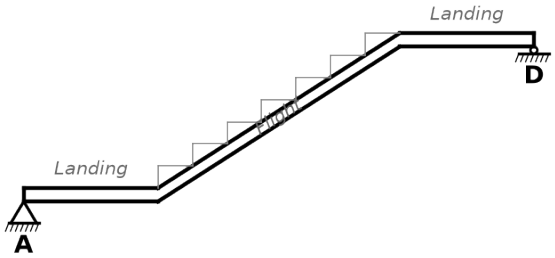
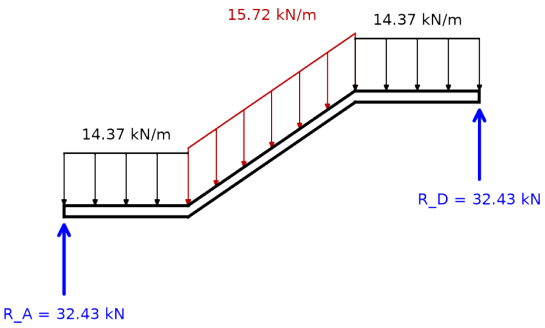
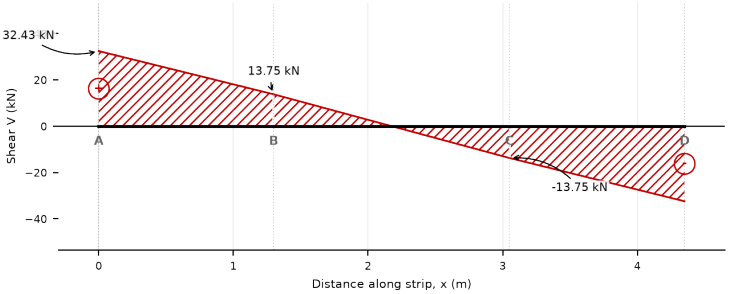
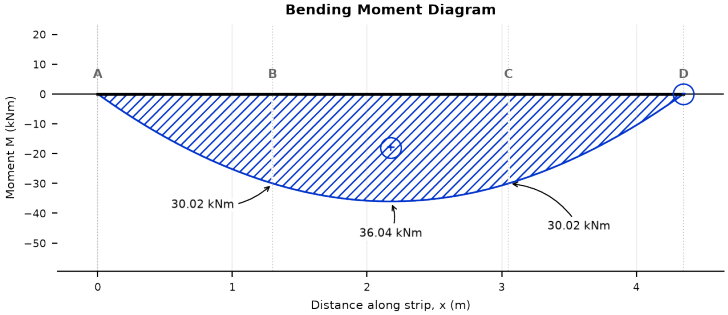
STAIRCASE ANALYSIS REPORT

Element: Staircase Analysis 001

Design Code: EN 1992-1-1:2004 | Date: 28 October 2026

REFERENCE	CALCULATIONS	OUTPUT
§Sketch Idealisation	The staircase is idealised, for analysis, as a single simply-supported span (pin at A, roller at D) carrying its self-weight and imposed load. **Structural idealisation**  	
§Input Parameters	**STAIRCASE - 1 m STRIP BEAM** Waist thickness = 200.0 mm Riser = 150.0 mm Tread = 250.0 mm Number of steps = 7 Concrete density γ_c = 25.0 kN/m³ Finishes = 1.2 kN/m² Live load q_k = 4.0 kN/m² Landing A span = 1.3 m Landing B span = 1.3 m	**Waist = 200.0 mm** **Riser = 150.0 mm** **Tread = 250.0 mm** **number of steps = 7**
§Geometry Flight Dimensions	**GEOMETRY** Horizontal span of flight: $L_b = tread \times N_{steps} = 250.0 \times 7 = 1750.0mm$ Headroom height: $L_h = riser \times (N_{steps} + 1) = 150.0 \times 8 = 1200.0mm$ Slope length: $L_s = \sqrt{L_b^2 + L_h^2} = 2122.0mm$ Angle of inclination: $\theta = \tan^{-1}(\frac{L_h}{L_b}) = 34.439°$ Average step projection: $h_p = \frac{riser}{2} = 75.0mm$ Average thickness: $t_{av} = waist + h_p = 200.0 + 75.0 = 275.0mm$	**L_b = 1750.0 mm** **L_h = 1200.0 mm** **θ = 34.439°** **L_s = 2122.0 mm** **t_{av} = 275.0 mm**
§Loads EN 1991-1-1	**DESIGN LOADS** **Flight** - waist self-weight resolved normal-to-slope → global vertical via cos(θ): $g_{waist,global} = \frac{waist}{1000} \times \gamma_c \times \cos\theta = 4.124kN/m^2$ $g_{stepped} = \frac{h_p}{1000} \times \gamma_c = 1.875kN/m^2$ $g_{k,flight} = g_{waist,global} + g_{stepped} + finishes = 7.199kN/m^2$ $E_{d,flight} = 1.35g_k + 1.5q_k = 15.718kN/m^2$ **Landing** $g_{k,landing} = \frac{waist}{1000} \times \gamma_c + finishes = 6.2kN/m^2$ $E_{d,landing} = 1.35g_k + 1.5q_k = 14.37kN/m^2$	**$g_{k,flight}$ = 7.199 kN/m²** **$E_{d,flight}$ = 15.718 kN/m²** **$g_{k,landing}$ = 6.2 kN/m²** **$E_{d,landing}$ = 14.37 kN/m²**

<table>
<tr><th>REFERENCE</th><th>CALCULATIONS</th><th>OUTPUT</th></tr>
<tr><td>§Reactions
Support Reactions</td><td>REACTIONS
Total factored load on the 1 m strip:
$W_{total} = 64.869kN$
Taking moments about A:
$R_D = \frac{\sum P_i x_i}{L_{total}} = 32.434kN$
Vertical equilibrium:
$R_A = W_{total} - R_D = 32.434kN$</td><td>$W_{total}$ = 64.869 kN
R_A = 32.434 kN
R_D = 32.434 kN</td></tr>
<tr><td>§Shear
Shear Force</td><td>SHEAR FORCE - KEY VALUES
Read off the equilibrium sweep of the free body:<table><tr><th>Node</th><th>x (m)</th><th>V (kN)</th></tr><tr><td>A (left support)</td><td>0.00</td><td>32.43</td></tr><tr><td>B (left kink)</td><td>1.30</td><td>13.75</td></tr><tr><td>flight mid</td><td>2.17</td><td>0.00</td></tr><tr><td>C (right kink)</td><td>3.05</td><td>-13.75</td></tr><tr><td>D (right support)</td><td>4.35</td><td>0.00</td></tr></table></td><td>V_{max} = 32.43 kN</td></tr>
<tr><td>§Moment
Bending Moment</td><td>BENDING MOMENT - KEY VALUES
Kink moments at landing / flight junctions:
$M_B = 30.022kNm$
$M_C = 30.022kNm$
Peak moment at the true zero-shear location:
$x = 2.175m$
$M_{max} = 36.039kNm$<table><tr><th>x (m)</th><th>M (kNm)</th></tr><tr><td>0.00</td><td>0.00</td></tr><tr><td>1.30</td><td>30.02</td></tr><tr><td>2.17</td><td>36.04</td></tr><tr><td>3.05</td><td>30.02</td></tr><tr><td>4.35</td><td>0.00</td></tr></table></td><td>M_B = 30.022 kNm
M_C = 30.022 kNm
M_{max} = 36.039 kNm</td></tr>
<tr><td></td><td></td><td></td></tr>
</table>

REFERENCE	CALCULATIONS	OUTPUT
§Diagrams Loading · SFD · BMD	Loading (ULS) and reactions **Loading of the structure (ULS)**  Shear Force Diagram **Shear Force Diagram**  Bending Moment Diagram **Bending Moment Diagram**  	**Loading · SFD · BMD**