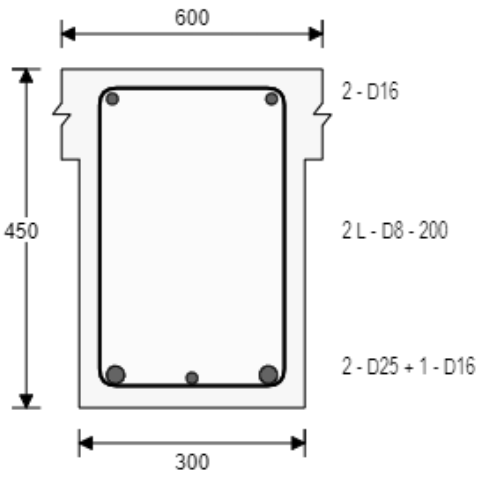
1.0 INPUT

1.1 Dimensions

Flange Type		Flange **T**
Section Width	b	= **300** mm
Section Depth	h	= **450** mm
Maximum Flange Width	b_f	= **600** mm
Flange Depth	h_f	= **120** mm
Distance between Zero Moments	L	= **1500** mm



1.2 Reinforcement Cover

Clear Cover for Tension	C_{ot}	= **25** mm
Clear Cover for Compression	C_{oc}	= **25** mm
Side Cover	C_{os}	= **25** mm

1.3 Design Loads

Design Moment	M	= **140** kNm
Design Shear Force	V	= **0** kN

1.4 Materials

Concrete Grade	f_{cu}	= **35** N/mm^2
Main Reinforcement Grade	f_y	= **460** N/mm^2
Shear Reinforcement Grade	f_{yv}	= **460** N/mm^2
Aggregate Size	h_{agg}	= **20** mm

1.4.1 Material Safety Factors

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

2.0 OUTPUT

Ref: BS 8110 - Part 1

2.1 Flexure Design (Positive)

2.1.1 Tension Layer Effective Depth Calculation

2.1.1.1 Layer: 01

Rebars			**2 - D 25 + 1 - D 16**
Area of Reinforcement Provided	A_{t1}	=	**1182.8** mm^2
Depth of Layer 01	d_{t1}	=	**404.5** mm
Total Area of Tension Steel Provided	A_{sbp}	=	**1182.8** mm^2
Effective Depth for Tension	d	=	**404.5** mm

2.1.2 Compression Layer Effective Depth Calculation

2.1.2.1 Layer: 01

Rebars			**2 - D 16**	
Area of Reinforcement Provided	A_{c1}	=	**402.1** mm^2	
Depth of Layer 01	d_{c1}	=	**41** mm	
Total Area of Compression Steel Provided	A_{stp}	=	**402.1** mm^2	
Effective Depth for Compression	d_2	=	**41** mm	
Effective Width of Flange	b_{eff}	=	min(b + L / 5, b_f) = **600** mm	*Cl.3.4.1.5*
Flange Moment of Resistance	M_{Flange}	=	(0.67 * f_{cu} * b_{eff} * h_f * (d - 0.5 * h_f)) / γ_{mc}	
		=	**387.8** kNm	
Maximum Moment of Resistance	M_{max}	=	[(0.67 * f_{cu} * (b_{eff} - b) * h_f * (d - 0.5 * h_f)) + (0.2336 * f_{cu} * b * d^2)] / γ_{mc} = **461.4** kNm	
K Factor	K	=	M / (b * d^2 * f_{cu}) = **0.041**	*Cl. 3.4.4.4*
K' Factor	K'	=	0.2336 / γ_{mc} = **0.156**	
Lever Arm Distance	z	=	d * min([0.5 + (0.25 - K / 0.9)$^{1/2}$], 0.95) = **384.3** mm	
Area of Tension Reinforcement	A_{smom}	=	M / (f_y * z / γ_{ms}) = **910.8** mm^2	*Cl.3.4.4.4*
Minimum Area of Reinforcement	A_{min}	=	0.26% * b * h = **351** mm^2	
Maximum Area of Reinforcement	A_{max}	=	4% * b * h = **5400** mm^2	

3.0 SUMMARY

Description	Required		Actual		Status
Area of Tension Reinforcement (mm^2)	A_{smom}	>=**910.8**	A_{stp}	= **1182.8**	**PASS**
Minimum Area of Reinforcement (mm^2)	A_{min}	>=**351**	A_{scp}	= **402.1**	**PASS**
Maximum Area of Reinforcement (mm^2)	A_{max}	<=**5400**	A_{stp}	= **1182.8**	**PASS**