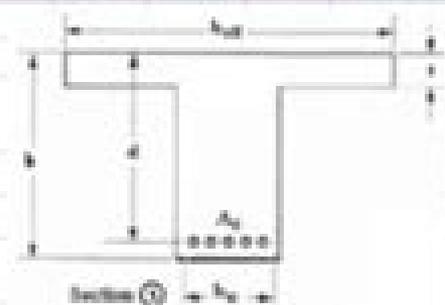


CONCRETE DESIGN CALCULATOR: Quiz-4 Solution Section (3)



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 $R_n = 388.79$		$M_u [ft-k] = 227.8$	
$R_n \text{ of } \rho_{max} [psi] = 192.2$	$R_n \text{ of } \rho_{max} [psi] = 952.0$	$b_w d^3 = 7813.549$		$M_u [ft-k] = 253.2$	
		$d = 22.10$		Density [pcf] 150	

Enter Givens & Estimates:

$w_s [k/ft]$	0.35	$b_w [in]$	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	$A_g [in^2]$	2.65	$\beta_1$	0.85
Est Self Wt [pcf]	400	$A_{g,max} [in^2]$	1.214	$c [in]$	0.57
Actual Self Wt [pcf]	450.00	$A_{g,max} [in^2]$	1.280	$e_1$	0.1227
		$\phi M_n [ft-k]$	253.36		

Neutral Axis Calculations:

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

N.A. is in the flange

Select  $A_s$  in Tension:

BAR	Qty	$A_s [in^2]$
#8	3	2.37

If  $a < ht$

$A_s [in^2]$	2.6496
--------------	--------

If $a > t$	
$A_{g,req} [in^2]$	10.88
$M_{unb} [k-ft]$	1224.00
$M_{ub} [k-ft]$	996.16
$R_n$	1441.20
$\rho_s =$	0.03
$a [in]$	14.64
$c [in]$	17.22
$e_1$	0.00
$A_{g,req} [in^2]$	13.27
$A_s [in^2]$	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	35.10	32.00	37.70

# Civil Engineering Material Calculation

**Per Freiesleben Hansen**



## **Civil Engineering Material Calculation:**

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*Advances in Materials and Manufacturing Technology* Ramesh Kumar Nayak, J. Paulo Davim, Rajiv Shekhar, Geoffrey Mitchell, 2026-01-01 This book comprises select proceedings of the 3rd International conference on Advances in Materials and Manufacturing Technology ICAMMT 2024 Functional materials smart materials and intelligent materials stand as foundational elements in twenty first century technology irrespective of their designation The evolution of modern structural materials reflects an unprecedented trajectory of scientific and technological progress The book discusses the latest materials manufacturing processes evaluation of materials properties for the application in automotive aerospace marine locomotive and energy sectors The topics covered include advanced metal forming bending welding and casting techniques recycling and re manufacturing of materials and components materials processing characterization and applications multi physics coupling simulation and optimization alternate materials material substitution thermally enhanced processes and materials composites and polymer manufacturing the fabrication process of nanomaterial powder metallurgy and ceramic forming numerical modelling and simulation advanced machining processes functionally graded materials non destructive examination optimization techniques engineering materials heat treatment material testing MEMS integration energy materials bio materials metamaterials metallography nanomaterial SMART materials application of AI and ML in advanced materials automation and superalloys In addition it discusses industrial applications and cover theoretical and analytical methods numerical simulations and experimental techniques in the area of advanced materials and their applications The recognition of benefits restricting from advanced materials and structures transcends various applications Smart systems offer a streamlined approach to controlling material and system characteristics by autonomously adapting to environmental changes Mechanistic comprehension across disciplines is paramount for developing materials with capabilities that surpass current standards Our conference serves as a cross disciplinary summit transcending organizational and global barriers to integrate research and education in the vital field of advanced materials We focus on major sectors including advanced processing material characterization modelling and simulation properties performance and device fabrication aiming to overlay the way for the next wave of scientific and technological advancements

*Advanced Research on Civil Engineering, Materials Engineering and Applied Technology* Helen Zhang, David Jin, X.J. Zhao, 2013-12-23 Selected peer reviewed papers from the 2013 2nd International Conference on Civil Engineering and Material Engineering CEME 2013 December 21 22 2013 Wuhan

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web the roof slope fall should be at least 100mm 4 if using a clear pvc roof then a steeper slope is advisable as a steeper fall means faster water run off and therefore a cleaner roof the plans the plans show a flat plan bird s eye view and an elevation side plan giving all

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