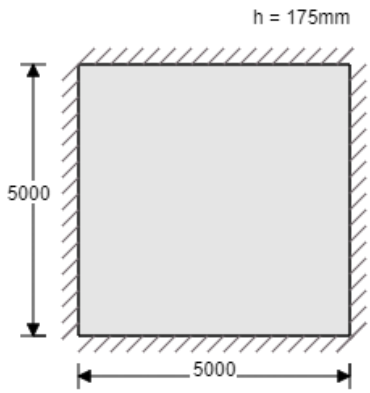
1.0 INPUT

1.1 Dimensions

Length of Slab	L_L	= **5000**mm
Width of Slab	L_W	= **5000** mm
Slab Thickness	h	= **175** mm



1.2 Reinforcement Details

Sagging Along Length		**8 @ 150** mm C/C
Hogging Along Length		**8 @ 150** mm C/C
Sagging Along Width		**8 @ 150** mm C/C
Hogging Along Width		**8 @ 150** mm C/C
Clear Cover	C_c	= **25** mm

1.3 Loads (Unfactored)

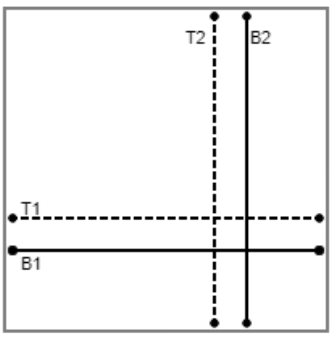
Characteristic Imposed Load	Q_k	= **4** kN/m^2
Characteristic Loads due to Finishes	G_k	= **1.5** kN/m^2

1.4 Design Load Factors

Imposed Load Factor	γ_{fq}	= **1.6**
Dead Load Factor	γ_{fg}	= **1.4**

1.5 Materials

Concrete Grade	f_{cu}	= **25** N/mm^2
Main Reinforcement Grade	f_y	= **460** N/mm^2
Density of Concrete	γ_{conc}	= **24** kN/m^3
Modulus of Elasticity of Steel	E_s	= **200** kN/mm^2



B1: 8ϕ - 150 c/c B2: 8ϕ - 150 c/c
T1: 8ϕ - 150 c/c T2: 8ϕ - 150 c/c

1.6 Deflection

Support Condition	SC	= **Program**
Allowable L/d Ratio	$(L/d)_A$	= **26**

1.7 Material Safety Factors

Concrete in Compression	γ_{mc}	= **1.5**
Reinforcement	γ_{ms}	= **1.15**
Concrete in Shear	γ_{mcs}	= **1.25**

1.8 End Condition

Slab Spanning	**Two Way**
Condition	**Interior Panels**

1.9 Crack Check

Check for Crack Width		**Yes**
Maximum Allowable Crack Width	W_k	= **0.3** mm

2.0 OUTPUT

2.1 Design Load

Self Weight of Slab	q_{kswt}	= h * γ_{conc} = **4.2** kN/m^2	
Design Load	n	= γ_{fg} * (q_{kswt} + G_k) + γ_{fq} * Q_k = **14.4** kN/m^2	*Cl.3.2.1.2.2*
Length of Shorter Span	L_x	= min (L_L, L_W) = **5000** mm	
Length of Longer Span	L_y	= max (L_L, L_W) = **5000** mm	
L_y / L_x Ratio		= **1**	

2.2 Reinforcement and Shear Calculation

2.2.1 Reinforcement - Length (Sagging)

Moment Coefficient	β_1	= **0.024**	*Table 3.14*
Sagging Moment	M	= β_1 * n * L_x^2 = **8.6** kNm	*Cl.3.5.3.3*
Depth of Reinforcement	d	= **146** mm	
	K	= M / (b * d^2 * f_{cu}) = **0.016**	
	K'	= 0.2336 / γ_{mc} = **0.156**	
Lever Arm	z	= d * min(0.5 + (0.25 - K / 0.9)$^{1/2}$, 0.95)	
		= **138.7** mm	
Area of Reinforcement Required /m	A_{sx}	= M / ((f_y / γ_{ms}) * z) = **227.5** mm^2	
Area of Reinforcement Provided /m	$A_{sx,p}$	= **335.2** mm^2	

2.2.2 Shear Check (Continuous)

Shear Coefficient	α_1	= **0.33**	*Table 3.15*
Design Shear Force	V	= α_1 * n * L_x = **23.7** kN	*Cl.3.5.3.7*
Design Shear Stress	v	= V / (b * d) = **0.163** N/mm^2	*Cl.3.4.5.2*
Percentage of Reinforcement	P_t	= **0.23** %	
Concrete Shear Stress	v_c	= **0.498** N/mm^2	*Table 3.8*
Maximum Shear Stress	v_{max}	= min (0.8 * $f_{cu}^{1/2}$, 5) = **4** N/mm^2	

2.2.3 Reinforcement - Width (Sagging)

Moment Coefficient	β_2	= **0.024**	
Hogging Moment	M	= β_2 * n * L_x^2 = **8.6** kNm	
Depth of Reinforcement	d	= **138** mm	
	K	= M / (b * d^2 * f_{cu}) = **0.018**	
Lever Arm	z	= d * min(0.5 + (0.25 - K / 0.9)$^{1/2}$, 0.95)	
		= **131.1** mm	
Area of Reinforcement Required /m	A_{sy}	= M / ((f_y / γ_{ms}) * z) = **227.5** mm^2	
Area of Reinforcement Provided /m	$A_{sy,p}$	= **335.2** mm^2	

2.2.4 Shear Check (Continuous)

Shear Coefficient	α_2	= **0.33**	*Table 3.15*
Design Shear Force	V	= α_2 * n * L_x = **23.7** kN	*Cl.3.5.3.7*
Design Shear Stress	v	= V / (b * d) = **0.172** N/mm^2	*Cl.3.4.5.2*
Percentage of Reinforcement	P_t	= **0.243** %	*Table 3.8*
Concrete Shear Stress	v_c	= **0.515** N/mm^2	

2.2.5 Reinforcement - Length (Hogging)

Moment Coefficient	β_3	= **0.031**	
Sagging Moment	M	= β_3 * n * L_x^2 = **11.1** kNm	

Depth of Reinforcement	d	= **146** mm	
	K	= M / (b * d^2 * f_{cu}) = **0.021**	
Lever Arm	z	= d * min(0.5 + (0.25 - K / 0.9)$^{1/2}$, 0.95)	
		= **138.7** mm	
Area of Reinforcement Required /m	A_{sxh}	= M / ((f_y / γ_{ms}) * z) = **227.5** mm^2	
Area of Reinforcement Provided /m	$A_{sxh,p}$	= **335.2** mm^2	

2.2.6 Reinforcement - Width (Hogging)

Moment Coefficient	β_4	= **0.031**	
Hogging Moment	M	= β_4 * n * L_x^2 = **11.1** kNm	
Depth of Reinforcement	d	= **138** mm	
	K	= M / (b * d^2 * f_{cu}) = **0.023**	
Lever Arm	z	= d * min(0.5 + (0.25 - K / 0.9)$^{1/2}$, 0.95)	
		= **131.1** mm	
Area of Reinforcement Required /m	A_{syh}	= M / ((f_y / γ_{ms}) * z) = **227.5** mm^2	
Area of Reinforcement Provided /m	$A_{syh,p}$	= **335.2** mm^2	

2.3 Deflection Check (Shorter Span)

Design Service Stress	f_s	= (2 * f_y * A_{sx}) / (3 * $A_{sx,p}$) = **208.1** N/mm^2	
Modification Factor	M_F	= min (0.55 + ((477 - f_s) / (120 * (0.9 + (M / d^2)))) , 2) = **2**	*Cl.3.4.6.5*
Span/Effective Depth Ratio	$(L/d)_A$	= **26**	
Allowable Span/Effective Depth Ratio	$(L/d)_{allow}$	= M_F * $(L/d)_A$ = **52**	*Table 3.9*
Actual Span/Effective Depth Ratio	$(L/d)_{actual}$	= L_x / d = **36.2**	

2.4 Crack Width

Ref : BS 8110 - Part 2

Service Load	n_{cr}	= Q_k + G_k + q_{kswt} = **9.7** kNm

2.4.1 Length Bottom - Sag

Cracking Moment @ Bottom / m	$M_{cr,x}$	= β_1 * n_{cr} * L_x^2 = **5.82** kNm
Width of Crack	$W_{cr,x}$	= **0** mm

2.4.2 Length Top - Hog

Cracking Moment @ Top / m	$M_{cr,xh}$	= β_2 * n_{cr} * L_x^2 = **7.517** kNm
Width of Crack	$W_{cr,xh}$	= **0.023** mm

2.4.3 Width Bottom - Sag

Cracking Moment @ Bottom / m	$M_{cr,y}$	= β_3 * n_{cr} * L_x^2 = **5.82** kNm
Width of Crack	$W_{cr,y}$	= **0** mm

2.4.4 Width Top - Hog

Cracking Moment @ Top / m	$M_{cr,yh}$	= β_4 * n_{cr} * L_x^2 = **7.517** kNm
Width of Crack	$W_{cr,yh}$	= **0.032** mm

3.0 SUMMARY

3.1 Length Direction

Description	Required		Actual		Status
Sagging Reinforcement (mm^2/m)	A_{sx}	>= **227.5**	$A_{sx,p}$	= **335.2**	**PASS**
Crack Width - Sag (mm)	W_k	<= **0.3**	$W_{cr,x}$	= **0**	**PASS**

3.1 Length Direction

Description	Required		Actual		Status
Shear Resistance (N/mm^2)	v	>= **0.163**	v_c	= **0.498**	**PASS**
Hogging Reinforcement (mm^2/m)	A_{sxh}	>= **227.5**	$A_{sxh,p}$	= **335.2**	**PASS**
Crack Width - Hog (mm)	W_k	<= **0.3**	$W_{cr,xh}$	= **0.023**	**PASS**

3.2 Width Direction

Description	Required		Actual		Status
Sagging Reinforcement (mm^2/m)	A_{sy}	>= **227.5**	$A_{sy,p}$	= **335.2**	**PASS**
Crack Width - Sag (mm)	W_k	<= **0.3**	$W_{cr,y}$	= **0**	**PASS**
Shear Resistance (N/mm^2)	v	>= **0.172**	v_c	= **0.515**	**PASS**
Hogging Reinforcement (mm^2/m)	A_{syh}	>= **227.5**	$A_{syh,p}$	= **335.2**	**PASS**
Crack Width - Hog (mm)	W_k	<= **0.3**	$W_{cr,yh}$	= **0.032**	**PASS**

3.3 Deflection

Description	Required		Actual		Status
Deflection	$(L/d)_{allow}$	<= **52**	$(L/d)_{actual}$	= **36.2**	**PASS**