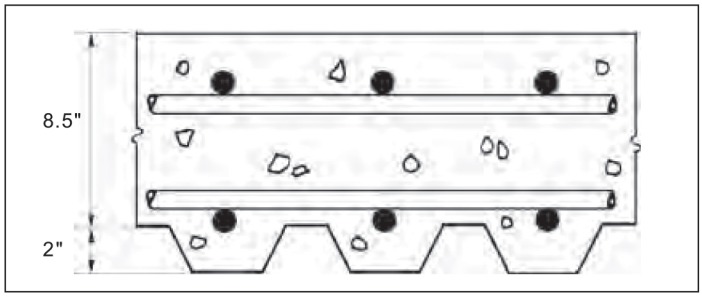
REDBIRD ENGINEERING

Example Problem



GIVEN:

Beam Spacing	=	8'0" cc
Beam Flange	=	10"
Slab thickness	=	8.5" (measured to top of deck as per figure)
Concrete unit weigth	=	150 pcf
Design Span	=	8'0" - 10" - 2" = 7'0" = 7.0'
Deck Type	=	2" Deep Deck

REQUIRED: Section Modulus (S) and Moment of inertia (I) for the bridge form section.

SOLUTION:

Concrete weight = (8.5+1)(150)/12 = 118.75 psf
Bridge form weight = 3 psf
W_d = Dead Load (deflection) = 121.75 psf = 122 psf
Construction = 50 psf
Total Load (stress) = 172 psf

DEFLECTION: Calculate Required I.

$l/180 = \frac{7(12)}{180} = 0.47"$

0.47" < ½" use 0.47"

$I_{req} = \frac{.013(122)(7)^4\ 1728}{29.5 \times 10^6\ (0.47)} = 0.475\ in^4/ft.\ of\ width$

Note: If W_d had been less than 120 psf, 120 would have been used to determine the required I.

STRESS: Determine the required S if the steel grade is 50 ksi.

$f = 0.725 \times 50000 = 36250$ use 36000 psi.

$S_{req} = \frac{M}{36000} = \frac{172(7)^2(12)}{8 \times 36000} = 0.351\ in^3/ft.$

Note: If the steel grade were 40 ksi the allowable f would be:
40000 x .725 = 29000
the required S would be:

$S_{req} = 0.351 \times \frac{36000}{29000} = 0.436\ in^3/ft.$

The choice of deck can influence the concrete weight. For this problem:

$\frac{8.5}{12} \times 150 = 106.3$ psf
2" x 6" C_v = .0833; .0833 x 150 = 12.5 psf
106.3 + 12.5 = 119 psf as used in the problem.
Using the average slab depth is usually close enough.