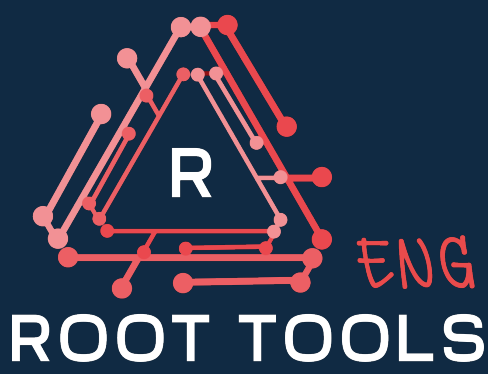
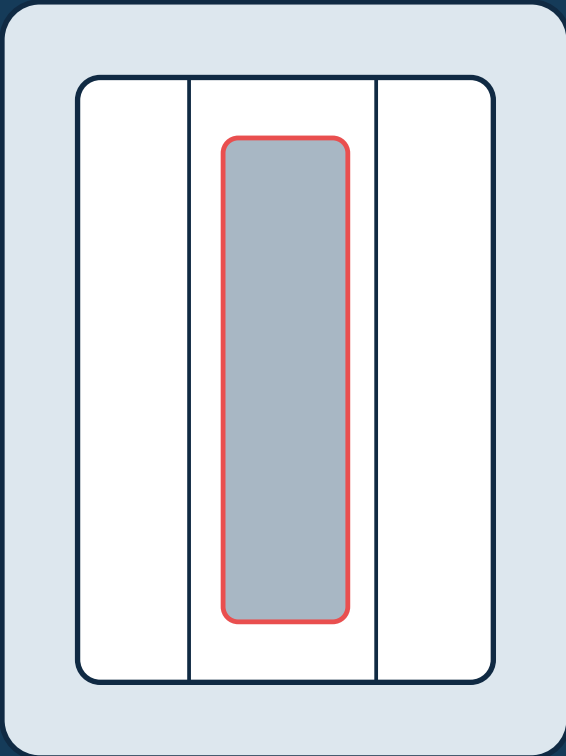
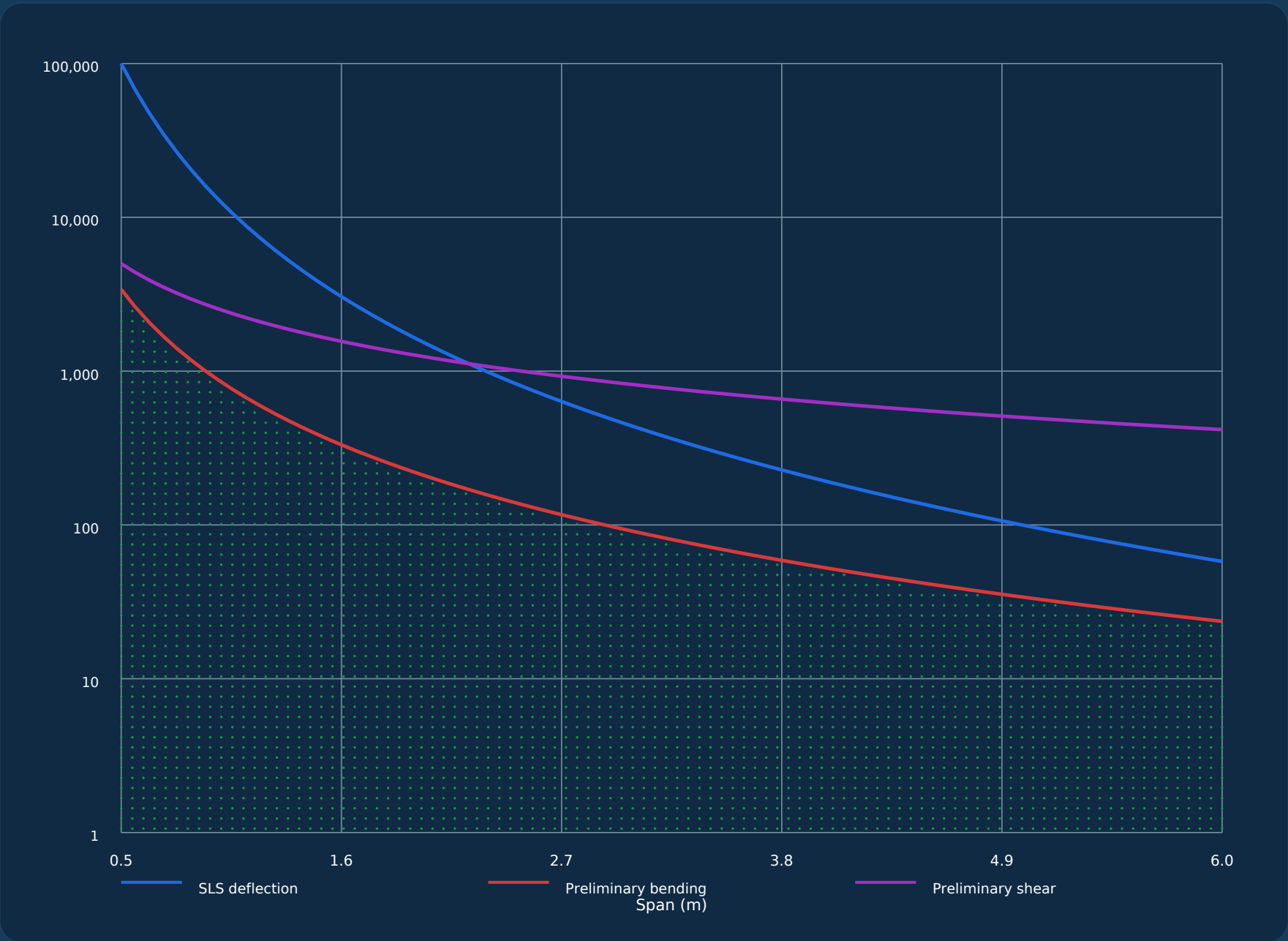




ALUMINIUM BEAM CHECK

Professional User Guide

VERSION 6.3.7 A2 EDITION UDL BEAM CHECK



SECTION

GEOMETRY

A focused engineering program for evaluating constant aluminium beam sections under one downward uniformly distributed load. The program reads section properties from the drawing, checks bending, shear and deflection, and produces a professional graphical report.

01

Purpose and product scope

A market-ready overview of what the program checks, what it produces, and how to use the results responsibly.



FAST SECTION INPUT

Select the complete closed beam geometry from the drawing or enter I_x , W_x and mass manually.



FOCUSED ENGINE

Bending, shear and serviceability checks for a single constant aluminium beam under UDL.



CLEAR STATUS LANGUAGE

Verified, declared, auto-estimated and not verified items remain visibly separated.



AUTOMATIC REPORT

A graphical 380 x 524 report is generated with date, time, results, chart and limitations.

PROGRAM SCOPE

- One constant beam section
- One downward UDL
- Simply supported, cantilever or fixed ends
- Aluminium EN AW-6063 material options
- Optional internal reinforcement
- Capacity overview or project check
- Automatic self-weight
- Graphical client report

Verification language used throughout the program

VERIFIED

DECLARED BY USER

AUTO-ESTIMATED

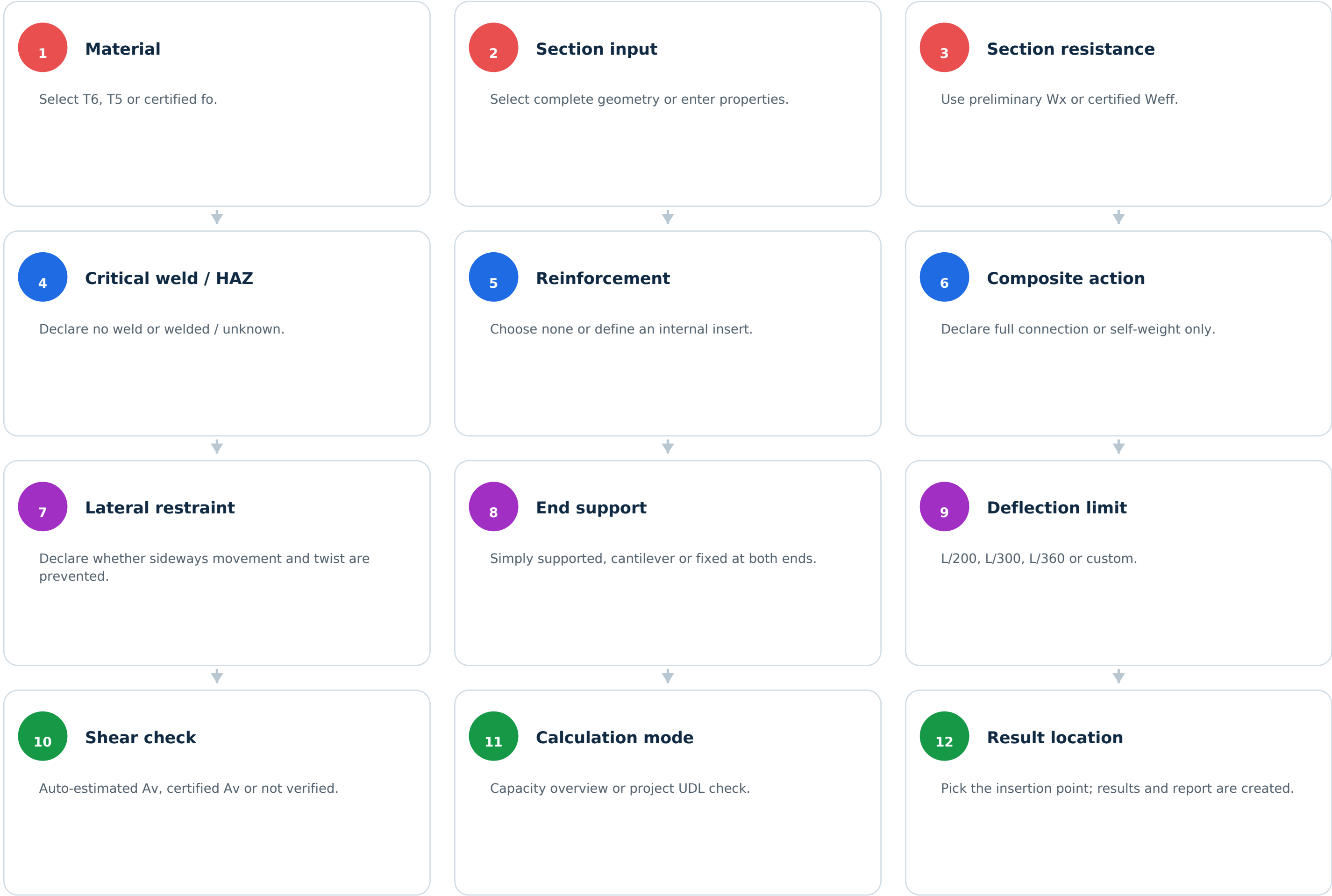
NOT VERIFIED

A result can be numerically within the calculated capacity while still remaining preliminary when local buckling, lateral stability, HAZ or shear area has not been fully verified.

02

Complete workflow

Follow the sequence below. Invalid entries return to the same step; the program does not silently replace them with another option.



Before starting

Use Model Space, finish any active command, select an unlocked current layer, and confirm that the drawing units are millimetres.

03

Main beam definition

Material, section geometry and resistance properties are defined before any structural check is performed.

1. MAIN BEAM MATERIAL

1

EN AW-6063-T6, fo = 160 MPa

2

EN AW-6063-T5, fo = 110 MPa

3

Enter a certified fo value

Use the manufacturer certificate when a project-specific value is available.

2. SECTION INPUT

1

Select the complete closed geometry

2

Enter Ix, Wx and mass manually

The drawing method also reads area, centroid and section depth.

3. SECTION RESISTANCE

1

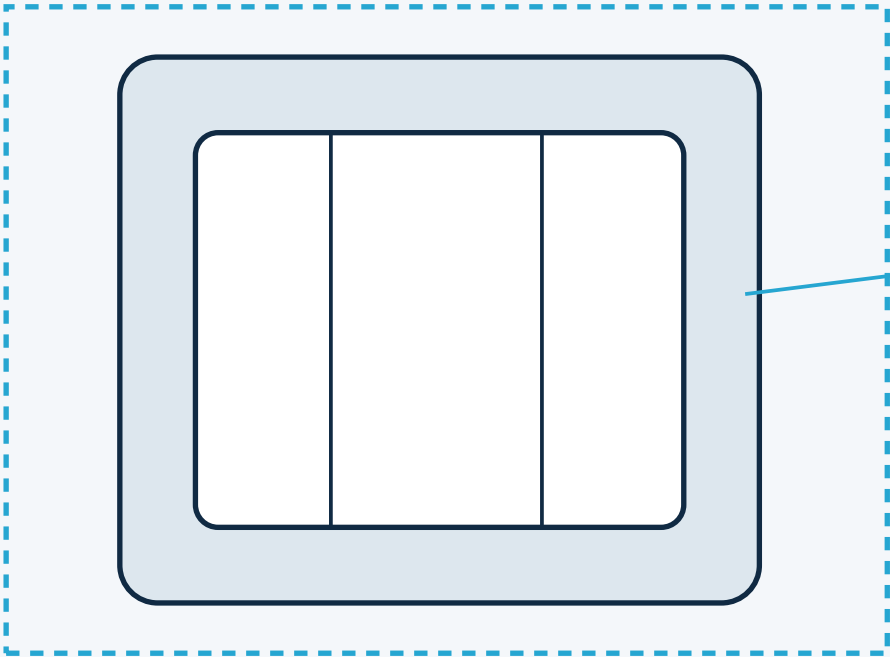
Preliminary check using gross Wx

2

Enter certified effective Weff

Certified Weff is preferred for slender or Class 4 sections.

SELECTING THE SECTION FROM THE DRAWING



Select the complete closed geometry

Selection rules

- Select one complete closed profile only.
- Use lines, 2D polylines, arcs, circles, ellipses or splines.
- Do not mix an existing REGION with source curves.
- Open gaps, duplicate geometry and disconnected profiles are rejected.
- The original beam geometry is not modified.

Manual input units

Ix: cm4

Wx / Weff: cm3

Mass: kg/m

fo: MPa

The program validates positive values and returns to the same input when the entry is invalid.

04

Reinforcement, weld and stability declarations

These steps determine whether the program can use composite stiffness and whether the result is fully or partially verified.

4. WELD AT THE CRITICAL SECTION

1

No weld at the critical beam section

2

Welded or unknown - HAZ remains not verified

For a one-piece extruded profile with no critical weld, select option 1.

7. SIDEWAYS MOVEMENT AND TWIST

1

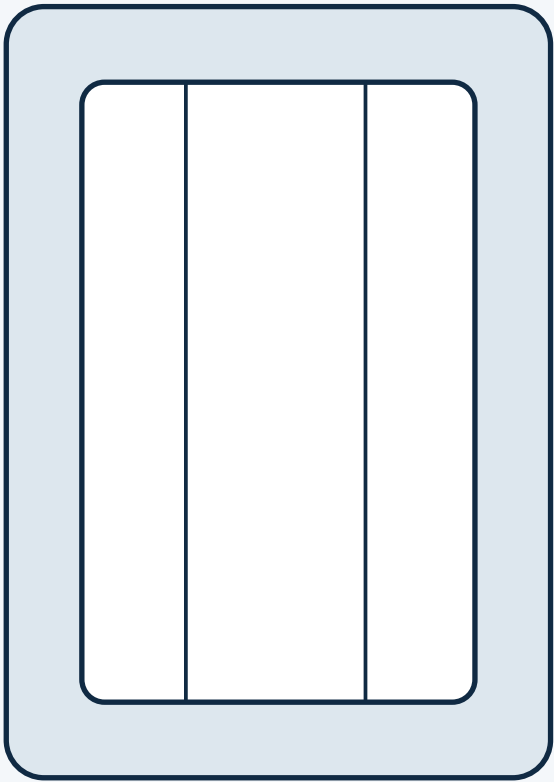
Yes - continuous lateral restraint is provided

2

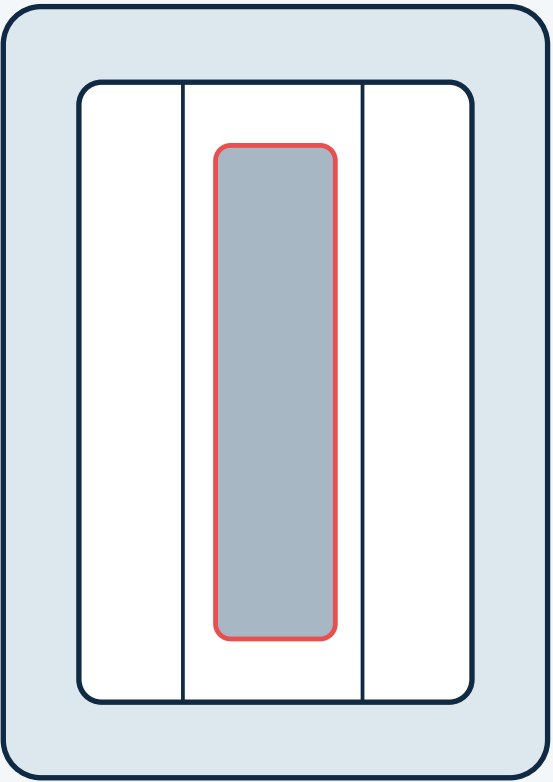
No or unknown - lateral stability remains not verified

This is different from the support condition at the beam ends.

5-6. INTERNAL REINFORCEMENT



No reinforcement



Internal insert

Program logic

Not present

Main beam only.

Present + no composite action

Insert self-weight is included; stiffness and resistance are ignored.

Present + full composite action

Elastic neutral axis, transformed EI and material stresses are calculated.

Reinforcement position

Vertical distance from the main beam centroid is required.

Composite model Elastic neutral axis: $y_{NA} = \frac{\sum(E A y)}{\sum(E A)}$

Flexural rigidity: $EI = \sum[E (I + A d^2)]$

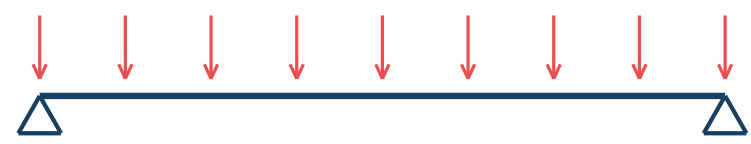
Composite action must represent continuous force transfer with no relative slip. Connection design remains outside this beam-capacity check.

05

End support, deflection limit and shear check

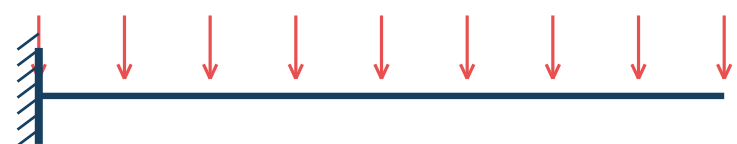
These inputs define the beam model and the governing SLS / ULS limits.

SIMPLY SUPPORTED



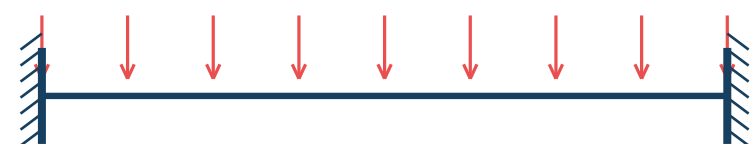
Both ends supported; rotation is free.

CANTILEVER



One end fixed; the other end is free.

FIXED AT BOTH ENDS



Both ends restrained against rotation.

8. DEFLECTION LIMIT

- 1

L/200

General structural movement
- 2

L/300

Tighter serviceability limit
- 3

L/360

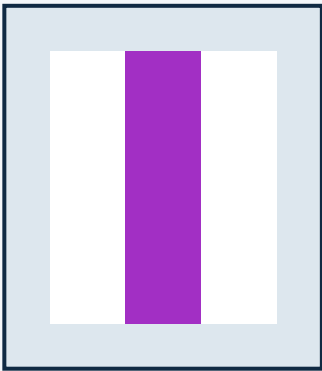
Sensitive finishes / glazing
- 4

Custom

Enter denominator n for L/n

Allowable deflection = span / selected denominator.

9. SHEAR CHECK



Effective shear area Av

- 1

Use auto-estimated Av from the selected geometry.
- 2

Enter a certified Av value.
- 3

Continue without shear verification.

$V_{Rd} = A_v \times f_d / \sqrt{3}$. Auto-estimated Av is clearly labelled preliminary.

The program offers two focused workflows. Both include beam self-weight automatically.

1. CAPACITY OVERVIEW

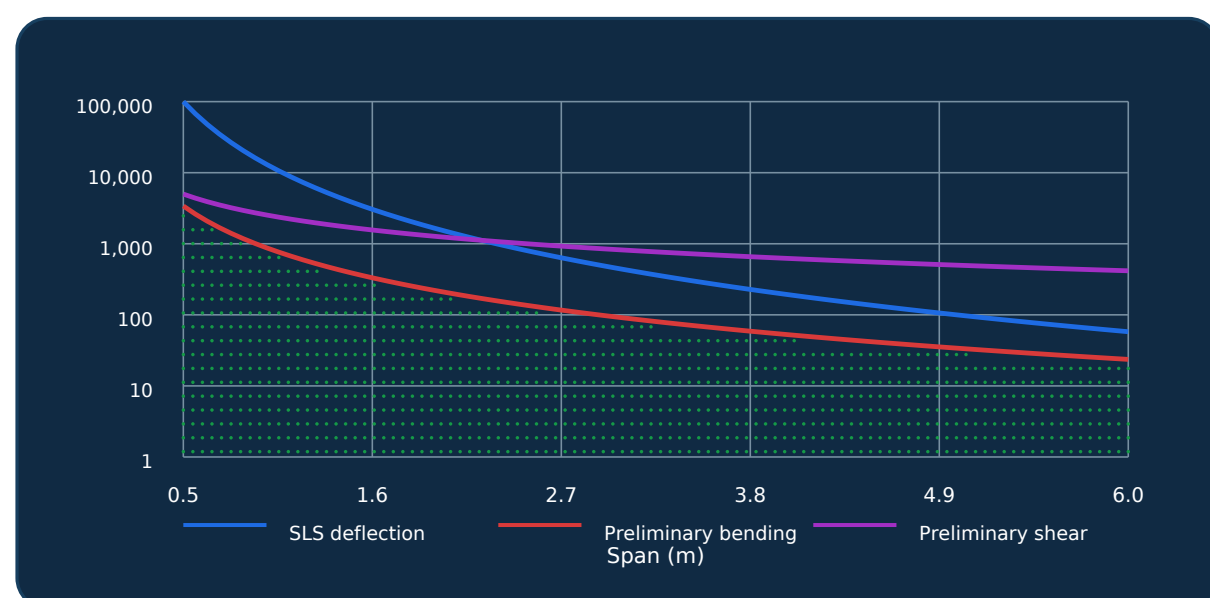
Answers: How much additional uniformly distributed load can this section carry across a range of spans?

Inputs

- Minimum span
- Maximum span
- All previously defined material and section conditions

Outputs

- Gross governing UDL including self-weight
- Net additional UDL excluding self-weight
- Net total additional load over each span



2. PROJECT UDL CHECK

Checks one actual beam span using permanent load G and variable load Q. The result includes SLS and ULS utilization.

Required inputs

Span m

Permanent UDL G kg/m eq.

Variable UDL Q kg/m eq.

Load combinations

SLS: $G + \text{self-weight} + Q$

ULS: $1.35(G + \text{self-weight}) + 1.50Q$

Do not add the beam self-weight to G. The program calculates and adds it automatically.

Area load conversion: line load (kg/m) = area load (kg/m²) x beam spacing (m)

Example: $80 \text{ kg/m}^2 \times 1.20 \text{ m spacing} = 96 \text{ kg/m line load.}$

07

Reading the capacity overview

The table and chart show the additional load capacity after deducting the beam self-weight.

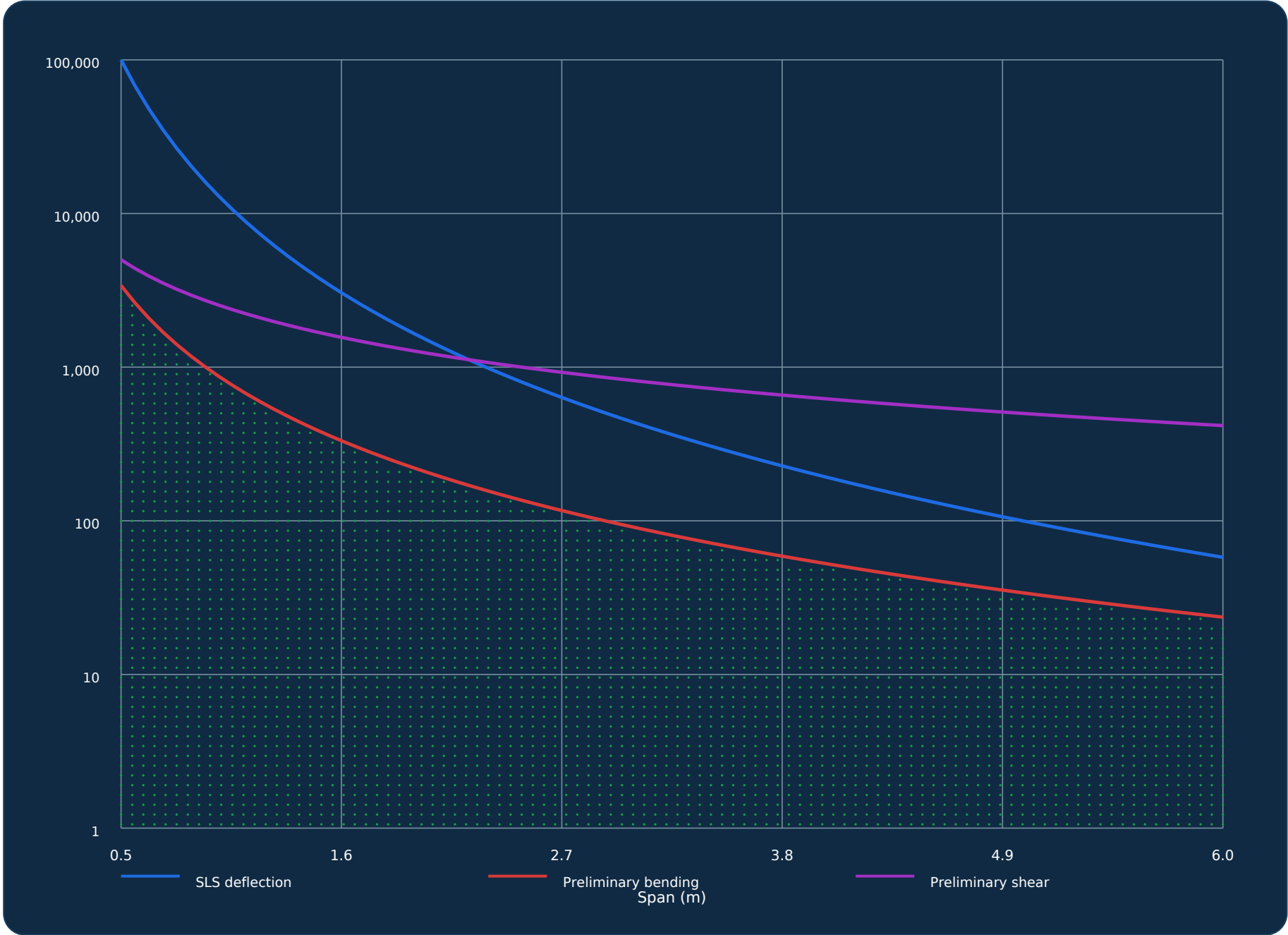


Chart key

- Blue - SLS deflection limit
- Red - Preliminary ULS bending
- Magenta - Preliminary ULS shear
- Green dots - Preliminary calculated capacity

Important

The green dotted zone represents calculated capacity only within the selected assumptions and verification status. It is not a universal safe zone.

CAPACITY TABLE - ILLUSTRATIVE FORMAT

Span (m)	Gross UDL incl. self	Net additional UDL	Net additional total	Governing limit
0.50	3,397.2	3,395.5	1,698	Prelim. shear
1.00	1,174.8	1,173.1	1,173	Prelim. bending
2.00	293.8	292.1	584	Prelim. bending
4.00	73.6	71.9	287	Prelim. bending
6.00	32.8	31.1	186	Prelim. bending

Gross UDL

includes beam self-weight

Net UDL

additional load only

Net total

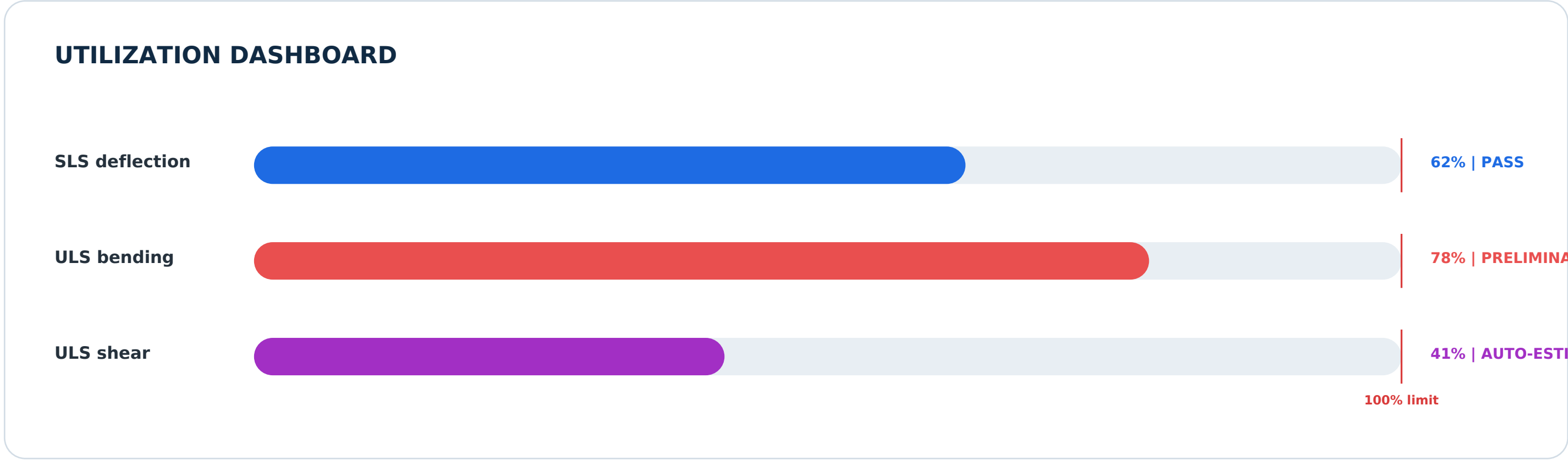
Net UDL x span

The governing curve is the lowest applicable limit at each span.

08

Reading the project UDL check

The program compares demand and capacity at the actual project span and reports utilization for each check.



PROJECT CHECK RESULTS

Check	Demand	Capacity / limit	Utilization / status
SLS deflection	12.4 mm	20.0 mm	62% PASS
ULS bending	1.123 kNm	1.440 kNm	78% PRELIM.
ULS shear	5.12 kN	12.50 kN	41% AUTO-EST.
Overall assessment		PARTIAL CHECK	

HOW TO INTERPRET

PASS

Calculated demand is within the selected limit.

FAIL

Calculated demand exceeds the selected limit.

PRELIMINARY

The numerical check is available, but one or more required verifications remain open.

DECLARED BY USER

The program records the user statement; it does not independently prove the condition.

Project input reminder

Enter only the additional permanent and variable line loads. The program adds the beam self-weight automatically.

09

Automatic client report

A professional graphical report is created immediately with the calculation output. No additional report input is required.



Report contents

- Drawing name and automatic reference
- Date and time from the computer
- Prepared-by user name
- Material and section properties
- Design basis and support condition
- Capacity chart or utilization chart
- Summary table and governing limit
- Verification status and scope limitations

Report size

380 x 524 drawing units

When the drawing uses millimetres, this equals 380 x 524 mm.

PDF / plot checklist

- Use a dedicated Layout or Window plot around the report.
- Use ACI 7 (White) so text follows the CTB plot style.
- Confirm lineweights in Plot Preview.
- Keep the green capacity hatch as a dotted pattern.
- Verify page scale and orientation before sending.

10 Troubleshooting and validation

Common messages are designed to protect the drawing and return the user to a safe step.



AutoCAD busy

Finish or cancel the active command, then run the program again. VBARUN itself is allowed.



Model Space required

Switch to Model Space. The program does not create the beam check in Paper Space.



Locked current layer

Select an unlocked layer before running the program.



Invalid profile selection

Check for open gaps, duplicates, mixed REGION/curves, disconnected loops or unsupported objects.



Invalid numeric input

Read the permitted range in the message and re-enter the value. The step remains active.



Certified Weff exceeds Wx

Recheck units and the certified source. Weff must not exceed the gross elastic Wx used by the program.



Automatic Av unavailable

Use a certified Av or continue with shear not verified.



Report creation warning

The beam results remain available even if the report cannot be completed.

Recommended validation before client use

- Run Debug > Compile after importing a new release.
- Test simply supported, cantilever and fixed-end cases.
- Keep an archived copy of the validated program version.
- Compare one simple solid or rectangular hollow section with an independent calculation.
- Review Plot Preview with the intended CTB file.

11 Quick reference

A single-page field checklist for daily use.

INPUT SEQUENCE

- 1

Material

T6, T5 or certified fo
- 2

Section input

Complete drawing geometry or manual properties
- 3

Section resistance

Gross Wx preliminary or certified Weff
- 4

Critical weld / HAZ

No weld or welded / unknown
- 5

Reinforcement

None or internal insert
- 6

Composite action

Full connection or self-weight only
- 7

Lateral restraint

Yes or no / unknown
- 8

End support

Simply, cantilever or fixed ends
- 9

Deflection limit

L/200, L/300, L/360 or custom
- 10

Shear check

Auto Av, certified Av or not verified
- 11

Calculation mode

Capacity overview or project UDL check
- 12

Result location

Pick insertion point

KEY FORMULAS

Self-weight = area x 0.0027 kg/m

SLS = G + self-weight + Q

ULS = 1.35(G + self-weight) + 1.50Q

MRd = fd x W

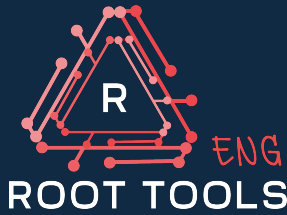
VRd = Av x fd / sqrt(3)

Allowable deflection = L / limit

RESULT STATUS

- VERIFIED
- DECLARED BY USER
- AUTO-ESTIMATED
- NOT VERIFIED
- PRELIMINARY

CONTACT



ROOTHUBS LTD

Website: roothubs.com

Email: info@roothubs.com

Phone: 050-9917798

Phone: 053-9487653

International: +44 7537 126305

Document use

This guide explains ROOT TOOL v6.3.7 as a focused preliminary aluminium beam-capacity program. Always retain the calculation assumptions and verification status in the client report.