Calculate Composite Centroid - Negative Bending

n= 8

Element	Actual Height of Element	Effective Height of Element (Concrete above N.A.) See Note.	Width of Element	Spacing of Elements c-c (in.)	Number of Elements (per ft)	Actual Area	Trans-formed Area (A/n)	Distance from bottom of grid to horiz. centroid of element	
						A	A_t	d	$A_t \times d$
Main Bars	3.945	3.945		12	1	1.480	1.480	0.953	1.410
less punchout hol	0.75	0.75	0.17	12	1	-0.128	-0.128	1.820	-0.232
less shear hole	0.75	0.75	0.17	12	1	-0.128	-0.128	3.320	-0.423
Concrete	0	0.0000	12	12	1	0.000	0.000	7.445	0.000
Rebar				4	3	0.589	0.589	4.695	2.766
Σ							1.814		3.521

Centroid of composite section = y (measured from bottom of grid) = $\Sigma(A_t{*}d)/\Sigma(A_t)$ **1.941** in.

Note: No concrete is included in the calculations for negative bending.

Calculate Composite Moment of Inertia - Negative Bending

Element	Distance from Centroid of Element to Composite Centroid (y)		Moment of Inertia of Element Taken by Itself	Trans-formed Moment of Inertia	Times Number of Elements (per ft.)	Trans-formed Moment of Inertia (per ft.)
	d'	$A_t \times (d')^2$	I	I/n		I_t
Main Bars	-0.988	1.444	2.150	2.150	1	2.150
less punchout hol	-0.121	-0.002	-0.006	-0.006	1	-0.006
less shear hole	1.379	-0.243	-0.006	-0.006	1	-0.006
Concrete	5.504	0.000	0.000	0.000	1	0.000
Rebar	2.754	4.468	0.003	0.003	3	0.009
Sums		5.668				2.147

I_g=Moment of Inertia for Composite Section= $\Sigma(A_t \times (d')^2) + \Sigma(I_t)$ = **7.815** in^4

Computation of Section Properties -- Exodermic Deck

SECTION MODULI - NEGATIVE BENDING

Point of Interest	Location Relative to Bottom of Grid	Distance from Centroid to Point of Interest	Effective Section Modulus in^3
Embedded Rebar	4.695	2.754	-2.84
Top of Main Bars	3.945	2.004	-3.90
Top of Shear Hole	3.695	1.754	-4.46
Bottom of Shear hole	2.945	1.004	-7.78
Top of Distribution Bars	2.945	1.004	-7.78
Top of Weld	2.945	1.004	-7.78
Bottom of welds	2.445	0.504	-15.50
Top of Punchout	2.195	0.254	-30.74
Bottom of distrib. Bar	1.445	-0.495	15.76
Bottom of Punchout	1.445	-0.495	15.76
Bottom of Steel Grid	0	-1.941	4.03