Example Problem: Calculate Quantities for Box Bridge (No Fill)

Given:

Structure 3 @ 18’x12’x26’ (cell width x cell height x bridge length) Reinforced Concrete Box

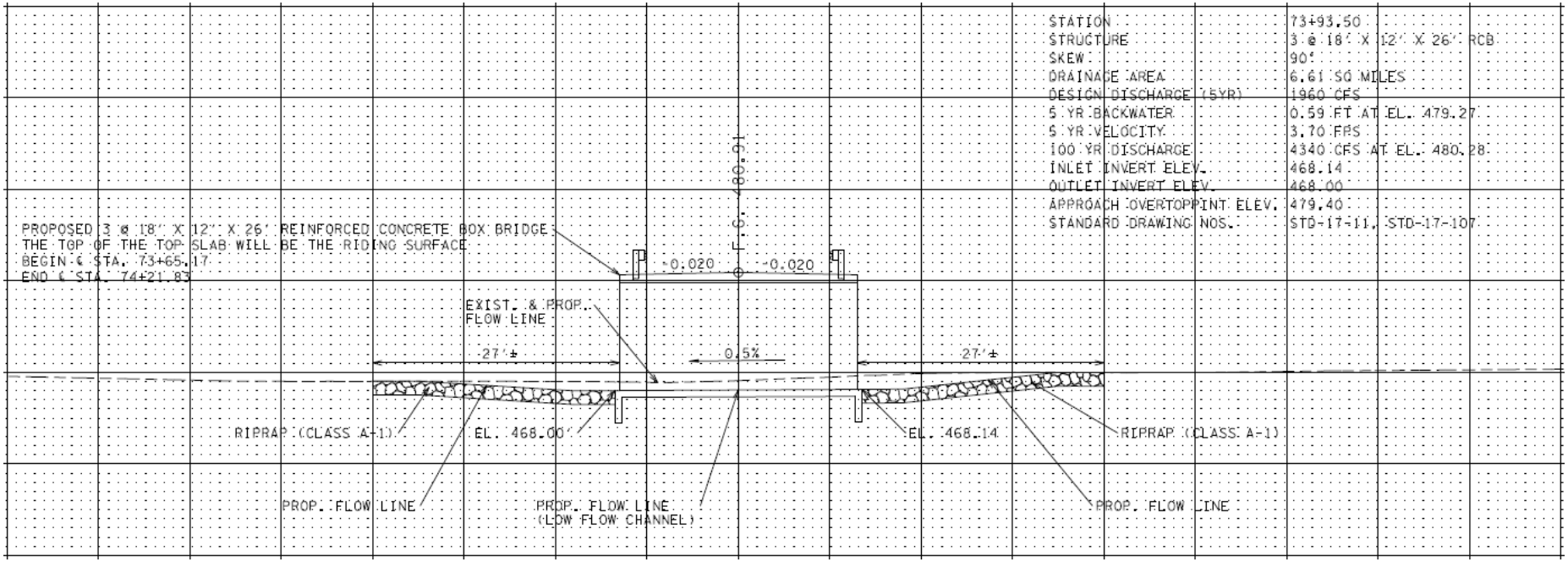
Bridge Skew 90°

Maximum Fill Height (FT) = No Fill

Since the top of the top slab will be a riding surface, Maximum Fill Height = 0

Slope = 2:1

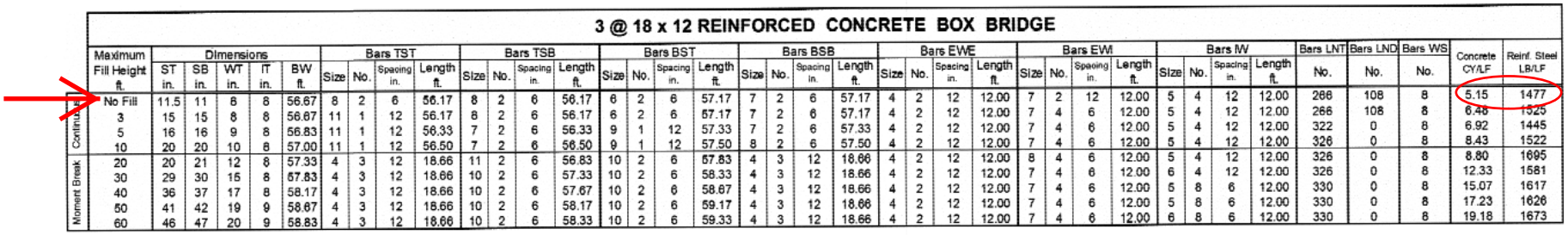
Per Typical Sections in plans



Solution:

Calculate box bridge quantities.

Refer to Standard Drawing STD-17-107



3 @ 18 x 12 REINFORCED CONCRETE BOX BRIDGE

	Maximum Fill Height ft.	Dimensions ST in.	SB in.	WT in.	IT in.	BW ft.	Bars TST Size	No.	Spacing in.	Length ft.	Bars TSB Size	No.	Spacing in.	Length ft.	Bars BST Size	No.	Spacing in.	Length ft.	Bars BSB Size	No.	Spacing in.	Length ft.	Bars EWE Size	No.	Spacing in.	Length ft.	Bars EWI Size	No.	Spacing in.	Length ft.	Bars IW Size	No.	Spacing in.	Length ft.	Bars LNT No.	Bars LND No.	Bars WS No.	Concrete CY/LF	Reinf. Steel LB/LF
Continuous	No Fill	11.5	11	6	8	56.67	8	2	6	56.17	8	2	6	56.17	6	2	6	57.17	7	2	6	57.17	4	2	12	12.00	7	2	12	12.00	5	4	12	12.00	266	108	8	5.15	1477
	3	15	15	8	8	56.67	11	1	12	56.17	8	2	6	56.17	6	2	6	57.17	7	2	6	57.17	4	2	12	12.00	7	4	6	12.00	5	4	12	12.00	266	108	8	6.48	1525
	5	16	16	9	8	56.83	11	1	12	56.33	7	2	6	56.33	9	1	12	57.33	7	2	6	57.33	4	2	12	12.00	7	4	6	12.00	5	4	12	12.00	322	0	8	6.92	1445
	10	20	20	10	8	57.00	11	1	12	56.50	7	2	6	56.50	9	1	12	57.50	8	2	6	57.50	4	2	12	12.00	7	4	6	12.00	5	4	12	12.00	326	0	8	8.43	1522
Moment Break	20	20	21	12	8	57.33	4	3	12	18.66	11	2	6	56.83	10	2	6	57.83	4	3	12	18.66	4	2	12	12.00	8	4	6	12.00	5	4	12	12.00	326	0	8	8.80	1695
	30	29	30	15	8	57.83	4	3	12	18.66	10	2	6	57.33	10	2	6	58.33	4	3	12	18.66	4	2	12	12.00	7	4	6	12.00	6	4	12	12.00	326	0	8	12.33	1581
	40	36	37	17	8	58.17	4	3	12	18.66	10	2	6	57.67	10	2	6	58.67	4	3	12	18.66	4	2	12	12.00	7	4	6	12.00	5	8	6	12.00	330	0	8	15.07	1617
	50	41	42	19	9	58.67	4	3	12	18.66	10	2	6	58.17	10	2	6	59.17	4	3	12	18.66	4	2	12	12.00	7	4	6	12.00	5	8	6	12.00	330	0	8	17.23	1626
	60	46	47	20	9	58.83	4	3	12	18.66	10	2	6	58.33	10	2	6	59.33	4	3	12	18.66	4	2	12	12.00	7	4	6	12.00	6	8	6	12.00	330	0	8	19.18	1673

Use table for 3 @ 18 x 12 Box Bridge

Use Maximum Fill Height (FT) = No Fill

Therefore,

Concrete = 5.15 CY/LF

Reinforcing Steel = 1477 LB/LF

The box bridge is 26 FT long, therefore,

Concrete = 5.15 CY/LF * 26 FT = 133.9 CY

Reinforcing Steel = 1477 LB/LF * 26 FT = 38402 LB

Calculate the wing wall quantities.

Refer to Standard Drawing STD-17-11, the quantities given in the tables in Standard Drawing STD-17-11 are for **ALL FOUR WINGWALLS**.

90° SKEW

2:1 SLOPE				
H	W	h	CONCRETE (C.Y.)	REINF. STEEL (LBS.)
4	5.00	1.75	3.3	630
4.5	5.75	2.00	4.1	694
5	6.50	2.25	5.3	781
5.5	7.25	2.50	6.3	914
6	8.00	2.75	7.4	1,014
6.5	8.50	3.00	8.4	1,069
7	9.25	3.25	10.1	1,367
7.5	10.00	3.50	11.5	1,486
8	10.75	3.75	13.0	1,607
8.5	11.50	4.00	14.6	1,749
9	12.25	4.25	16.9	2,576
9.5	12.75	4.50	18.4	2,639
10	13.50	4.75	20.4	2,875
10.5	14.25	5.00	23.2	3,091
11	15.00	5.25	26.3	3,494
11.5	15.75	5.50	30.3	4,328
12	16.50	5.75	32.9	4,544
12.5	17.00	6.00	35.1	4,662
13	17.75	6.25	39.4	5,610
13.5	18.50	6.50	42.4	6,003
14	19.25	6.75	45.5	6,260
14.5	20.00	7.00	49.9	6,741
15	20.75	7.25	56.4	7,352
15.5	21.25	7.50	59.4	8,039
16	22.00	7.75	63.2	8,506
16.5	22.75	8.00	67.2	9,812
17	23.50	8.25	73.7	10,799
17.5	24.25	8.50	78.1	10,884
18	24.75	8.75	81.7	11,209
18.5	25.50	9.00	88.3	11,733
19	26.25	9.25	97.7	12,981
19.5	27.00	9.50	102.8	14,737
20	27.75	9.75	108.1	15,265
20.5	28.50	10.00	113.5	15,719
21	29.00	10.25	126.0	17,262

3:1 SLOPE				
H	W	h	CONCRETE (C.Y.)	REINF. STEEL (LBS.)
4	6.25	2.25	4.3	675
4.5	7.25	2.50	5.4	744
5	8.00	3.00	6.9	849
5.5	9.00	3.25	8.3	1,014
6	9.75	3.50	9.5	1,116
6.5	10.50	3.75	10.8	1,180
7	11.50	4.00	13.1	1,520
7.5	12.25	4.50	14.9	1,624
8	13.25	4.75	16.9	1,754
8.5	14.00	5.00	19.5	1,974
9	14.75	5.25	22.2	2,962
9.5	15.75	5.50	24.7	3,082
10	16.50	6.00	27.3	3,342
10.5	17.50	6.25	30.1	3,504
11	18.25	6.50	33.6	3,928
11.5	19.00	6.75	37.5	4,786
12	20.00	7.00	41.9	5,216
12.5	20.75	7.50	45.4	5,394
13	21.75	7.75	52.0	6,412
13.5	22.50	8.00	55.4	6,870
14	23.25	8.25	59.0	7,136
14.5	24.25	8.50	63.3	7,589
15	25.00	9.00	73.3	8,368
15.5	25.75	9.25	77.5	9,299
16	26.75	9.50	82.6	9,820
16.5	27.50	9.75	87.1	11,451
17	28.50	10.00	95.7	12,593
17.5	29.25	10.50	101.2	12,502
18	30.00	10.75	106.4	12,936
18.5	31.00	11.00	118.0	13,630
19	31.75	11.25	129.5	14,977
19.5	32.75	11.50	136.5	17,020
20	33.50	12.00	143.3	17,579
20.5	34.25	12.25	149.6	18,066
21	35.25	12.50	167.3	19,857

Refer to Standard Drawings STD 17-107, use H = 13 FT

H = CELL HEIGHT + ST = 12 FT + 11.5 IN(1 FT / 12 IN) = 12.96 FT, use 13 FT*

3 @ 18 x 12 REINFORCED CONCRETE BOX BRIDGE

	Maximum Fill Height ft	Dimensions ST in.	SB in.	WT in.	IT in.	BW ft.	Bars TST Size	No.	Spacing in.	Length ft.	Bars TSB Size	No.	Spacing in.	Length ft.	Bars BST Size	No.	Spacing in.	Length ft.	Bars BSB Size	No.	Spacing in.	Length ft.	Bars EWE Size	No.	Spacing in.	Length ft.	Bars EWI Size	No.	Spacing in.	Length ft.	Bars IW Size	No.	Spacing in.	Length ft.	Bars LNT No.	Bars LND No.	Bars WS No.	Concrete CY/LF	Reinf. Steel LB/LF
Continuous	No Fill	11.5	11	8	8	56.67	8	2	6	56.17	8	2	6	56.17	6	2	6	57.17	7	2	6	57.17	4	2	12	12.00	7	2	12	12.00	5	4	12	12.00	266	108	8	5.15	1477
	3	15	15	8	8	56.67	11	1	12	56.17	8	2	6	56.17	6	2	6	57.17	7	2	6	57.17	4	2	12	12.00	7	4	6	12.00	5	4	12	12.00	266	108	8	6.48	1525
	5	16	16	9	8	56.83	11	1	12	56.33	7	2	6	56.33	9	1	12	57.33	7	2	6	57.33	4	2	12	12.00	7	4	6	12.00	5	4	12	12.00	322	0	8	6.92	1445
	10	20	20	10	8	57.00	11	1	12	56.50	7	2	6	56.50	9	1	12	57.50	8	2	6	57.50	4	2	12	12.00	7	4	6	12.00	5	4	12	12.00	326	0	8	8.43	1522
Moment Break	20	20	21	12	8	57.33	4	3	12	18.66	11	2	6	56.83	10	2	6	57.83	4	3	12	18.66	4	2	12	12.00	8	4	6	12.00	5	4	12	12.00	326	0	8	8.80	1695
	30	29	30	15	8	57.83	4	3	12	18.66	10	2	6	57.33	10	2	6	58.33	4	3	12	18.66	4	2	12	12.00	7	4	6	12.00	6	4	12	12.00	326	0	8	12.33	1581
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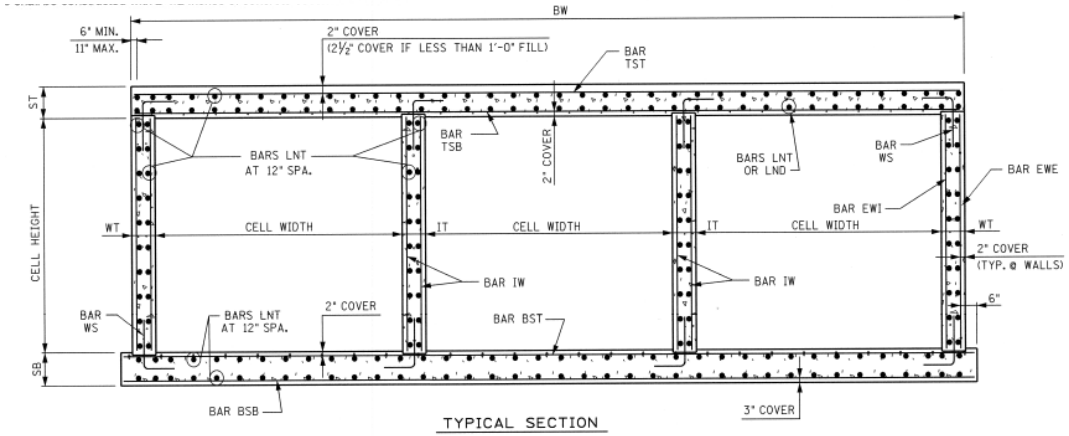
Use Table from STD-17-107



Use Typical Section from STD-17-107

Therefore,

Concrete = 39.4 CY

Reinforcing Steel = 5610 LB

*The quantities given in tables in Standard Drawing STD-17-11 are for **ALL FOUR WINGWALLS**.*

Therefore,

TOTAL CONCRETE = 133.9 CY + 39.4 CY = 173.3 CY

TOTAL REINFORCING STEEL = 38402 LB + 5610 LB = 44012 LB