads and rating factors at critical sections for Type 3-3

| Type 3-3 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|---------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 0.90 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 1.35 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 1.75 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.34 | -0.51 | -0.02 | 0.03 | 0.07 | -0.48 | -0.02 | -0.14 | -0.15 | -0.24 | -0.26 |
| γ_{DW}^*DW | 0.58 | -0.79 | -0.03 | -0.06 | 0.17 | -0.71 | -0.04 | -0.06 | -0.05 | -0.14 | -0.14 |
| γ_{EV}^*EV | 0.06 | -0.11 | 0.00 | -0.01 | 0.01 | -0.10 | 0.00 | -0.01 | -0.01 | -0.02 | -0.02 |
| γ_{EH}^*EH | 0.25 | 0.15 | -0.01 | -0.01 | 0.19 | 0.12 | -0.01 | -0.02 | -0.02 | -0.02 | 0.00 |
| γ_{ES}^*ES | 0.10 | 0.05 | 0.00 | 0.00 | 0.08 | 0.04 | 0.00 | -0.01 | -0.01 | -0.01 | 0.00 |
| γ_{LS}^*LS | 0.31 | 0.00 | -0.01 | -0.01 | 0.25 | 0.00 | -0.01 | -0.02 | -0.02 | -0.02 | 0.00 |
| γ_{LL}^*LL | 3.69 | -3.48 | -0.19 | -0.29 | 3.40 | -2.94 | -0.26 | -0.29 | -0.24 | -0.58 | -0.55 |
| $\phi_c\phi_s\phi R_n$ | 16.06 | -17.75 | -1.09 | -1.09 | 16.06 | -17.75 | -1.09 | -46.37 | -46.37 | -46.37 | -46.37 |
| RF | 3.68 | 4.75 | 4.98 | 3.47 | 4.25 | 5.65 | 3.76 | 147.20 | 174.35 | 76.18 | 83.81 |

Table C-87
Culvert #7 load factors, factored loads and rating factors at critical sections for NRL

| NRL | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|-------|-------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 0.90 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 1.35 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 1.75 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.34 | -0.51 | -0.02 | 0.03 | 0.07 | -0.48 | -0.02 | -0.14 | -0.15 | -0.24 | -0.26 |
| γ_{DW}^*DW | 0.58 | -0.79 | -0.03 | -0.06 | 0.17 | -0.71 | -0.04 | -0.06 | -0.05 | -0.14 | -0.14 |
| γ_{EV}^*EV | 0.06 | -0.11 | 0.00 | -0.01 | 0.01 | -0.10 | 0.00 | -0.01 | -0.01 | -0.02 | -0.02 |
| γ_{EH}^*EH | 0.25 | 0.15 | -0.01 | -0.01 | 0.19 | 0.12 | -0.01 | -0.02 | -0.02 | -0.02 | 0.00 |
| γ_{ES}^*ES | 0.10 | 0.05 | 0.00 | 0.00 | 0.08 | 0.04 | 0.00 | -0.01 | -0.01 | -0.01 | 0.00 |
| γ_{LS}^*LS | 0.31 | 0.00 | -0.01 | -0.01 | 0.25 | 0.00 | -0.01 | -0.02 | -0.02 | -0.02 | 0.00 |
| γ_{LL}^*LL | 4.12 | -5.04 | -0.21 | -0.29 | 2.30 | -4.22 | -0.28 | -0.33 | -0.27 | -0.70 | -0.66 |
| $\phi_c\phi_s\phi R_n$ | 16.06 | -17.75 | -1.09 | -1.09 | 16.06 | -17.75 | -1.09 | -46.37 | -46.37 | -46.37 | -46.37 |
| RF | 3.32 | 3.28 | 4.73 | 3.48 | 6.10 | 3.94 | 3.57 | 131.05 | 155.90 | 63.85 | 69.61 |

Table C-88
Culvert #7 load factors, factored loads and rating factors at critical sections for SU4

| SU4 | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|-------|-------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 0.90 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 1.35 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 1.75 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.34 | -0.51 | -0.02 | 0.03 | 0.07 | -0.48 | -0.02 | -0.14 | -0.15 | -0.24 | -0.26 |
| γ_{DW}^*DW | 0.58 | -0.79 | -0.03 | -0.06 | 0.17 | -0.71 | -0.04 | -0.06 | -0.05 | -0.14 | -0.14 |
| γ_{EV}^*EV | 0.06 | -0.11 | 0.00 | -0.01 | 0.01 | -0.10 | 0.00 | -0.01 | -0.01 | -0.02 | -0.02 |
| γ_{EH}^*EH | 0.25 | 0.15 | -0.01 | -0.01 | 0.19 | 0.12 | -0.01 | -0.02 | -0.02 | -0.02 | 0.00 |
| γ_{ES}^*ES | 0.10 | 0.05 | 0.00 | 0.00 | 0.08 | 0.04 | 0.00 | -0.01 | -0.01 | -0.01 | 0.00 |
| γ_{LS}^*LS | 0.31 | 0.00 | -0.01 | -0.01 | 0.25 | 0.00 | -0.01 | -0.02 | -0.02 | -0.02 | 0.00 |
| γ_{LL}^*LL | 4.35 | -4.63 | -0.24 | -0.37 | 3.11 | -3.86 | -0.28 | -0.36 | -0.30 | -0.74 | -0.70 |
| $\phi_c\phi_s\phi R_n$ | 16.06 | -17.75 | -1.09 | -1.09 | 16.06 | -17.75 | -1.09 | -46.37 | -46.37 | -46.37 | -46.37 |
| RF | 3.16 | 3.58 | 4.14 | 2.74 | 4.63 | 4.31 | 3.58 | 121.48 | 143.72 | 59.81 | 65.93 |

Table C-89
Culvert #7 load factors, factored loads and rating factors at critical sections for SU5

| SU5 | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|-------|-------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 0.90 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 1.35 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 1.75 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC*DC} | 0.34 | -0.51 | -0.02 | 0.03 | 0.07 | -0.48 | -0.02 | -0.14 | -0.15 | -0.24 | -0.26 |
| γ_{DW*DW} | 0.58 | -0.79 | -0.03 | -0.06 | 0.17 | -0.71 | -0.04 | -0.06 | -0.05 | -0.14 | -0.14 |
| γ_{EV*EV} | 0.06 | -0.11 | 0.00 | -0.01 | 0.01 | -0.10 | 0.00 | -0.01 | -0.01 | -0.02 | -0.02 |
| γ_{EH*EH} | 0.25 | 0.15 | -0.01 | -0.01 | 0.19 | 0.12 | -0.01 | -0.02 | -0.02 | -0.02 | 0.00 |
| γ_{ES*ES} | 0.10 | 0.05 | 0.00 | 0.00 | 0.08 | 0.04 | 0.00 | -0.01 | -0.01 | -0.01 | 0.00 |
| γ_{LS*LS} | 0.31 | 0.00 | -0.01 | -0.01 | 0.25 | 0.00 | -0.01 | -0.02 | -0.02 | -0.02 | 0.00 |
| γ_{LL*LL} | 4.28 | -5.02 | -0.21 | -0.29 | 2.59 | -4.37 | -0.27 | -0.33 | -0.27 | -0.70 | -0.67 |
| $\phi_c\phi_s\phi R_n$ | 16.06 | -17.75 | -1.09 | -1.09 | 16.06 | -17.75 | -1.09 | -46.37 | -46.37 | -46.37 | -46.37 |
| RF | 3.21 | 3.29 | 4.70 | 3.47 | 5.46 | 3.80 | 3.62 | 130.95 | 155.90 | 63.11 | 68.11 |

Table C-90
Culvert #7 load factors, factored loads and rating factors at critical sections for SU6

| SU6 | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|-------|-------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 0.90 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 1.35 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 1.75 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.34 | -0.51 | -0.02 | 0.03 | 0.07 | -0.48 | -0.02 | -0.14 | -0.15 | -0.24 | -0.26 |
| γ_{DW}^*DW | 0.58 | -0.79 | -0.03 | -0.06 | 0.17 | -0.71 | -0.04 | -0.06 | -0.05 | -0.14 | -0.14 |
| γ_{EV}^*EV | 0.06 | -0.11 | 0.00 | -0.01 | 0.01 | -0.10 | 0.00 | -0.01 | -0.01 | -0.02 | -0.02 |
| γ_{EH}^*EH | 0.25 | 0.15 | -0.01 | -0.01 | 0.19 | 0.12 | -0.01 | -0.02 | -0.02 | -0.02 | 0.00 |
| γ_{ES}^*ES | 0.10 | 0.05 | 0.00 | 0.00 | 0.08 | 0.04 | 0.00 | -0.01 | -0.01 | -0.01 | 0.00 |
| γ_{LS}^*LS | 0.31 | 0.00 | -0.01 | -0.01 | 0.25 | 0.00 | -0.01 | -0.02 | -0.02 | -0.02 | 0.00 |
| γ_{LL}^*LL | 4.19 | -5.25 | -0.21 | -0.29 | 2.36 | -4.37 | -0.28 | -0.33 | -0.27 | -0.71 | -0.68 |
| $\phi_c\phi_s\phi R_n$ | 16.06 | -17.75 | -1.09 | -1.09 | 16.06 | -17.75 | -1.09 | -46.37 | -46.37 | -46.37 | -46.37 |
| RF | 3.28 | 3.15 | 4.70 | 3.45 | 5.95 | 3.80 | 3.57 | 130.95 | 155.93 | 62.71 | 67.60 |

Table C-91
Culvert #7 load factors, factored loads and rating factors at critical sections for SU7

| SU7 | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|-------|-------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 0.90 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 0.50 | 1.35 | 1.35 | 1.35 | 1.35 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 0.50 | 1.50 | 1.50 | 1.50 | 1.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 0.00 | 1.75 | 1.75 | 1.75 | 1.75 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC*DC} | 0.34 | -0.51 | -0.02 | 0.03 | 0.07 | -0.48 | -0.02 | -0.14 | -0.15 | -0.24 | -0.26 |
| γ_{DW*DW} | 0.58 | -0.79 | -0.03 | -0.06 | 0.17 | -0.71 | -0.04 | -0.06 | -0.05 | -0.14 | -0.14 |
| γ_{EV*EV} | 0.06 | -0.11 | 0.00 | -0.01 | 0.01 | -0.10 | 0.00 | -0.01 | -0.01 | -0.02 | -0.02 |
| γ_{EH*EH} | 0.25 | 0.15 | -0.01 | -0.01 | 0.19 | 0.12 | -0.01 | -0.02 | -0.02 | -0.02 | 0.00 |
| γ_{ES*ES} | 0.10 | 0.05 | 0.00 | 0.00 | 0.08 | 0.04 | 0.00 | -0.01 | -0.01 | -0.01 | 0.00 |
| γ_{LS*LS} | 0.31 | 0.00 | -0.01 | -0.01 | 0.25 | 0.00 | -0.01 | -0.02 | -0.02 | -0.02 | 0.00 |
| γ_{LL*LL} | 4.06 | -5.11 | -0.21 | -0.29 | 2.27 | -4.37 | -0.28 | -0.33 | -0.27 | -0.71 | -0.68 |
| $\phi_c\phi_s\phi R_n$ | 16.06 | -17.75 | -1.09 | -1.09 | 16.06 | -17.75 | -1.09 | -46.37 | -46.37 | -46.37 | -46.37 |
| RF | 3.37 | 3.24 | 4.70 | 3.47 | 6.17 | 3.80 | 3.57 | 130.95 | 155.93 | 62.71 | 67.60 |

Culvert #8

Table C-92

Culvert #8 un-factored dead and live loads at critical sections for each load type

| Loads Types | | | M(kip-in/in) - V(kip/in) - A (kip/in) at critical sections | | | | | | | | | | |
|--------------|------|-----------|--|--------|--------|--------|-------|--------|--------|--------|--------|--------|--------|
| Load | Type | GW (kips) | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
| | | | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| DC | dead | - | 0.533 | -0.715 | -0.023 | 0.040 | 0.265 | -0.688 | -0.034 | -0.044 | -0.076 | -0.112 | -0.141 |
| DW | dead | - | 0.296 | -0.398 | -0.013 | 0.022 | 0.149 | -0.381 | -0.019 | -0.021 | -0.021 | -0.058 | -0.058 |
| EV | dead | - | 0.556 | -0.747 | -0.024 | 0.041 | 0.277 | -0.719 | -0.035 | -0.039 | -0.040 | -0.107 | -0.108 |
| EH | dead | - | 0.126 | 0.209 | -0.002 | -0.002 | 0.045 | 0.111 | 0.002 | -0.002 | -0.003 | 0.005 | 0.004 |
| ES | dead | - | 0.014 | 0.023 | 0.000 | 0.000 | 0.006 | 0.014 | 0.000 | 0.000 | 0.000 | 0.001 | 0.000 |
| LS | live | - | 0.070 | 0.116 | -0.001 | -0.001 | 0.028 | 0.069 | 0.001 | -0.001 | -0.002 | 0.003 | 0.002 |
| HL-93 | live | NA | 3.660 | -3.079 | -0.183 | 0.214 | 2.913 | -2.561 | -0.202 | -0.231 | -0.208 | -0.314 | -0.254 |
| HL-93 TD | live | NA | 3.099 | -2.911 | 0.141 | 0.199 | 2.295 | -2.537 | -0.175 | -0.210 | -0.190 | -0.435 | -0.350 |
| LA Type 3 | live | 41 | 1.688 | -1.822 | 0.095 | 0.117 | 1.376 | -1.592 | -0.103 | -0.114 | -0.103 | -0.258 | -0.206 |
| LA Type 3-S2 | live | 73 | 1.843 | -2.187 | 0.096 | 0.121 | 1.289 | -2.059 | -0.112 | -0.135 | -0.122 | -0.257 | -0.206 |
| LA Type 6 | live | 80 | 2.130 | -1.942 | 0.116 | 0.140 | 1.617 | -1.674 | -0.126 | -0.144 | -0.130 | -0.300 | -0.239 |
| LA Type 8 | live | 80 | 2.141 | -2.005 | 0.112 | 0.136 | 1.640 | -1.868 | -0.119 | -0.145 | -0.131 | -0.292 | -0.233 |
| Type 3-3 | live | 80 | 1.697 | -1.557 | 0.086 | 0.103 | 1.411 | -1.476 | -0.092 | -0.110 | -0.099 | -0.222 | -0.177 |
| NRL | live | 80 | 1.728 | -2.039 | 0.099 | 0.126 | 1.336 | -1.784 | -0.114 | -0.119 | -0.107 | -0.305 | -0.243 |
| SU 4 | live | 54 | 1.816 | -1.878 | 0.101 | 0.125 | 1.503 | -1.658 | -0.111 | -0.122 | -0.110 | -0.296 | -0.236 |
| SU 5 | live | 62 | 1.812 | -2.058 | 0.101 | 0.127 | 1.432 | -1.783 | -0.109 | -0.122 | -0.110 | -0.296 | -0.236 |
| SU 6 | live | 69.5 | 1.803 | -2.059 | 0.099 | 0.127 | 1.412 | -1.849 | -0.112 | -0.120 | -0.108 | -0.310 | -0.248 |
| SU 7 | live | 77.5 | 1.733 | -2.071 | 0.098 | 0.127 | 1.335 | -1.808 | -0.114 | -0.119 | -0.107 | -0.307 | -0.245 |

Table C-93
Culvert #8 load factors, factored loads and rating factors at critical sections for HL-93 inventory level

| HL-93 (INV) | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|--------------------------|-------|--------|-------|------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 0.50 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 0.50 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 0.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 0.00 | 0.00 |
| γ_{LL} | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 |
| γ_{DC}^{*DC} | 0.67 | -0.89 | -0.03 | 0.05 | 0.33 | -0.86 | -0.04 | -0.05 | -0.09 | -0.14 | -0.18 |
| γ_{DW}^{*DW} | 0.44 | -0.60 | -0.02 | 0.03 | 0.22 | -0.57 | -0.03 | -0.03 | -0.03 | -0.09 | -0.09 |
| γ_{EV}^{*EV} | 0.72 | -0.97 | -0.03 | 0.05 | 0.36 | -0.93 | -0.05 | -0.05 | -0.05 | -0.14 | -0.14 |
| γ_{EH}^{*EH} | 0.17 | 0.10 | 0.00 | 0.00 | 0.06 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{ES}^{*ES} | 0.02 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^{*LS} | 0.12 | 0.00 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^{*LL} | 9.68 | -8.15 | -0.48 | 0.57 | 7.71 | -6.78 | -0.54 | -0.61 | -0.55 | -1.15 | -0.93 |
| $\phi_c\phi_s\phi_{R_n}$ | 15.40 | -17.92 | -1.17 | 1.17 | 15.40 | -17.92 | -1.17 | -47.71 | -47.71 | -47.71 | -47.71 |
| RF | 1.36 | 1.91 | 2.23 | 1.83 | 1.86 | 2.30 | 1.97 | 77.50 | 85.73 | 41.09 | 51.12 |

Table C-94
Culvert #8 load factors, factored loads and rating factors at critical sections for HL-93 operational level

| HL-93 (OPR) | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|-------|------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 0.50 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 0.50 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 0.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 0.00 | 0.00 |
| γ_{LL} | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 |
| γ_{DC}^*DC | 0.67 | -0.89 | -0.03 | 0.05 | 0.33 | -0.86 | -0.04 | -0.05 | -0.09 | -0.14 | -0.18 |
| γ_{DW}^*DW | 0.44 | -0.60 | -0.02 | 0.03 | 0.22 | -0.57 | -0.03 | -0.03 | -0.03 | -0.09 | -0.09 |
| γ_{EV}^*EV | 0.72 | -0.97 | -0.03 | 0.05 | 0.36 | -0.93 | -0.05 | -0.05 | -0.05 | -0.14 | -0.14 |
| γ_{EH}^*EH | 0.17 | 0.10 | 0.00 | 0.00 | 0.06 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{ES}^*ES | 0.02 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.12 | 0.00 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^*LL | 7.47 | -6.28 | -0.37 | 0.44 | 5.95 | -5.23 | -0.41 | -0.47 | -0.43 | -0.89 | -0.71 |
| $\phi_c\phi_s\phi R_n$ | 15.40 | -17.92 | -1.17 | 1.17 | 15.40 | -17.92 | -1.17 | -47.71 | -47.71 | -47.71 | -47.71 |
| RF | 1.76 | 2.48 | 2.89 | 2.38 | 2.41 | 2.99 | 2.56 | 100.34 | 110.97 | 53.26 | 66.27 |

Table C-95
Culvert #8 load factors, factored loads and rating factors at critical sections for LA Type 3

| LA Type 3 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|----------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 0.50 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 0.50 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 0.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.67 | -0.89 | -0.03 | 0.05 | 0.33 | -0.86 | -0.04 | -0.05 | -0.09 | -0.14 | -0.18 |
| γ_{DW}^*DW | 0.44 | -0.60 | -0.02 | 0.03 | 0.22 | -0.57 | -0.03 | -0.03 | -0.03 | -0.09 | -0.09 |
| γ_{EV}^*EV | 0.72 | -0.97 | -0.03 | 0.05 | 0.36 | -0.93 | -0.05 | -0.05 | -0.05 | -0.14 | -0.14 |
| γ_{EH}^*EH | 0.17 | 0.10 | 0.00 | 0.00 | 0.06 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{ES}^*ES | 0.02 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.12 | 0.00 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^*LL | 4.25 | -4.59 | 0.24 | 0.30 | 3.47 | -4.01 | -0.26 | -0.29 | -0.26 | -0.65 | -0.52 |
| $\phi_c\phi_s\phi_{R_n}$ | 15.40 | -17.92 | 1.17 | 1.17 | 15.40 | -17.92 | -1.17 | -47.71 | -47.71 | -47.71 | -47.71 |
| RF | 3.06 | 3.39 | 5.31 | 3.51 | 4.10 | 3.89 | 4.07 | 164.28 | 181.66 | 72.91 | 91.34 |

Table C-96
Culvert #8 load factors, factored loads and rating factors at critical sections for LA Type 3 S2

| LA Type 3 S2 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|-------------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 0.50 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 0.50 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 0.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC*DC} | 0.67 | -0.89 | -0.03 | 0.05 | 0.33 | -0.86 | -0.04 | -0.05 | -0.09 | -0.14 | -0.18 |
| γ_{DW*DW} | 0.44 | -0.60 | -0.02 | 0.03 | 0.22 | -0.57 | -0.03 | -0.03 | -0.03 | -0.09 | -0.09 |
| γ_{EV*EV} | 0.72 | -0.97 | -0.03 | 0.05 | 0.36 | -0.93 | -0.05 | -0.05 | -0.05 | -0.14 | -0.14 |
| γ_{EH*EH} | 0.17 | 0.10 | 0.00 | 0.00 | 0.06 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{ES*ES} | 0.02 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS*LS} | 0.12 | 0.00 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL*LL} | 4.64 | -5.51 | 0.24 | 0.31 | 3.25 | -5.19 | -0.28 | -0.34 | -0.31 | -0.65 | -0.52 |
| $\phi_c\phi_s\phi_{R_n}$ | 15.40 | -17.92 | 1.17 | 1.17 | 15.40 | -17.92 | -1.17 | -47.71 | -47.71 | -47.71 | -47.71 |
| RF | 2.81 | 2.83 | 5.23 | 3.40 | 4.37 | 3.01 | 3.75 | 138.38 | 153.12 | 73.03 | 91.36 |

Table C-97
Culvert #8 load factors, factored loads and rating factors at critical sections for LA Type 6

| LA Type 6 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|----------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 0.50 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 0.50 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 0.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.67 | -0.89 | -0.03 | 0.05 | 0.33 | -0.86 | -0.04 | -0.05 | -0.09 | -0.14 | -0.18 |
| γ_{DW}^*DW | 0.44 | -0.60 | -0.02 | 0.03 | 0.22 | -0.57 | -0.03 | -0.03 | -0.03 | -0.09 | -0.09 |
| γ_{EV}^*EV | 0.72 | -0.97 | -0.03 | 0.05 | 0.36 | -0.93 | -0.05 | -0.05 | -0.05 | -0.14 | -0.14 |
| γ_{EH}^*EH | 0.17 | 0.10 | 0.00 | 0.00 | 0.06 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{ES}^*ES | 0.02 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.12 | 0.00 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^*LL | 5.37 | -4.89 | 0.29 | 0.35 | 4.08 | -4.22 | -0.32 | -0.36 | -0.33 | -0.75 | -0.60 |
| $\phi_c\phi_s\phi_{R_n}$ | 15.40 | -17.92 | 1.17 | 1.17 | 15.40 | -17.92 | -1.17 | -47.71 | -47.71 | -47.71 | -47.71 |
| RF | 2.44 | 3.18 | 4.34 | 2.94 | 3.50 | 3.70 | 3.33 | 130.18 | 144.06 | 62.74 | 78.54 |

Table C-98
Culvert #8 load factors, factored loads and rating factors at critical sections for LA Type 8

| LA Type 8 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|----------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 0.50 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 0.50 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 0.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC*DC} | 0.67 | -0.89 | -0.03 | 0.05 | 0.33 | -0.86 | -0.04 | -0.05 | -0.09 | -0.14 | -0.18 |
| γ_{DW*DW} | 0.44 | -0.60 | -0.02 | 0.03 | 0.22 | -0.57 | -0.03 | -0.03 | -0.03 | -0.09 | -0.09 |
| γ_{EV*EV} | 0.72 | -0.97 | -0.03 | 0.05 | 0.36 | -0.93 | -0.05 | -0.05 | -0.05 | -0.14 | -0.14 |
| γ_{EH*EH} | 0.17 | 0.10 | 0.00 | 0.00 | 0.06 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{ES*ES} | 0.02 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS*LS} | 0.12 | 0.00 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL*LL} | 5.40 | -5.05 | 0.28 | 0.34 | 4.13 | -4.71 | -0.30 | -0.36 | -0.33 | -0.74 | -0.59 |
| $\phi_c\phi_s\phi_{R_n}$ | 15.40 | -17.92 | 1.17 | 1.17 | 15.40 | -17.92 | -1.17 | -47.71 | -47.71 | -47.71 | -47.71 |
| RF | 2.42 | 3.08 | 4.47 | 3.03 | 3.45 | 3.32 | 3.54 | 129.57 | 143.34 | 64.35 | 80.52 |

Table C-99
Culvert #8 load factors, factored loads and rating factors at critical sections for Type 3-3

| Type 3-3 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|---------------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 0.50 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 0.50 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 0.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.67 | -0.89 | -0.03 | 0.05 | 0.33 | -0.86 | -0.04 | -0.05 | -0.09 | -0.14 | -0.18 |
| γ_{DW}^*DW | 0.44 | -0.60 | -0.02 | 0.03 | 0.22 | -0.57 | -0.03 | -0.03 | -0.03 | -0.09 | -0.09 |
| γ_{EV}^*EV | 0.72 | -0.97 | -0.03 | 0.05 | 0.36 | -0.93 | -0.05 | -0.05 | -0.05 | -0.14 | -0.14 |
| γ_{EH}^*EH | 0.17 | 0.10 | 0.00 | 0.00 | 0.06 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{ES}^*ES | 0.02 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.12 | 0.00 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^*LL | 4.28 | -3.92 | 0.22 | 0.26 | 3.56 | -3.72 | -0.23 | -0.28 | -0.25 | -0.56 | -0.45 |
| $\phi_c\phi_s\phi R_n$ | 15.40 | -17.92 | 1.17 | 1.17 | 15.40 | -17.92 | -1.17 | -47.71 | -47.71 | -47.71 | -47.71 |
| RF | 3.04 | 3.97 | 5.87 | 4.01 | 4.00 | 4.20 | 4.57 | 169.89 | 187.90 | 84.71 | 106.13 |

Table C-100
Culvert #8 load factors, factored loads and rating factors at critical sections for NRL

| NRL | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|-------|------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 0.50 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 0.50 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 0.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.67 | -0.89 | -0.03 | 0.05 | 0.33 | -0.86 | -0.04 | -0.05 | -0.09 | -0.14 | -0.18 |
| γ_{DW}^*DW | 0.44 | -0.60 | -0.02 | 0.03 | 0.22 | -0.57 | -0.03 | -0.03 | -0.03 | -0.09 | -0.09 |
| γ_{EV}^*EV | 0.72 | -0.97 | -0.03 | 0.05 | 0.36 | -0.93 | -0.05 | -0.05 | -0.05 | -0.14 | -0.14 |
| γ_{EH}^*EH | 0.17 | 0.10 | 0.00 | 0.00 | 0.06 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{ES}^*ES | 0.02 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.12 | 0.00 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^*LL | 4.35 | -5.14 | 0.25 | 0.32 | 3.37 | -4.50 | -0.29 | -0.30 | -0.27 | -0.77 | -0.61 |
| $\phi_c\phi_s\phi R_n$ | 15.40 | -17.92 | 1.17 | 1.17 | 15.40 | -17.92 | -1.17 | -47.71 | -47.71 | -47.71 | -47.71 |
| RF | 2.99 | 3.03 | 5.10 | 3.26 | 4.22 | 3.47 | 3.67 | 157.52 | 174.43 | 61.62 | 77.15 |

Table C-101
Culvert #8 load factors, factored loads and rating factors at critical sections for SU4

| SU4 | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|-------|------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 0.50 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 0.50 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 0.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.67 | -0.89 | -0.03 | 0.05 | 0.33 | -0.86 | -0.04 | -0.05 | -0.09 | -0.14 | -0.18 |
| γ_{DW}^*DW | 0.44 | -0.60 | -0.02 | 0.03 | 0.22 | -0.57 | -0.03 | -0.03 | -0.03 | -0.09 | -0.09 |
| γ_{EV}^*EV | 0.72 | -0.97 | -0.03 | 0.05 | 0.36 | -0.93 | -0.05 | -0.05 | -0.05 | -0.14 | -0.14 |
| γ_{EH}^*EH | 0.17 | 0.10 | 0.00 | 0.00 | 0.06 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{ES}^*ES | 0.02 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.12 | 0.00 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^*LL | 4.58 | -4.73 | 0.26 | 0.31 | 3.79 | -4.18 | -0.28 | -0.31 | -0.28 | -0.74 | -0.59 |
| $\phi_c\phi_s\phi R_n$ | 15.40 | -17.92 | 1.17 | 1.17 | 15.40 | -17.92 | -1.17 | -47.71 | -47.71 | -47.71 | -47.71 |
| RF | 2.85 | 3.29 | 4.97 | 3.30 | 3.76 | 3.74 | 3.80 | 153.86 | 170.26 | 63.56 | 79.52 |

Table C-102
Culvert #8 load factors, factored loads and rating factors at critical sections for SU5

| SU5 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|----------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 0.50 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 0.50 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 0.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.67 | -0.89 | -0.03 | 0.05 | 0.33 | -0.86 | -0.04 | -0.05 | -0.09 | -0.14 | -0.18 |
| γ_{DW}^*DW | 0.44 | -0.60 | -0.02 | 0.03 | 0.22 | -0.57 | -0.03 | -0.03 | -0.03 | -0.09 | -0.09 |
| γ_{EV}^*EV | 0.72 | -0.97 | -0.03 | 0.05 | 0.36 | -0.93 | -0.05 | -0.05 | -0.05 | -0.14 | -0.14 |
| γ_{EH}^*EH | 0.17 | 0.10 | 0.00 | 0.00 | 0.06 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{ES}^*ES | 0.02 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.12 | 0.00 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^*LL | 4.57 | -5.19 | 0.26 | 0.32 | 3.61 | -4.49 | -0.27 | -0.31 | -0.28 | -0.74 | -0.59 |
| $\phi_c\phi_s\phi R_n$ | 15.40 | -17.92 | 1.17 | 1.17 | 15.40 | -17.92 | -1.17 | -47.71 | -47.71 | -47.71 | -47.71 |
| RF | 2.85 | 3.00 | 4.97 | 3.25 | 3.94 | 3.48 | 3.86 | 153.86 | 170.26 | 63.56 | 79.52 |

Table C-103
Culvert #8 load factors, factored loads and rating factors at critical sections for SU6

| SU6 | 2 | 3 | 1 | 3 | 5 | 4 | 4 | 6 | 7 | 8 | 9 |
|------------------------|-------|--------|-------|------|-------|--------|-------|--------|--------|--------|--------|
| Load Factor | M (+) | M (-) | V | V | M (+) | M (-) | V | A | A | A | A |
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 0.50 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 0.50 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 0.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC}^*DC | 0.67 | -0.89 | -0.03 | 0.05 | 0.33 | -0.86 | -0.04 | -0.05 | -0.09 | -0.14 | -0.18 |
| γ_{DW}^*DW | 0.44 | -0.60 | -0.02 | 0.03 | 0.22 | -0.57 | -0.03 | -0.03 | -0.03 | -0.09 | -0.09 |
| γ_{EV}^*EV | 0.72 | -0.97 | -0.03 | 0.05 | 0.36 | -0.93 | -0.05 | -0.05 | -0.05 | -0.14 | -0.14 |
| γ_{EH}^*EH | 0.17 | 0.10 | 0.00 | 0.00 | 0.06 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{ES}^*ES | 0.02 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS}^*LS | 0.12 | 0.00 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL}^*LL | 4.54 | -5.19 | 0.25 | 0.32 | 3.56 | -4.66 | -0.28 | -0.30 | -0.27 | -0.78 | -0.63 |
| $\phi_c\phi_s\phi R_n$ | 15.40 | -17.92 | 1.17 | 1.17 | 15.40 | -17.92 | -1.17 | -47.71 | -47.71 | -47.71 | -47.71 |
| RF | 2.87 | 3.00 | 5.07 | 3.25 | 4.00 | 3.35 | 3.74 | 156.54 | 173.31 | 60.57 | 75.67 |

Table C-104
Culvert #8 load factors, factored loads and rating factors at critical sections for SU7

| SU7 Load Factor | 2 M (+) | 3 M (-) | 1 V | 3 V | 5 M (+) | 4 M (-) | 4 V | 6 A | 7 A | 8 A | 9 A |
|----------------------------|------------|------------|--------|--------|------------|------------|--------|--------|--------|--------|--------|
| γ_{DC} | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| γ_{DW} | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| γ_{EV} | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 |
| γ_{EH} | 1.35 | 0.50 | 1.35 | 0.50 | 1.35 | 0.50 | 0.50 | 1.35 | 1.35 | 0.50 | 0.50 |
| γ_{ES} | 1.50 | 0.50 | 1.50 | 0.50 | 1.50 | 0.50 | 0.50 | 1.50 | 1.50 | 0.50 | 0.50 |
| γ_{LS} | 1.75 | 0.00 | 1.75 | 0.00 | 1.75 | 0.00 | 0.00 | 1.75 | 1.75 | 0.00 | 0.00 |
| γ_{LL} | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| γ_{DC*DC} | 0.67 | -0.89 | -0.03 | 0.05 | 0.33 | -0.86 | -0.04 | -0.05 | -0.09 | -0.14 | -0.18 |
| γ_{DW*DW} | 0.44 | -0.60 | -0.02 | 0.03 | 0.22 | -0.57 | -0.03 | -0.03 | -0.03 | -0.09 | -0.09 |
| γ_{EV*EV} | 0.72 | -0.97 | -0.03 | 0.05 | 0.36 | -0.93 | -0.05 | -0.05 | -0.05 | -0.14 | -0.14 |
| γ_{EH*EH} | 0.17 | 0.10 | 0.00 | 0.00 | 0.06 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{ES*ES} | 0.02 | 0.01 | 0.00 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LS*LS} | 0.12 | 0.00 | 0.00 | 0.00 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| γ_{LL*LL} | 4.37 | -5.22 | 0.25 | 0.32 | 3.36 | -4.56 | -0.29 | -0.30 | -0.27 | -0.77 | -0.62 |
| $\phi_c\phi_s\phi R_n$ | 15.40 | -17.92 | 1.17 | 1.17 | 15.40 | -17.92 | -1.17 | -47.71 | -47.71 | -47.71 | -47.71 |
| RF | 2.98 | 2.98 | 5.12 | 3.25 | 4.23 | 3.43 | 3.67 | 157.95 | 174.96 | 61.24 | 76.61 |

APPENDIX D

Load Rating using BrR

In this section, the load ratings of the selected culverts using conventional rating methods and tools are provided. These values were obtained by DOTD Bridge Design Section using AASHTOWare BrR program. It should be noted that these are preliminary results and should not be construed as final rating values for decision making purposes. The purpose of providing these values is to illustrate the difference between the approach followed in this study vs. traditional methods and tools used in everyday applications.

**Table D-1
Culvert #1 load rating factors obtained using BrR**

| Live Load | Live Load Type | Rating Method | Rating Level | Load Rating (Ton) | Rating Factor | Component | Location (ft) | Location (%) | Limit State | Impact | Lane |
|------------|----------------|---------------|--------------|-------------------|---------------|-------------|---------------|--------------|-------------|--------------|--------------|
| HL-93 (US) | Axle Load | LRFR | Inventory | 27.24 | 0.757 | Top Slab 2 | 2.80 | 40.000 | Flexure | As Requested | As Requested |
| HL-93 (US) | Axle Load | LRFR | Operating | 35.31 | 0.981 | Top Slab 2 | 2.80 | 40.000 | Flexure | As Requested | As Requested |
| HL-93 (US) | Tandem | LRFR | Inventory | 24.41 | 0.976 | Top Slab 1 | 2.80 | 40.000 | Flexure | As Requested | As Requested |
| HL-93 (US) | Tandem | LRFR | Operating | 31.64 | 1.265 | Top Slab 1 | 2.80 | 40.000 | Flexure | As Requested | As Requested |
| NRL | Axle Load | LRFR | Legal | 43.67 | 1.092 | Ext. Wall 2 | 3.50 | 50.000 | Flexure | As Requested | As Requested |
| SU4 | Axle Load | LRFR | Legal | 29.46 | 1.091 | Ext. Wall 2 | 3.50 | 50.000 | Flexure | As Requested | As Requested |
| SU5 | Axle Load | LRFR | Legal | 33.88 | 1.093 | Ext. Wall 2 | 3.50 | 50.000 | Flexure | As Requested | As Requested |
| SU6 | Axle Load | LRFR | Legal | 37.98 | 1.093 | Ext. Wall 2 | 3.50 | 50.000 | Flexure | As Requested | As Requested |
| SU7 | Axle Load | LRFR | Legal | 42.35 | 1.093 | Ext. Wall 2 | 3.50 | 50.000 | Flexure | As Requested | As Requested |
| Type 3-3 | Axle Load | LRFR | Legal | 44.03 | 1.101 | Ext. Wall 2 | 3.50 | 50.000 | Flexure | As Requested | As Requested |
| LA Type 3 | Axle Load | LRFR | Legal | 22.46 | 1.096 | Ext. Wall 2 | 3.50 | 50.000 | Flexure | As Requested | As Requested |
| LA TYPE 6 | Axle Load | LRFR | Legal | 43.53 | 1.088 | Ext. Wall 2 | 3.50 | 50.000 | Flexure | As Requested | As Requested |
| LA TYPE 8 | Axle Load | LRFR | Legal | 47.87 | 1.088 | Ext. Wall 2 | 3.50 | 50.000 | Flexure | As Requested | As Requested |
| LATYPE3S2 | Axle Load | LRFR | Legal | 39.90 | 1.093 | Ext. Wall 2 | 3.50 | 50.000 | Flexure | As Requested | As Requested |

**Table D-2
Culvert #2 load rating factors obtained using BrR**

| Live Load | Live Load Type | Rating Method | Rating Level | Load Rating (Ton) | Rating Factor | Component | Location (ft) | Location (%) | Limit State | Impact | Lane |
|------------|----------------|---------------|--------------|-------------------|---------------|-------------|---------------|--------------|-------------|--------------|--------------|
| HL-93 (US) | Axle Load | LRFR | Inventory | 0.00 | 0.000 | Ext. Wall 1 | 1.80 | 30.000 | Flexure | As Requested | As Requested |
| HL-93 (US) | Axle Load | LRFR | Operating | 0.00 | 0.000 | Ext. Wall 1 | 1.80 | 30.000 | Flexure | As Requested | As Requested |
| HL-93 (US) | Tandem | LRFR | Inventory | 0.00 | 0.000 | Ext. Wall 1 | 1.80 | 30.000 | Flexure | As Requested | As Requested |
| HL-93 (US) | Tandem | LRFR | Operating | 0.00 | 0.000 | Ext. Wall 1 | 1.80 | 30.000 | Flexure | As Requested | As Requested |
| NRL | Axle Load | LRFR | Legal | 0.00 | 0.000 | Ext. Wall 1 | 1.80 | 30.000 | Flexure | As Requested | As Requested |
| SU4 | Axle Load | LRFR | Legal | 0.00 | 0.000 | Ext. Wall 1 | 1.80 | 30.000 | Flexure | As Requested | As Requested |
| SU5 | Axle Load | LRFR | Legal | 0.00 | 0.000 | Ext. Wall 1 | 1.80 | 30.000 | Flexure | As Requested | As Requested |
| SU6 | Axle Load | LRFR | Legal | 0.00 | 0.000 | Ext. Wall 1 | 1.80 | 30.000 | Flexure | As Requested | As Requested |
| SU7 | Axle Load | LRFR | Legal | 0.00 | 0.000 | Ext. Wall 1 | 1.80 | 30.000 | Flexure | As Requested | As Requested |
| Type 3-3 | Axle Load | LRFR | Legal | 0.00 | 0.000 | Ext. Wall 1 | 1.80 | 30.000 | Flexure | As Requested | As Requested |
| LA Type 3 | Axle Load | LRFR | Legal | 0.00 | 0.000 | Ext. Wall 1 | 1.80 | 30.000 | Flexure | As Requested | As Requested |
| LA TYPE 6 | Axle Load | LRFR | Legal | 0.00 | 0.000 | Ext. Wall 1 | 1.80 | 30.000 | Flexure | As Requested | As Requested |
| LA TYPE 8 | Axle Load | LRFR | Legal | 0.00 | 0.000 | Ext. Wall 1 | 1.80 | 30.000 | Flexure | As Requested | As Requested |
| LATYPE3S2 | Axle Load | LRFR | Legal | 0.00 | 0.000 | Ext. Wall 1 | 1.80 | 30.000 | Flexure | As Requested | As Requested |

**Table D-3
Culvert #3 load rating factors obtained using BrR**

| Live Load | Live Load Type | Rating Method | Rating Level | Load Rating (Ton) | Rating Factor | Component | Location (ft) | Location (%) | Limit State | Impact | Lane |
|------------|----------------|---------------|--------------|-------------------|---------------|-------------|---------------|--------------|-------------|--------------|--------------|
| HL-93 (US) | Axle Load | LRFR | Inventory | 13.27 | 0.368 | Ext. Wall 1 | 4.00 | 50.000 | Flexure | As Requested | As Requested |
| HL-93 (US) | Axle Load | LRFR | Operating | 17.20 | 0.478 | Ext. Wall 1 | 4.00 | 50.000 | Flexure | As Requested | As Requested |
| HL-93 (US) | Tandem | LRFR | Inventory | 9.11 | 0.364 | Ext. Wall 1 | 4.00 | 50.000 | Flexure | As Requested | As Requested |
| HL-93 (US) | Tandem | LRFR | Operating | 11.80 | 0.472 | Ext. Wall 1 | 4.00 | 50.000 | Flexure | As Requested | As Requested |
| NRL | Axle Load | LRFR | Legal | 13.22 | 0.331 | Ext. Wall 1 | 4.00 | 50.000 | Flexure | As Requested | As Requested |
| SU4 | Axle Load | LRFR | Legal | 8.92 | 0.331 | Ext. Wall 1 | 4.00 | 50.000 | Flexure | As Requested | As Requested |
| SU5 | Axle Load | LRFR | Legal | 10.25 | 0.331 | Ext. Wall 1 | 4.00 | 50.000 | Flexure | As Requested | As Requested |
| SU6 | Axle Load | LRFR | Legal | 11.48 | 0.331 | Ext. Wall 1 | 4.00 | 50.000 | Flexure | As Requested | As Requested |
| SU7 | Axle Load | LRFR | Legal | 12.81 | 0.331 | Ext. Wall 1 | 4.00 | 50.000 | Flexure | As Requested | As Requested |
| Type 3-3 | Axle Load | LRFR | Legal | 13.33 | 0.333 | Ext. Wall 1 | 4.00 | 50.000 | Flexure | As Requested | As Requested |
| LA Type 3 | Axle Load | LRFR | Legal | 6.79 | 0.331 | Ext. Wall 1 | 4.00 | 50.000 | Flexure | As Requested | As Requested |
| LA TYPE 6 | Axle Load | LRFR | Legal | 13.16 | 0.329 | Ext. Wall 1 | 4.00 | 50.000 | Flexure | As Requested | As Requested |
| LA TYPE 8 | Axle Load | LRFR | Legal | 14.48 | 0.329 | Ext. Wall 1 | 4.00 | 50.000 | Flexure | As Requested | As Requested |
| LATYPE3S2 | Axle Load | LRFR | Legal | 12.10 | 0.331 | Ext. Wall 1 | 4.00 | 50.000 | Flexure | As Requested | As Requested |

**Table D-4
Culvert #4 load rating factors obtained using BrR**

| Live Load | Live Load Type | Rating Method | Rating Level | Load Rating (Ton) | Rating Factor | Component | Location (ft) | Location (%) | Limit State | Impact | Lane |
|------------|----------------|---------------|--------------|-------------------|---------------|-------------|---------------|--------------|-------------|--------------|--------------|
| HL-93 (US) | Axle Load | LRFR | Inventory | 1.09 | 0.030 | Ext. Wall 2 | 4.80 | 40.000 | Flexure | As Requested | As Requested |
| HL-93 (US) | Axle Load | LRFR | Operating | 1.42 | 0.039 | Ext. Wall 2 | 4.80 | 40.000 | Flexure | As Requested | As Requested |
| HL-93 (US) | Tandem | LRFR | Inventory | 0.74 | 0.030 | Ext. Wall 2 | 4.80 | 40.000 | Flexure | As Requested | As Requested |
| HL-93 (US) | Tandem | LRFR | Operating | 0.96 | 0.038 | Ext. Wall 2 | 4.80 | 40.000 | Flexure | As Requested | As Requested |
| NRL | Axle Load | LRFR | Legal | 1.07 | 0.027 | Ext. Wall 2 | 4.80 | 40.000 | Flexure | As Requested | As Requested |
| SU4 | Axle Load | LRFR | Legal | 0.73 | 0.027 | Ext. Wall 2 | 4.80 | 40.000 | Flexure | As Requested | As Requested |
| SU5 | Axle Load | LRFR | Legal | 0.83 | 0.027 | Ext. Wall 2 | 4.80 | 40.000 | Flexure | As Requested | As Requested |
| SU6 | Axle Load | LRFR | Legal | 0.93 | 0.027 | Ext. Wall 2 | 4.80 | 40.000 | Flexure | As Requested | As Requested |
| SU7 | Axle Load | LRFR | Legal | 1.04 | 0.027 | Ext. Wall 2 | 4.80 | 40.000 | Flexure | As Requested | As Requested |
| Type 3-3 | Axle Load | LRFR | Legal | 1.09 | 0.027 | Ext. Wall 2 | 4.80 | 40.000 | Flexure | As Requested | As Requested |
| LA Type 3 | Axle Load | LRFR | Legal | 0.56 | 0.027 | Ext. Wall 2 | 4.80 | 40.000 | Flexure | As Requested | As Requested |
| LA TYPE 6 | Axle Load | LRFR | Legal | 1.08 | 0.027 | Ext. Wall 2 | 4.80 | 40.000 | Flexure | As Requested | As Requested |
| LA TYPE 8 | Axle Load | LRFR | Legal | 1.18 | 0.027 | Ext. Wall 2 | 4.80 | 40.000 | Flexure | As Requested | As Requested |
| LATYPE3S2 | Axle Load | LRFR | Legal | 0.99 | 0.027 | Ext. Wall 2 | 4.80 | 40.000 | Flexure | As Requested | As Requested |

**Table D-5
Culvert #5 load rating factors obtained using BrR**

| Live Load | Live Load Type | Rating Method | Rating Level | Load Rating (Ton) | Rating Factor | Component | Location (ft) | Location (%) | Limit State | Impact | Lane |
|------------|----------------|---------------|--------------|-------------------|---------------|-------------|---------------|--------------|-------------|--------------|--------------|
| HL-93 (US) | Axle Load | LRFR | Inventory | 27.20 | 0.756 | Ext. Wall 1 | 3.50 | 50.000 | Flexure | As Requested | As Requested |
| HL-93 (US) | Axle Load | LRFR | Operating | 35.26 | 0.979 | Ext. Wall 1 | 3.50 | 50.000 | Flexure | As Requested | As Requested |
| HL-93 (US) | Tandem | LRFR | Inventory | 18.90 | 0.756 | Ext. Wall 2 | 3.50 | 50.000 | Flexure | As Requested | As Requested |
| HL-93 (US) | Tandem | LRFR | Operating | 24.50 | 0.980 | Ext. Wall 2 | 3.50 | 50.000 | Flexure | As Requested | As Requested |
| NRL | Axle Load | LRFR | Legal | 27.20 | 0.680 | Ext. Wall 2 | 3.50 | 50.000 | Flexure | As Requested | As Requested |
| SU4 | Axle Load | LRFR | Legal | 18.28 | 0.677 | Ext. Wall 2 | 3.50 | 50.000 | Flexure | As Requested | As Requested |
| SU5 | Axle Load | LRFR | Legal | 21.02 | 0.678 | Ext. Wall 2 | 3.50 | 50.000 | Flexure | As Requested | As Requested |
| SU6 | Axle Load | LRFR | Legal | 23.59 | 0.679 | Ext. Wall 2 | 3.50 | 50.000 | Flexure | As Requested | As Requested |
| SU7 | Axle Load | LRFR | Legal | 26.33 | 0.679 | Ext. Wall 2 | 3.50 | 50.000 | Flexure | As Requested | As Requested |
| Type 3-3 | Axle Load | LRFR | Legal | 27.11 | 0.678 | Ext. Wall 2 | 3.50 | 50.000 | Flexure | As Requested | As Requested |
| LA Type 3 | Axle Load | LRFR | Legal | 13.85 | 0.676 | Ext. Wall 2 | 3.50 | 50.000 | Flexure | As Requested | As Requested |
| LA TYPE 6 | Axle Load | LRFR | Legal | 26.92 | 0.673 | Ext. Wall 2 | 3.50 | 50.000 | Flexure | As Requested | As Requested |
| LA TYPE 8 | Axle Load | LRFR | Legal | 29.62 | 0.673 | Ext. Wall 2 | 3.50 | 50.000 | Flexure | As Requested | As Requested |
| LATYPE3S2 | Axle Load | LRFR | Legal | 24.66 | 0.676 | Ext. Wall 2 | 3.50 | 50.000 | Flexure | As Requested | As Requested |

**Table D-6
Culvert #6 load rating factors obtained using BrR**

| Live Load | Live Load Type | Rating Method | Rating Level | Load Rating (Ton) | Rating Factor | Component | Location (ft) | Location (%) | Limit State | Impact | Lane |
|------------|----------------|---------------|--------------|-------------------|---------------|------------|---------------|--------------|-------------|--------------|--------------|
| HL-93 (US) | Axle Load | LRFR | Inventory | 48.75 | 1.354 | Top Slab 3 | 3.00 | 60.000 | Flexure | As Requested | As Requested |
| HL-93 (US) | Axle Load | LRFR | Operating | 63.20 | 1.756 | Top Slab 3 | 3.00 | 60.000 | Flexure | As Requested | As Requested |
| HL-93 (US) | Tandem | LRFR | Inventory | 42.95 | 1.718 | Top Slab 3 | 3.00 | 60.000 | Flexure | As Requested | As Requested |
| HL-93 (US) | Tandem | LRFR | Operating | 55.67 | 2.227 | Top Slab 3 | 3.00 | 60.000 | Flexure | As Requested | As Requested |
| NRL | Axle Load | LRFR | Legal | 103.40 | 2.585 | Top Slab 3 | 3.00 | 60.000 | Flexure | As Requested | As Requested |
| SU4 | Axle Load | LRFR | Legal | 71.54 | 2.650 | Top Slab 3 | 3.00 | 60.000 | Flexure | As Requested | As Requested |
| SU5 | Axle Load | LRFR | Legal | 80.13 | 2.585 | Top Slab 3 | 3.00 | 60.000 | Flexure | As Requested | As Requested |
| SU6 | Axle Load | LRFR | Legal | 89.83 | 2.585 | Top Slab 3 | 3.00 | 60.000 | Flexure | As Requested | As Requested |
| SU7 | Axle Load | LRFR | Legal | 100.17 | 2.585 | Top Slab 3 | 3.00 | 60.000 | Flexure | As Requested | As Requested |
| Type 3-3 | Axle Load | LRFR | Legal | 115.18 | 2.880 | Top Slab 3 | 3.00 | 60.000 | Flexure | As Requested | As Requested |
| LA Type 3 | Axle Load | LRFR | Legal | 56.10 | 2.737 | Top Slab 3 | 3.00 | 60.000 | Flexure | As Requested | As Requested |
| LA TYPE 6 | Axle Load | LRFR | Legal | 97.00 | 2.425 | Top Slab 3 | 3.00 | 60.000 | Flexure | As Requested | As Requested |
| LA TYPE 8 | Axle Load | LRFR | Legal | 107.14 | 2.435 | Top Slab 3 | 3.00 | 60.000 | Flexure | As Requested | As Requested |
| LATYPE3S2 | Axle Load | LRFR | Legal | 93.33 | 2.557 | Top Slab 2 | 3.00 | 60.000 | Flexure | As Requested | As Requested |

**Table D-7
Culvert #7 load rating factors obtained using BrR**

| Live Load | Live Load Type | Rating Method | Rating Level | Load Rating (Ton) | Rating Factor | Component | Location (ft) | Location (%) | Limit State | Impact | Lane |
|------------|----------------|---------------|--------------|-------------------|---------------|-------------|---------------|--------------|-------------|--------------|--------------|
| HL-93 (US) | Axle Load | LRFR | Inventory | 21.01 | 0.584 | Ext. Wall 2 | 3.00 | 50.000 | Flexure | As Requested | As Requested |
| HL-93 (US) | Axle Load | LRFR | Operating | 27.23 | 0.756 | Ext. Wall 2 | 3.00 | 50.000 | Flexure | As Requested | As Requested |
| HL-93 (US) | Tandem | LRFR | Inventory | 14.70 | 0.588 | Ext. Wall 1 | 3.00 | 50.000 | Flexure | As Requested | As Requested |
| HL-93 (US) | Tandem | LRFR | Operating | 19.05 | 0.762 | Ext. Wall 1 | 3.00 | 50.000 | Flexure | As Requested | As Requested |
| NRL | Axle Load | LRFR | Legal | 21.26 | 0.532 | Ext. Wall 1 | 3.00 | 50.000 | Flexure | As Requested | As Requested |
| SU4 | Axle Load | LRFR | Legal | 14.35 | 0.532 | Ext. Wall 1 | 3.00 | 50.000 | Flexure | As Requested | As Requested |
| SU5 | Axle Load | LRFR | Legal | 16.48 | 0.532 | Ext. Wall 1 | 3.00 | 50.000 | Flexure | As Requested | As Requested |
| SU6 | Axle Load | LRFR | Legal | 18.47 | 0.532 | Ext. Wall 1 | 3.00 | 50.000 | Flexure | As Requested | As Requested |
| SU7 | Axle Load | LRFR | Legal | 20.60 | 0.532 | Ext. Wall 1 | 3.00 | 50.000 | Flexure | As Requested | As Requested |
| Type 3-3 | Axle Load | LRFR | Legal | 21.43 | 0.536 | Ext. Wall 1 | 3.00 | 50.000 | Flexure | As Requested | As Requested |
| LA Type 3 | Axle Load | LRFR | Legal | 10.93 | 0.533 | Ext. Wall 1 | 3.00 | 50.000 | Flexure | As Requested | As Requested |
| LA TYPE 6 | Axle Load | LRFR | Legal | 21.18 | 0.530 | Ext. Wall 1 | 3.00 | 50.000 | Flexure | As Requested | As Requested |
| LA TYPE 8 | Axle Load | LRFR | Legal | 23.30 | 0.530 | Ext. Wall 1 | 3.00 | 50.000 | Flexure | As Requested | As Requested |
| LATYPE3S2 | Axle Load | LRFR | Legal | 19.45 | 0.533 | Ext. Wall 1 | 3.00 | 50.000 | Flexure | As Requested | As Requested |

**Table D-8
Culvert #8 load rating factors obtained using BrR**

| Live Load | Live Load Type | Rating Method | Rating Level | Load Rating (Ton) | Rating Factor | Component | Location (ft) | Location (%) | Limit State | Impact | Lane |
|------------|----------------|---------------|--------------|-------------------|---------------|-------------|---------------|--------------|-------------|--------------|--------------|
| HL-93 (US) | Axle Load | LRFR | Inventory | 0.00 | 0.000 | Ext. Wall 1 | 3.20 | 40.000 | Flexure | As Requested | As Requested |
| HL-93 (US) | Axle Load | LRFR | Operating | 0.00 | 0.000 | Ext. Wall 1 | 3.20 | 40.000 | Flexure | As Requested | As Requested |
| HL-93 (US) | Tandem | LRFR | Inventory | 0.00 | 0.000 | Ext. Wall 1 | 3.20 | 40.000 | Flexure | As Requested | As Requested |
| HL-93 (US) | Tandem | LRFR | Operating | 0.00 | 0.000 | Ext. Wall 1 | 3.20 | 40.000 | Flexure | As Requested | As Requested |
| NRL | Axle Load | LRFR | Legal | 0.00 | 0.000 | Ext. Wall 1 | 3.20 | 40.000 | Flexure | As Requested | As Requested |
| SU4 | Axle Load | LRFR | Legal | 0.00 | 0.000 | Ext. Wall 1 | 3.20 | 40.000 | Flexure | As Requested | As Requested |
| SU5 | Axle Load | LRFR | Legal | 0.00 | 0.000 | Ext. Wall 1 | 3.20 | 40.000 | Flexure | As Requested | As Requested |
| SU6 | Axle Load | LRFR | Legal | 0.00 | 0.000 | Ext. Wall 1 | 3.20 | 40.000 | Flexure | As Requested | As Requested |
| SU7 | Axle Load | LRFR | Legal | 0.00 | 0.000 | Ext. Wall 1 | 3.20 | 40.000 | Flexure | As Requested | As Requested |
| Type 3-3 | Axle Load | LRFR | Legal | 0.00 | 0.000 | Ext. Wall 1 | 3.20 | 40.000 | Flexure | As Requested | As Requested |
| LA Type 3 | Axle Load | LRFR | Legal | 0.00 | 0.000 | Ext. Wall 1 | 3.20 | 40.000 | Flexure | As Requested | As Requested |
| LA TYPE 6 | Axle Load | LRFR | Legal | 0.00 | 0.000 | Ext. Wall 1 | 3.20 | 40.000 | Flexure | As Requested | As Requested |
| LA TYPE 8 | Axle Load | LRFR | Legal | 0.00 | 0.000 | Ext. Wall 1 | 3.20 | 40.000 | Flexure | As Requested | As Requested |
| LATYPE3S2 | Axle Load | LRFR | Legal | 0.00 | 0.000 | Ext. Wall 1 | 3.20 | 40.000 | Flexure | As Requested | As Requested |