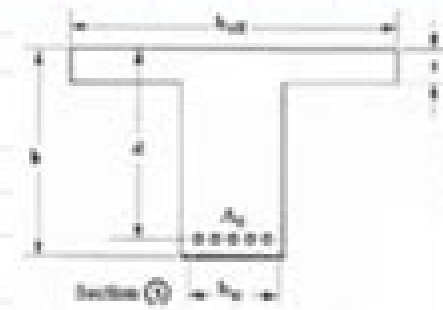


CONCRETE DESIGN CALCULATOR: Quiz-4 Solution Section (3)

Select Strength:	$f_y = 60000 \text{ psi}; f_c = 4000 \text{ psi}$	Select design ρ :	ρ_{max}	Select Load Case:	$1.2D + 1.4L$
$f_y = 60000$	$f_c = 4000$	Design $\rho = 0.0069$	Est w_s [k/ft] = 1.78		
$\rho_{max} = 0.0033$	$\rho_{max} = 0.0183$	Design $R_n = 388.79$	M_u [ft-k] = 227.8		
R_n at ρ_{max} [psi] = 192.2	R_n at ρ_{max} [psi] = 952.0	$b d^3 = 7813.549$	M_u [ft-k] = 253.2		
		$d = 22.10$	Density [pcf] 150		



Enter Givens & Estimates:

w_s [k/ft]	0.55	b_w [in]	16	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	β_1	0.85
Est Self Wt [plf]	400	$A_{g,max}$ [in ²]	1.214	c [in]	0.57
Actual Self Wt [plf]	450.00	$A_{g,max}$ [in ²]	1.280	e_t	0.1227
		ϕM_u [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
$A_{s,req}$ [in ²]	240	Governing z	22.50

N.A. is in the flange

Select A_s in Tension:

BAR	Qty	A_s [in ²]
#6	3	2.37

If $a < ht$

A_s [in ²]	2.6496
--------------------------	--------

If $a > t$	
$A_{s,req}$ [in ²]	10.88
$M_{u,max}$ [k-ft]	1224.00
$M_{u,req}$ [k-ft]	996.16
R_n	1441.20
$\rho_s = 0.03$	
a [in]	14.64
c [in]	17.22
e_t	0.00
$A_{s,req}$ [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	2.13	15.00	2.43	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	15.10	16.00	19.60	20.00	24.50	24.00	28.60	28.00	33.10	32.00	37.70

Manual Excel For Chemical Engineering Calculations

Lyle Albright



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Ludwig's Applied Process Design for Chemical and Petrochemical Plants A. Kayode Coker, 2011-08-30 This complete revision of Applied Process Design for Chemical and Petrochemical Plants Volume 1 builds upon Ernest E Ludwig's classic text to further enhance its use as a chemical engineering process design manual of methods and proven fundamentals. This new edition includes important supplemental mechanical and related data nomographs and charts. Also included within are improved techniques and fundamental methodologies to guide the engineer in designing process equipment and applying chemical processes to properly detailed equipment. All three volumes of Applied Process Design for Chemical and Petrochemical Plants serve the practicing engineer by providing organized design procedures, details on the equipment suitable for application, selection and charts in readily usable form. Process engineers, designers and operators will find more chemical/petrochemical plant design data in Volume 2 Third Edition which covers distillation and packed towers as well as material on azeotropes and ideal/non-ideal systems. Volume 3 Third Edition which covers heat transfer, refrigeration systems, compression, surge drums and mechanical drivers. A. Kayode Coker is Chairman of Chemical Process Engineering Technology department at Jubail Industrial College in Saudi Arabia. He is both a chartered scientist and a chartered chemical engineer for more than 15 years and an author of Fortran Programs for Chemical Process Design Analysis and Simulation, Gulf Publishing Co and Modeling of Chemical Kinetics and Reactor Design, Butterworth-Heinemann. Provides improved design manuals for methods and proven fundamentals of process design with related data and charts. Covers a complete range of basic/day to day petrochemical operation topics with new material on significant industry changes since 1995. [Numerical Methods in Chemical Engineering Using Python® and Simulink®](#) Nayef Ghasem, 2023-07-17 Numerical methods are vital to the practice of chemical engineering, allowing for the solution of real-world problems. Written in a concise and practical format, this textbook introduces readers to the numerical methods required in the discipline of chemical engineering and enables them to validate their solutions using both Python and Simulink. Introduces numerical methods followed by the solution of linear and nonlinear algebraic equations. Deals with the numerical integration of a definite function and solves initial and boundary value ordinary differential equations with different orders. Weaves in examples of various numerical methods and validates solutions to each with Python and Simulink graphical programming. Features appendices on how to use Python and Simulink. Aimed at advanced undergraduate and graduate chemical engineering students as well as practicing chemical engineers, this textbook offers a guide to the use of two of the most widely used programs in the discipline. The textbook features numerous video lectures of applications and a solutions manual for qualifying instructors. **Excel for Scientists and Engineers** E. Joseph Billo, 2007-04-06 Learn to fully harness the power of Microsoft Excel® to perform scientific and engineering calculations. With this text as your guide, you can significantly enhance Microsoft Excel's capabilities to execute the calculations needed to solve a variety of chemical, biochemical, physical, engineering, biological and medicinal problems. The

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