

Design Specifications:

AASHTO Bridge Design Specifications, 9th Edition (2020)
 ODOT Bridge Design Manual, 2020 (Dated July 2022)

Material Specifications:

28-day Concrete Compressive Design Strength, f'_c =
 Reinforcing Steel Yield Strength, f_y =

4.00	ksi	Using ODOT BDM Table 926-1, given 1958 construction
40.00	ksi	Using ODOT BDM Table 926-1, given 1958 construction

Geometry:

Column Diameter, D =
 Concrete Clear Cover to Spiral or Ties, d_{cover} =
 Core Diameter of Column, d_c =
 Pitch of Spiral or Tie, s =
 Area of Core, A_c =
 Spiral or Tie Reinforcing Bar Size =
 Cross-Sectional Area of Spiral or Tie Bar, A_{sp} =

36.00	in	Per Sheet 191/257 of FRA-3-18.36/FRA-1-(23.72)-(23.88)...1958 Plans
2.00	in	Per Sheet 191/257 of FRA-3-18.36/FRA-1-(23.72)-(23.88)...1958 Plans
32.00	in	LRFD 9th Ed, 5.11.4.1.4-1
4.50	in	Per Sheet 191/257 of FRA-3-18.36/FRA-1-(23.72)-(23.88)...1958 Plans
804.25	in ²	
4		Per Sheet 185,191/257 of FRA-3-18.36/FRA-1-(23.72)-(23.88)...1958 Plans
0.20	in ²	

Transverse Reinforcement Check for Confinement at Plastic Hinges (LRFD 5.11.4.1.4):

Maximum permitted volumetric ratio of spiral or tie, $P_{s,max}$ =
 Provided volumetric ratio of existing spiral or tie, $P_{s,provided}$ =

0.012	LRFD 9th Ed, 5.11.4.1.4-1
0.089	LRFD 9th Ed, 5.11.4.1.4-1

Volumetric Confining Ratio Met =

YES

Includes checks of AASHTO 5.10.4 & 5.11.4?

no if no, then disregard the following checks below:

5.10.4

Is a No. 3 or greater used for spiral?
 is pitch greater than 1.33*max nominal agg size of concrete?
 Longitudinal Steel Bar Size =
 Number of Longitudinal Bars =
 Diameter measured along centroid ring of longitudinal bars =
 Perimeter along ring of longitudinal bars =
 Spacing between longitudinal Bars =
 Maximum permitted longitudinal steel bar spacing (6db or 6")
 Are longitudinal bars spaced not to exceed 6db or 6"
 are 1.5turns provided at each end of spiral?

yes	No. 4 bar used
yes	Assumes 1.5" max aggregate size
10	
12	Per Sheet 191/257 of FRA-3-18.36/FRA-1-(23.72)-(23.88)...1958 Plans
29.73	in
93.4	in
8.491	in
6	in
no	
yes	Per Sheet 185/257 of FRA-3-18.36/FRA-1-(23.72)-(23.88)...1958 Plans

5.11.4 Requirements:

Transverse Reinforcement Spacing Check (LRFD 5.11.4.1.4 & 5.11.4.1.5) - Not Required for Rehab Projects:

Engineer to Verify whether the following criteria is met:

I. Is transverse reinforcement provided at integral connections and at the tops and bottoms of columns over a length not less than 36" ?	yes
II. Are longitudinal steel bars developed a minimum of 19.375" ?	yes
III. Does Transverse reinforcement extend a minimum of 18" into connections?	no
IV. Is the nominal shear resistance at the column connection satisfactory per 5.11.4.3-1?	yes

Criteria I (LRFD A5.11.4.1.5)

Maximum of:

- Ia Maximum Cross-Sectional Column Dimension
- Ib 1/6 Clear Height of Column
- Ic 18"

Ia.) Column Diameter, D = 36.00 in
 Ib.) 1/6 Maximum Clear Height, H = 35.64 in Column 4
 Top of Column El = 814.72
 Bot of Column El = 796.90
 Controlling Length = 36.00

Criteria II (LRFD A5.11.4.3)

Existing Longitudinal Reinforcing Bar Size = 10
 Is Existing Bar Epoxy Coated = yes Engineer Assumption, Conservative
 Is bar bent/hooked into connecting element (e.g. ftg or cap)? yes

Assumed Modifiers:

- $\lambda = 1$ LRFD 5.4.2.8 - Assumes normal weight concrete
- $\lambda_{ri} = 1.2$ LRFD 5.10.8.2.1b
- $\lambda_{rc} = 0.4$ LRFD 5.10.8.2.1c - assumes 2" min clr cover and min #4 spiral and conservatively no bar crossing splitting
- $\lambda_{er} = 1$ LRFD 5.10.8.2.1c-4 - Conservatively assumes no excess reinforcement
- $\lambda_{rc} = 0.8$ LRFD 5.10.8.2.4b
- $\lambda_{er} = 1$ LRFD 5.10.8.2.4b

Reinforcing Bar Diameter, db = 1.27 in
 Reinforcing Bar Yield Strength, fy = 40.00 ksi
 Concrete Compressive Strength, f'c = 4.00 ksi

Basic development length, ldb = 60.96 in
 Basic hooked development length, lhb = 16.08666667 in

Modified development length, ld = 35.125 in
 Modified development length, ld = 15.5 in
 Controlling development length, ld = 19.375 in 5.11.4.3..1.25 times ld

Criteria III (LRFD A5.11.4.3)

Transverse reinforcement shall be extended into the connection not less than

- i.) 1/2 the maximum column dimension
- ii) 15"

Maximum Column Dimension = 18.00 in
 Controlling length = 18.00

Criteria IV (5.11.4.3-1)

Vn = 985 kips