# LOAD AND RESISTANCE FACTOR RATING (LRFR) SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS

| LEVEL | | VEHICLE | WEIGHT (W) (TONS) | CONTROLLING LOAD RATING (#) | MINIMUM RATING FACTORS (RF) | TONS = W × RF | STRENGTH I LIMIT STATE | | | | | | | | | COMMENT NUMBER |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | LIVE-LOAD FACTORS $\gamma_{(LL)}$ | MOMENT | | | | SHEAR | | | | |
| | | | | | | | | RATING FACTOR | BOX NO. | ELEMENT TYPE | DISTANCE FROM LEFT END OF ELEMENT (ft) | RATING FACTOR | BOX NO. | ELEMENT TYPE | DISTANCE FROM LEFT END OF ELEMENT (ft) | |
| DESIGN LOAD RATING | | HL-93 (INVENTORY) | N/A | (1) | 1.22 | -- | 1.75 | 10.37 | 1 | TOP SLAB | 9.77 | 1.22 | 1 | TOP SLAB | 9.56 | |
| | | HL-93 (OPERATING) | N/A | | 1.58 | -- | 1.35 | 13.44 | 1 | TOP SLAB | 9.77 | 1.58 | 1 | TOP SLAB | 9.56 | |
| | | HS-20 (INVENTORY) | 36.000 | (2) | 1.22 | 43.83 | 1.75 | 10.37 | 1 | TOP SLAB | 9.77 | 1.22 | 1 | TOP SLAB | 9.56 | |
| | | HS-20 (OPERATING) | 36.000 | | 1.58 | 56.82 | 1.35 | 13.44 | 1 | TOP SLAB | 9.77 | 1.58 | 1 | TOP SLAB | 9.56 | |
| LEGAL LOAD RATING | SINGLE VEHICLE (SV) | SH | 12.500 | | 3.80 | 47.56 | 1.40 | 31.49 | 1 | TOP SLAB | 9.77 | 3.80 | 1 | TOP SLAB | 9.56 | |
| | | S3C | 21.500 | | 2.12 | 45.66 | 1.40 | 18.37 | 1 | TOP SLAB | 9.77 | 2.12 | 1 | TOP SLAB | 9.56 | |
| | | S3A | 22.750 | | 1.99 | 45.16 | 1.40 | 17.30 | 1 | TOP SLAB | 9.77 | 1.99 | 1 | TOP SLAB | 9.56 | |
| | | S4A | 26.750 | | 1.86 | 49.85 | 1.40 | 16.96 | 1 | TOP SLAB | 9.77 | 1.86 | 1 | TOP SLAB | 9.56 | |
| | | S5A | 30.500 | | 1.66 | 50.64 | 1.40 | 13.16 | 1 | TOP SLAB | 9.77 | 1.66 | 1 | TOP SLAB | 9.56 | |
| | | S6A | 34.500 | | 1.55 | 53.40 | 1.40 | 13.16 | 1 | TOP SLAB | 9.77 | 1.55 | 1 | TOP SLAB | 9.56 | |
| | | S7B | 38.500 | (3) | 1.52 | 58.60 | 1.40 | 12.60 | 1 | TOP SLAB | 9.77 | 1.52 | 1 | TOP SLAB | 9.56 | |
| | | S7A | 40.000 | | 1.60 | 64.08 | 1.40 | 13.36 | 1 | TOP SLAB | 9.77 | 1.60 | 1 | TOP SLAB | 9.56 | |
| | TRUCK TRACTOR SEMI-TRAILER (TTST) | T4A | 28.250 | | 1.99 | 56.08 | 1.40 | 17.30 | 1 | TOP SLAB | 9.77 | 1.99 | 1 | TOP SLAB | 9.56 | |
| | | T5B | 32.000 | | 1.72 | 55.14 | 1.40 | 15.20 | 1 | TOP SLAB | 9.77 | 1.72 | 1 | TOP SLAB | 9.56 | |
| | | T6A | 36.000 | | 1.76 | 63.22 | 1.40 | 14.70 | 1 | TOP SLAB | 9.77 | 1.76 | 1 | TOP SLAB | 9.56 | |
| | | T7A | 40.000 | | 1.76 | 70.24 | 1.40 | 14.45 | 1 | TOP SLAB | 9.77 | 1.76 | 1 | TOP SLAB | 9.56 | |
| | | T7B | 40.000 | | 1.76 | 70.24 | 1.40 | 15.75 | 1 | TOP SLAB | 9.77 | 1.76 | 1 | TOP SLAB | 9.56 | |

## LOAD FACTORS:

DESIGN LOAD RATING FACTORS

| LOAD TYPE | MAX FACTOR | MIN FACTOR |
|---|---|---|
| DC | 1.25 | 0.90 |
| DW | 1.50 | 0.65 |
| EV | 1.30 | 0.90 |
| EH | 1.35 | 0.90 |
| ES | 1.35 | 0.90 |
| LS | 1.75 | -- |
| WA | 1.00 | -- |

## NOTE:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

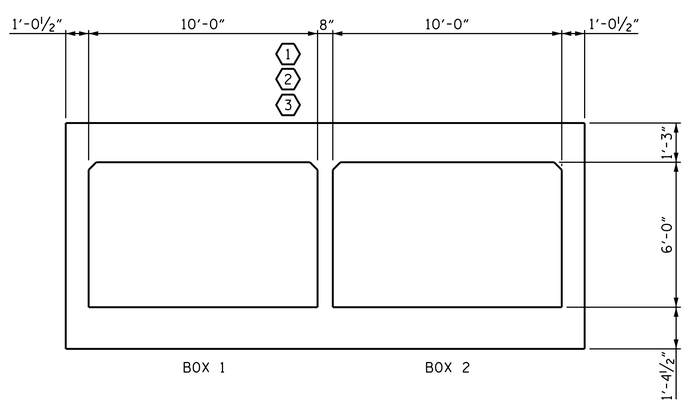
(#) CONTROLLING LOAD RATING

(1) DESIGN LOAD RATING (HL-93)

(2) DESIGN LOAD RATING (HS-20)

(3) LEGAL LOAD RATING **

** SEE CHART FOR VEHICLE TYPE




## LRFR SUMMARY

(LOOKING DOWNSTREAM)
(SECTION A-A)

PROJECT NO. U-2579B

FORSYTH COUNTY

STATION: 559+74.00 -L-

SHEET 7 OF 8

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD

LRFR SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS

(INTERSTATE TRAFFIC)

NORTH CAROLINA PROFESSIONAL SEAL 29048 ENGINEER RAMAN P. PATEL

DocuSigned by: Raman Patel 8/5/2014

| REVISIONS | | | | | | SHEET NO. |
|---|---|---|---|---|---|---|
| NO. | BY: | DATE: | NO. | BY: | DATE: | C-7 |
| 1 | | | 3 | | | TOTAL SHEETS |
| 2 | | | 4 | | | 30 |

STR. #19

STD. NO. LRFR6

ASSEMBLED BY : R. P. PATEL DATE : 10-31-13
CHECKED BY : J. P. MCCARTHA DATE : 11-8-13

DRAWN BY : WMC 7/11
CHECKED BY : GM 7/11

REV. 10/1/11 MAA/GM

DESIGN ENGINEER OF RECORD:
R. P. PATEL DATE : 4-29-14

04-AUG-2014 16:44
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