

**CONCRETE DESIGN CALCULATOR: Quiz-4 Solution Section (3)**



Select Strength:	$f_y = 60000 \text{ psi}; f_c = 4000 \text{ psi}$	Select design $\rho$ :	$\rho_{max}$	Select Load Case:	$1.2D + 1.4L$
$f_y = 60000$	$F_y = 4000$	Design $\rho = 0.0069$		Est $w_s$ [k/ft] = 1.78	
$\rho_{max} = 0.0033$	$\rho_{max} = 0.0181$	Design $R_n = 388.79$		$M_u$ [ft-k] = 227.8	
$R_n$ of $\rho_{max}$ [psi] = 192.2	$R_n$ of $\rho_{max}$ [psi] = 952.0	$b_w d^3 = 7813.549$		$M_u$ [ft-k] = 253.2	
		$d = 22.10$		Density [pcf] 150	

**Enter Givens & Estimates:**

$w_s$ [k/ft]	0.55	$b_w$ [in]	14	$b_{eff}$ [in]	80
$w_s$ [k/ft]	0.4	$h$ [in]	27	$t$ [in]	3
Length [ft]	32	$d$ [in]	24	$a$ [in]	0.49
Clear Cover [in]	3	$A_g$ [in <sup>2</sup> ]	2.65	$\beta_1$	0.85
Est Self Wt [pcf]	400	$A_{g,max}$ [in <sup>2</sup> ]	1.214	$c$ [in]	0.57
Actual Self Wt [pcf]	450.00	$A_{g,max}$ [in <sup>2</sup> ]	1.280	$e_1$	0.1227
		$\phi M_u$ [ft-k]	253.36		

**Neutral Axis Calculations:**

T [kips]	142.2	$z$ [in] =	21.60
$A_g$ [in <sup>2</sup> ]	41.8	$z$ [in] =	22.50
$A_{g,req}$ [in <sup>2</sup> ]	240	Governing $z$	22.50

N.A. is in the flange

**Select  $A_s$  in Tension:**

BAR	Qty	$A_s$ [in <sup>2</sup> ]
#8	3	2.37

**If  $a < ht$**

$A_s$ [in <sup>2</sup> ]	2.6496
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If $a > t$	
$A_{g,r}$ [in <sup>2</sup> ]	10.88
$M_{u,r}$ [k-ft]	1224.00
$M_{u,r}$ [k-ft]	996.16
$R_n$	1441.20
$\rho_s = 0.03$	
$a$ [in]	14.64
$c$ [in]	17.22
$e_1$	0.00
$A_{g,r}$ [in <sup>2</sup> ]	13.27
$A_s$ [in <sup>2</sup> ]	24.15

**Bar Selection:**

BAR	Number of Bars in a Single Layer of Reinforcing													
	2		3		4		5		6		7		8	
	Area	Width	Area	Width	Area	Width	Area	Width	Area	Width	Area	Width	Area	Width
#4	0.39	6.80	0.58	8.30	0.78	9.80	0.98	11.30	1.18	12.80	1.37	14.30	1.57	15.80
#5	0.61	6.90	0.91	8.50	1.23	10.20	1.55	11.80	1.84	13.4	2.15	15.00	2.45	16.70
#6	0.88	7.00	1.32	8.80	1.77	10.50	2.21	12.30	2.65	14.00	3.09	15.80	3.53	17.50
#7	1.20	7.20	1.80	9.00	2.41	10.90	3.01	12.80	3.61	14.70	4.21	16.50	4.81	18.40
#8	1.57	7.30	2.35	9.30	3.14	11.30	3.93	13.30	4.71	15.30	5.50	17.30	6.28	19.30
#9	2.00	7.60	3.00	9.80	4.00	12.10	5.00	14.30	6.00	16.60	7.00	18.80	8.00	21.10
#10	2.53	7.80	3.79	10.40	5.06	12.90	6.33	15.50	7.59	18.00	8.86	20.50	10.12	23.10
#11	3.12	8.10	4.68	10.90	6.25	13.80	7.81	16.60	9.37	19.40	10.94	22.20	12.50	25.00
#14	4.50	8.90	6.75	12.30	9.00	15.70	11.25	19.00	13.50	22.40	15.75	25.80	18.00	29.20
#18	8.00	10.60	12.00	14.10	16.00	19.60	20.00	24.50	24.00	28.80	28.00	33.10	32.00	37.70

# Civil Engineering Material Calculation

**CH Cherryholmes**



## **Civil Engineering Material Calculation:**

## Reviewing **Civil Engineering Material Calculation**: Unlocking the Spellbinding Force of Linguistics

In a fast-paced world fueled by information and interconnectivity, the spellbinding force of linguistics has acquired newfound prominence. Its capacity to evoke emotions, stimulate contemplation, and stimulate metamorphosis is actually astonishing. Within the pages of "**Civil Engineering Material Calculation**," an enthralling opus penned by a very acclaimed wordsmith, readers set about an immersive expedition to unravel the intricate significance of language and its indelible imprint on our lives. Throughout this assessment, we shall delve to the book is central motifs, appraise its distinctive narrative style, and gauge its overarching influence on the minds of its readers.

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