BS 5950-1:2000

$M_x \le M_b/m_{LT}$
$M_b = p_b S_x$
$\lambda_{LT} = uv\lambda\sqrt{\beta_W}$

M_2	(M^* kNm)	0.5625	Moment at 1/4 point
M_3	(M^* kNm)	0.25	Moment at 1/2 point
M_4	(M^* kNm)	0.0625	Moment at 3/4 point
M_{max}	(M^* kNm)	1	Maximum moment
m_{LT} (calc.)		0.41875	$m_{Lt} = (0.2 + 0.15M_2 + 0.5M_3 + 0.15M_4)/M_{max}$ (BS 5950-1:2000, Table 18)
m_{LT} (0.44)		0.44	Formula limit (BS 5950-1:2000, Table 18)
m_{LT} (cant.)		1	Value for destabilizing loading condition (BS 5950-1:2000, 4.3.6.6)
m_{LT}		1	Equivalent uniform moment factor for lateral-torsional buckling
L	(m)	5	Cantilever length
k		7.5	Load condition factor (BS 5950-1:2000, Table 14)
L_E	(m)	37.5	Effective length for lateral-torsional buckling
λ		483.871	$\lambda = L_E/r_y$
u		0.9	Buckling parameter (BS 5950-1:2000, 4.3.6.8)
D	(mm)	315	Depth of the section
T	(mm)	18.7	Flange thickness
x		16.84492	x = D/T
λ/x		28.72504	
v		0.392217	Slenderness factor: $v = 1/[1 + 0.05(\lambda/x)^2]^{0.25}$
r_y	(mm)	77.5	Radius of gyration about the minor axis
β_W		1	Ratio defined in BS 5950-1:2000, 4.3.6.9
λ_{LT}		170.8044	Equivalent slenderness: $\lambda_{LT} = uv\lambda\sqrt{\beta_W}$ (BS 5950-1:2000, 4.3.6.7)
S_x	(mm^3)	1960000	Plastic modulus about the major axis
p_b	(N/mm^2)	54	Bending strength (BS 5950-1:2000, 4.3.6.5, Table 16/Table 17)

Otherwise the bending strength p_b for the relevant values of λ_{LT} and p_y should be obtained from Table 16 for rolled sections or Table 17 for welded sections, or from the formula given in B.2.1.

M_b	(kNm)	105.84	Buckling resistance moment: $M_b = p_b S_x$ (BS 5950-1:2000, 4.3.6.4)
M_b/m_{LT}	(kNm)	105.84	

P360

$M_{b,Rd} = x_{LT} W_y f_y / \gamma_{M1}$
$x_{LT} = 1/(\Phi_{LT} + \sqrt{(\Phi_{LT}^2 - \bar{\lambda}_{LT}^2)})$
$\Phi_{LT} = 0.5[1 + \alpha_{LT}(\bar{\lambda}_{LT} - 0.2) + \bar{\lambda}_{LT}^2]$
$\bar{\lambda}_{LT} = (1/\sqrt{C_1}).UVD.\bar{\lambda}_z.\sqrt{\beta_w}$

Section		310UC118	
Support		Continuous, with lateral restraint to top flange	
Tip		Free	
C_1		1	Factor for shape of bending moment, conservatively taken as 1.0 (Section 2.4)
U		0.9	Parameter that depends on section geometry
h	(mm)	315	Depth of cross-section
t_f	(mm)	18.7	Flange thickness
k		3	Effective length parameter (P360, Figure 3.2)
L	(m)	5	Length
i_z	(mm)	77.5	Radius of gyration (presumed minor axis)
λ_z		193.5484	Effective length parameter: $\lambda_z = kL/i_z$
V		0.602257	Parameter related to slenderness: $V = 1/(1 + 0.05(\lambda_z/(h/t_f))^2)^{0.25}$
β_w		1	Parameter that allows for the classification of the cross-section
E	(Pa)	2E+11	Young's modulus
f_y	(MPa)	280	Yield strength
W_y	(mm^3)	1960000	Major axis section modulus
λ_1		83.9626	Limiting slenderness at which σ_{cr} is equal to f_y: $\lambda_1 = \pi\sqrt{(E/f_y)}$
$\bar{\lambda}_z$		2.305174	Minor axis non-dimensional slenderness of the member: $\bar{\lambda}_z = \lambda_z/\lambda_1$
D		2.5	Destabilizing parameter (P360, Figure 3.2)
$\bar{\lambda}_{LT}$		3.123692	Non-dimensional beam slenderness
Curve		c	Buckling curve (BS EN 1993-1-1：2005, Table 6.2)
α_{LT}		0.49	Imperfection factor (BS EN 1993-1-1：2005, Table 6.3)
Φ_{LT}		6.095031	$\Phi_{LT} = 0.5[1 + \alpha_{LT}(\bar{\lambda}_{LT} - 0.2) + \bar{\lambda}_{LT}^2]$
x_{LT}		0.088271	Reduction factor for lateral torsional buckling
$x_{LT.max}$		1	
x_{LT}		0.088271	
$x_{LT} \times f_y$		24.71585	
γ_{M1}		1	Partial factor for member buckling resistance
$M_{b,Rd}$	(kNm)	48.44307	Design buckling resistance moment