DESIGN OF SINGLY REINFORCED CONCRETE BEAM

Sl.no	Data	Value	Unit
1	Grade of concrete	M20	Grade
2	Clear span	5	m
3	Working Live load	10	kN/m
4	Characteristic strength of concrete (fck)	20	N/mm²
5	Characteristic strength of steel (fy)	415	N/mm²
6	Density of concrete	25	kN/m³
	Cross sectional dimensions		
	Effective depth	0.333333333	m
	Adopt effective depth d	0.35	m
	Depth of the beam (D)	0.4	m
	Width of the beam (b)	0.2	m
	Effective Span (l)	5.35	m
	Load calculations		
	Self weight of the beam (g)	2	kN/m
	Live load (q)	10	kN/m
	Total working load (W)	12	kN/m
	Factor of safety	1.5	
	Design Ultimate Load (Wu)	18	kN/m
	Span	5.35	m
	Moment Calculations		
	Design Moment (Mu)	64.400625	kNm
	Shear Force (Vu)	48.15	kN
	Reinforcement Calculations		
	Mulim	67.62	kNm
	Section is Under-reinforced		
	Ast required	-37.45Ast^2+12367.5Ast-64.4*10^6=0	
	a	-37.45	
	b	126367.5	
	c	-64400000	
	Ast1	625.618856	mm²
	Ast2	2748.680209	mm²
	Ast provided	628	mm²
	Dia of the bar	20	mm
	No of bars provided	2	
	Provide 2 - H20, Ast prov = 628 mm²		
	Provide 2 bars of 12mm diameter hanger bars on compression side		
	Check for shear		
	Tv	0.687857143	N/mm²
	Pt	0.897142857	%
	Tc	0.59	N/mm²
	From Table 19 IS 456		
	Shear reinforcement is required		
	Balance Shear (Vus)	6850	N
	Vus	7	kN
	Select 8 mm dia 2 Legged Stirrups		
	Shear Reinforcement Sv	1813.9152	mm
	Sv max	262.5	mm
	Sv>300mm		
	Provide 2L - H8 @250 mm c/c		
	Check for deflection		
	(L/D)basic	20	
	K1	0.99	
	K2	1	
	(L/D)max	19.8	
	(L/D)provided	15.28571429	
	Hence Deflection Control is Satisfied		