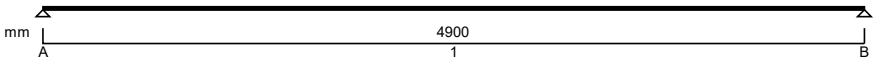
TIMBER JOIST DESIGN (BS5268-2:2002)

Tedds calculation version 1.1.04

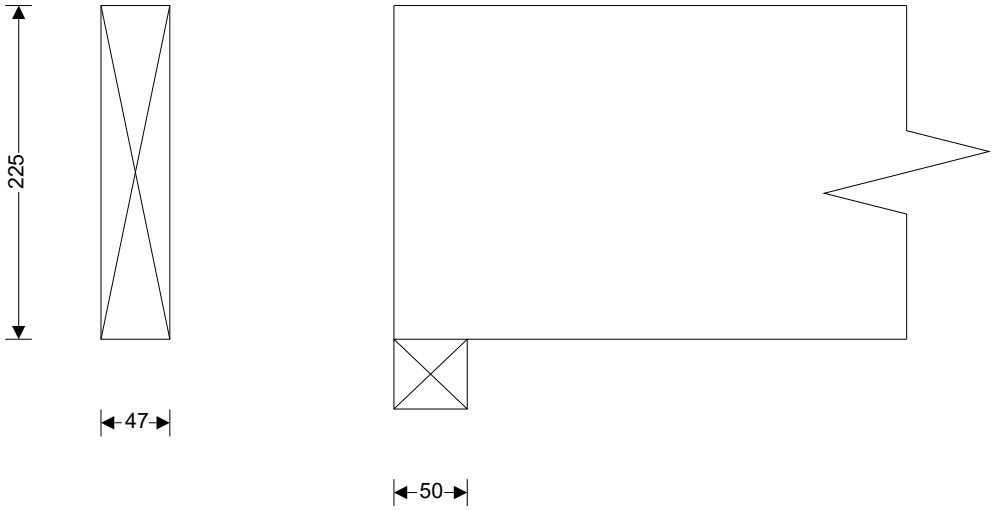
Joist details

Joist breadth	b = **47** mm
Joist depth	h = **225** mm
Joist spacing	s = **400** mm
Timber strength class	**C24**
Service class of timber	**1**



Span details

Number of spans	N_{span} = **1**
Length of bearing	L_b = **50** mm
Effective length of span	L_{s1} = **4900** mm



Section properties

Second moment of area	$I = b \times h^3 / 12$ = **44613281** mm^4
Section modulus	$Z = b \times h^2 / 6$ = **396563** mm^3

Loading details

Joist self weight	$F_{swt} = b \times h \times \rho_{char} \times g_{acc}$ = **0.04** kN/m
Dead load	F_{d_udl} = **0.50** kN/m^2
Imposed UDL(Long term)	F_{i_udl} = **1.50** kN/m^2
Imposed point load (Medium term)	F_{i_pt} = **1.40** kN

Modification factors

Service class for bending parallel to grain	K_{2m} = **1.00**

Service class for compression	K_{2c} = **1.00**
Service class for shear parallel to grain	K_{2s} = **1.00**
Service class for modulus of elasticity	K_{2e} = **1.00**
Section depth factor	K_7 = **1.03**
Load sharing factor	K_8 = **1.10**

Consider long term loads

Load duration factor	K_3 = **1.00**
Maximum bending moment	M = **2.510** kNm
Maximum shear force	V = **2.049** kN
Maximum support reaction	R = **2.049** kN
Maximum deflection	δ = **13.450** mm

Check bending stress

Bending stress	σ_m = **7.500** N/mm^2
Permissible bending stress	$\sigma_{m\_adm} = \sigma_m \times K_{2m} \times K_3 \times K_7 \times K_8$ = **8.515** N/mm^2
Applied bending stress	σ_{m_max} = M / Z = **6.329** N/mm^2

PASS - Applied bending stress within permissible limits

Check shear stress

Shear stress	τ = **0.710** N/mm^2
Permissible shear stress	$\tau_{adm} = \tau \times K_{2s} \times K_3 \times K_8$ = **0.781** N/mm^2
Applied shear stress	τ_{max} = 3 × V / (2 × b × h) = **0.291** N/mm^2

PASS - Applied shear stress within permissible limits

Check bearing stress

Compression perpendicular to grain (no wane)	σ_{cp1} = **2.400** N/mm^2
Permissible bearing stress	$\sigma_{c\_adm} = \sigma_{cp1} \times K_{2c} \times K_3 \times K_8$ = **2.640** N/mm^2
Applied bearing stress	σ_{c_max} = R / (b × L_b) = **0.872** N/mm^2

PASS - Applied bearing stress within permissible limits

Check deflection

Permissible deflection	δ_{adm} = min(L_{s1} × 0.003, 14 mm) = **14.000** mm
Bending deflection (based on E_{mean})	$\delta_{bending}$ = **13.029** mm
Shear deflection	δ_{shear} = **0.422** mm
Total deflection	$\delta = \delta_{bending} + \delta_{shear}$ = **13.450** mm

PASS - Actual deflection within permissible limits

Consider medium term loads

Load duration factor	K_3 = **1.25**
Maximum bending moment	M = **2.424** kNm
Maximum shear force	V = **1.979** kN
Maximum support reaction	R = **1.979** kN
Maximum deflection	δ = **11.211** mm

Check bending stress

Bending stress	σ_m = **7.500** N/mm^2
Permissible bending stress	$\sigma_{m\_adm} = \sigma_m \times K_{2m} \times K_3 \times K_7 \times K_8$ = **10.644** N/mm^2
Applied bending stress	σ_{m_max} = M / Z = **6.113** N/mm^2

PASS - Applied bending stress within permissible limits

Check shear stress

Shear stress	τ = **0.710** N/mm^2
Permissible shear stress	$\tau_{adm} = \tau \times K_{2s} \times K_3 \times K_8$ = **0.976** N/mm^2
Applied shear stress	$\tau_{max} = 3 \times V / (2 \times b \times h)$ = **0.281** N/mm^2

PASS - Applied shear stress within permissible limits

Check bearing stress

Compression perpendicular to grain (no wane)	σ_{cp1} = **2.400** N/mm^2
Permissible bearing stress	$\sigma_{c\_adm} = \sigma_{cp1} \times K_{2c} \times K_3 \times K_8$ = **3.300** N/mm^2
Applied bearing stress	$\sigma_{c\_max} = R / (b \times L_b)$ = **0.842** N/mm^2

PASS - Applied bearing stress within permissible limits

Check deflection

Permissible deflection	$\delta_{adm} = \min(L_{s1} \times 0.003, 14\ mm)$ = **14.000** mm
Bending deflection (based on E_{mean})	$\delta_{bending}$ = **10.803** mm
Shear deflection	δ_{shear} = **0.408** mm
Total deflection	$\delta = \delta_{bending} + \delta_{shear}$ = **11.211** mm

PASS - Actual deflection within permissible limits