Fatigue and Deflection only

Calculate Composite Centroid

Element	Actual Height of Element	Effective Height of Element **	Width of Element	Spacing of Elements IN C/C	Number of Elements per Foot	Actual Area	Transformed Area	Distance from Bottom of Grid to Centroid of Element	
						A	A_t	d	$A_t \times d$
Main Bar	2.000	2.000	N/A	16	1.2	1.36651729	1.36651729	0.44119029	0.59837569
Supplemental Bar 1	0.000	0.000	0.000	4	3	0.00000000	0.00000000	2.00000000	0.00000000
Supplemental Bar 2	0.000	0.000	0.000	3.75	3.2	0.00000000	0.00000000	2.00000000	0.00000000
Concrete**	3.000	3.000	12.000	12	1	36.00000000	4.50000000	1.50000000	6.75000000
Top Punchout*	0.000	0.000	-0.183	16	1.2	0.00000000	0.00000000	1.00000000	0.00000000
Bottom Punchout*	0.000	0.000	-0.183	16	1.2	0.00000000	0.00000000	1.87500000	0.00000000
Σ							5.86651729		7.34837569

Centroid of Composite Section = y (measured from bottom of grid) = $\Sigma(A_t * d) / \Sigma(A_t)$ = 1.254734416 ft

**Note : Effective Height of Concrete for fatigue and deflection per AASHTO 10.38.1.6

Calculate Composite Moment of Inertia

Element	Distance from Centroid of Element to Composite Centroid (y)		Moment of Inertia of Element taken by Itself	Transformed Moment of Inertia	Times Number of Elements (per ft.)	Transformed Moment of Inertia (per ft.)
	d'	$A_t * (d')^2$	I	I/n		I_t
Main Bars	-0.813532413	0.89788299	0.31702077	0.31702077	1.2	0.38102492
Supplemental Bar 1	0.74528558	0.00000000	0.00000000	0.00000000	3	0.00000000
Supplemental Bar 2	0.74528558	0.00000000	0	0.00000000	3.2	0.00000000
Concrete*	0.24528558	0.27000843	27.00000000	3.37500000	1	3.37500000
Top Punchout*	-0.25473442	0.00000000	0.00000000	0.00000000	1.2	0.00000000
Bottom Punchout*	0.62028558	0.00000000	0.00000000	0.00000000	1.2	0.00000000
Σ		1.18988711E				3.75602492

I_x = Moment of Inertia for Composite Section = $\Sigma(A_t * (d')^2) + \Sigma(I_t)$ = 4.924716342

Computation of Section Properties

Point of Interest	Location Relative to Bottom of Grid	Distance from Centroid to Point of Interest	Effective Section Modulus
Top of Concrete	3.000	1.74528558	22.57406042
Bottom of Grid	0	-1.25473442	-3.92490736
Top of Grid	2.000	0.74528558	6.60800183
Form Pan	0.000	-1.25473442	-3.92490736
Other Area of Interest	0.000	-1.25473442	-3.92490736
CB Weld / Main Bar Punchout	2	0.74528558	6.60800183

*Punchout is Ignored in Compression Areas and Subtracted When in Tension