# 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 | 5.31 | -- | 1.75 | 18.12 | 1 | EXTERIOR WALL | 4.55 | 5.31 | 1 | EXTERIOR WALL | 2.02 | |
| | | HL-93 (OPERATING) | N/A | | 6.88 | -- | 1.35 | 23.48 | 1 | EXTERIOR WALL | 4.55 | 6.88 | 1 | EXTERIOR WALL | 2.02 | |
| | | HS-20 (INVENTORY) | 36.000 | 2 | 5.31 | 191.16 | 1.75 | 18.12 | 1 | EXTERIOR WALL | 4.55 | 5.31 | 1 | EXTERIOR WALL | 2.02 | |
| | | HS-20 (OPERATING) | 36.000 | | 6.88 | 247.63 | 1.35 | 23.48 | 1 | EXTERIOR WALL | 4.55 | 6.88 | 1 | EXTERIOR WALL | 2.02 | |
| LEGAL LOAD RATING | SINGLE VEHICLE (SV) | SH | 12.500 | 3 | 6.63 | 82.91 | 1.40 | 22.63 | 1 | EXTERIOR WALL | 4.55 | 6.63 | 1 | EXTERIOR WALL | 2.02 | |
| | | S3C | 21.500 | | 6.63 | 142.61 | 1.40 | 22.63 | 1 | EXTERIOR WALL | 4.55 | 6.63 | 1 | EXTERIOR WALL | 2.02 | |
| | | S3A | 22.750 | | 6.63 | 150.90 | 1.40 | 22.63 | 1 | EXTERIOR WALL | 4.55 | 6.63 | 1 | EXTERIOR WALL | 2.02 | |
| | | S4A | 26.750 | | 6.63 | 177.43 | 1.40 | 22.63 | 1 | EXTERIOR WALL | 4.55 | 6.63 | 1 | EXTERIOR WALL | 2.02 | |
| | | S5A | 30.500 | | 6.63 | 202.30 | 1.40 | 22.63 | 1 | EXTERIOR WALL | 4.55 | 6.63 | 1 | EXTERIOR WALL | 2.02 | |
| | | S6A | 34.500 | | 6.63 | 228.84 | 1.40 | 22.63 | 1 | EXTERIOR WALL | 4.55 | 6.63 | 1 | EXTERIOR WALL | 2.02 | |
| | | S7B | 38.500 | | 6.63 | 255.37 | 1.40 | 22.63 | 1 | EXTERIOR WALL | 4.55 | 6.63 | 1 | EXTERIOR WALL | 2.02 | |
| | | S7A | 40.000 | | 6.63 | 265.32 | 1.40 | 22.63 | 1 | EXTERIOR WALL | 4.55 | 6.63 | 1 | EXTERIOR WALL | 2.02 | |
| | TRUCK TRACTOR SEMI-TRAILER (TTST) | T4A | 28.250 | | 6.63 | 187.38 | 1.40 | 22.63 | 1 | EXTERIOR WALL | 4.55 | 6.63 | 1 | EXTERIOR WALL | 2.02 | |
| | | T5B | 32.000 | | 6.63 | 212.25 | 1.40 | 22.63 | 1 | EXTERIOR WALL | 4.55 | 6.63 | 1 | EXTERIOR WALL | 2.02 | |
| | | T6A | 36.000 | | 6.63 | 238.78 | 1.40 | 22.63 | 1 | EXTERIOR WALL | 4.55 | 6.63 | 1 | EXTERIOR WALL | 2.02 | |
| | | T7A | 40.000 | | 6.63 | 265.32 | 1.40 | 22.63 | 1 | EXTERIOR WALL | 4.55 | 6.63 | 1 | EXTERIOR WALL | 2.02 | |
| | | T7B | 40.000 | | 6.63 | 265.32 | 1.40 | 22.63 | 1 | EXTERIOR WALL | 4.55 | 6.63 | 1 | EXTERIOR WALL | 2.02 | |

## 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.

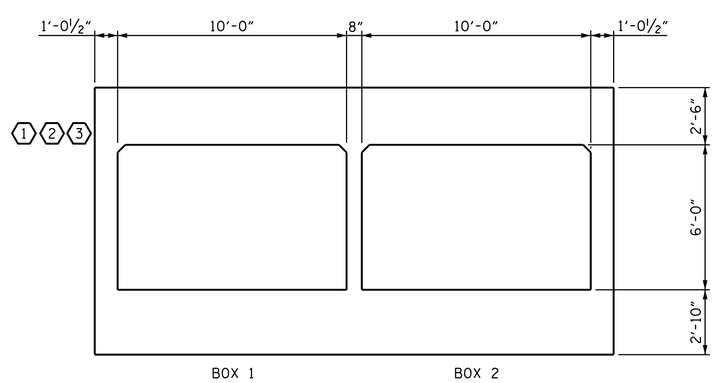
(#) CONTROLLING LOAD RATING

(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 B-B)

PROJECT NO. U-2579B
FORSYTH COUNTY
STATION: 559+74.00 -L-

SHEET 8 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-8 |
| 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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