

Scan&Solve™ Cheat Sheet for Units and Loads

Supported Unit Systems

Scan&Solve for Rhino performs analysis in 5 different unit systems:

Analysis Units	Rhino Units	Gravity	Mass	Force	Stress	Length
MKS (m.kg.s)	Meters	9.81 m/s ²	kg	N	Pa	m
CGS (cm.g.s)	Centimeters	981 cm/s ²	g	dyne	dyne/cm ² (Barye)	cm
MMS (mm.Mg.s)	Millimeters	9810 mm/s ²	Mg	N	MPa	mm
FPS (ft.lbf.s)	Feet	32.2 ft/s ²	slug (lbf.s ² /ft)	lbf	lbf/ft ²	ft
IPS (in.lbf.s)	Inches	386.4 in/s ²	slinch (lbf.s ² /in)	lbf	psi	in

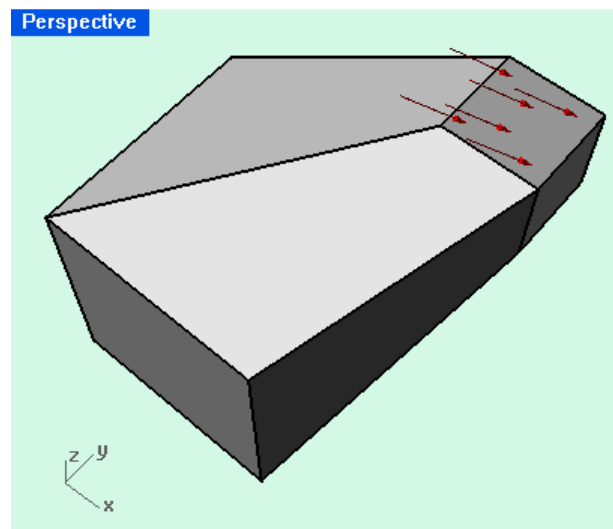
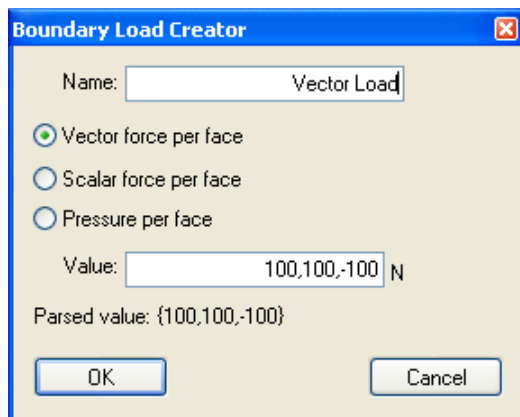
The analysis units are chosen by Scan&Solve based on the length units used to model in Rhino. If the units in use by Rhino are not supported by Scan&Solve, the MKS system of units is used.

Loads

Scan&Solve currently supports 3 types of loads: Vector Force, Scalar Force, Pressure. Each is described in the pages that follow.

Vector Force per Face

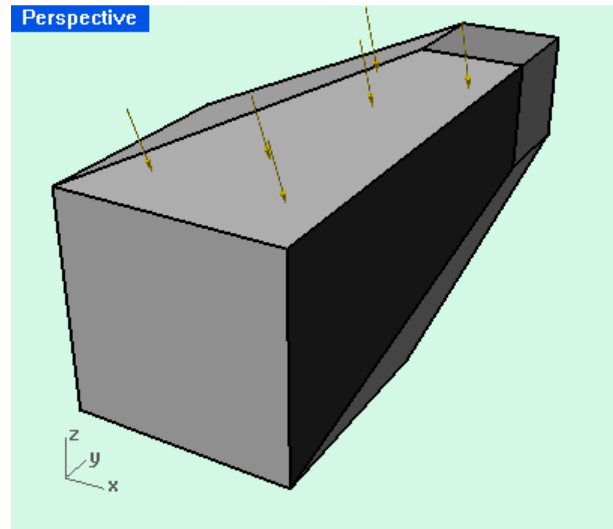
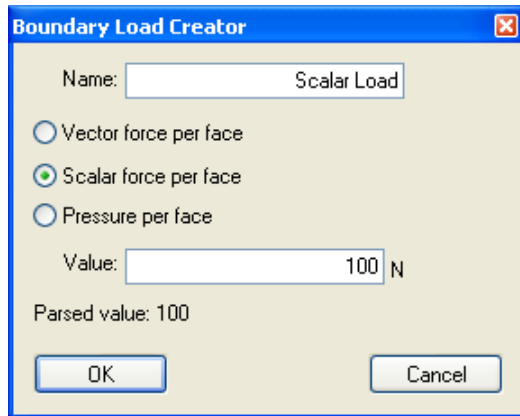
A “Vector force per face” load is a force load applied to a face in a specified direction. This type of load is analogous to pressing on the top of a book to push it across a table. The force is specified by entering the components of the force in each coordinate direction. If multiple faces are selected, the specified force is duplicated on each face. Vector loads are annotated with red arrows in the direction the force is applied.



Example vector load applied to the face of a solid. The components of the force are 100 N in the X-direction, 100 N in the Y-direction, and 100 N in the negative Z-direction.

Scalar Force per Face

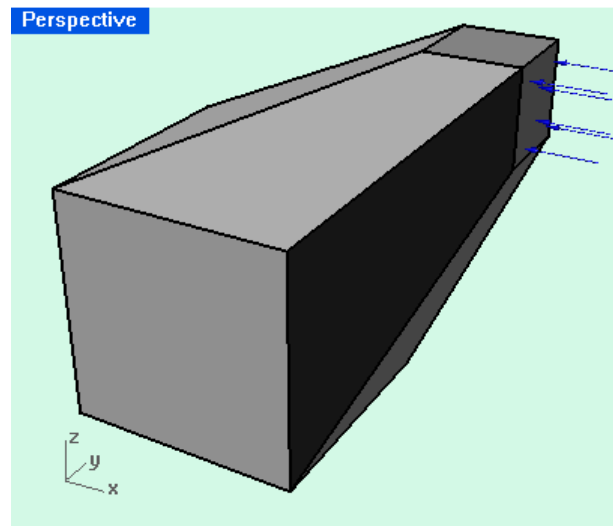
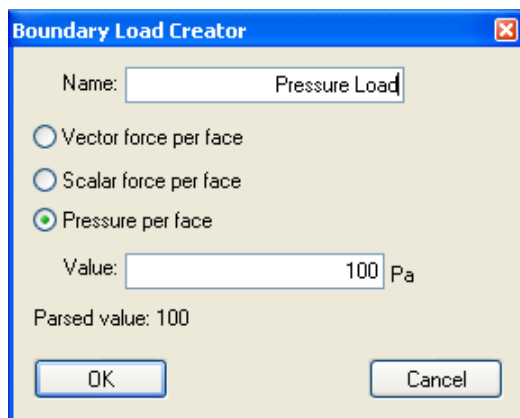
A “Scalar force per face” load is a load specified in terms of the total force to be applied over a face. This type of load is akin to pushing on a facet of a soccer ball; where the amount of force may be known, but the direction might only be described as “inward”. Positive loads push into the surface, negative loads pull on the surface. If multiple faces are selected when the load is specified, the specified force is duplicated on each face. Scalar loads are annotated with yellow arrows in the direction of the applied load.



Example scalar load applied to a face of a solid. A total of 100 N is distributed evenly over the face, in a direction perpendicular to the surface at each point.

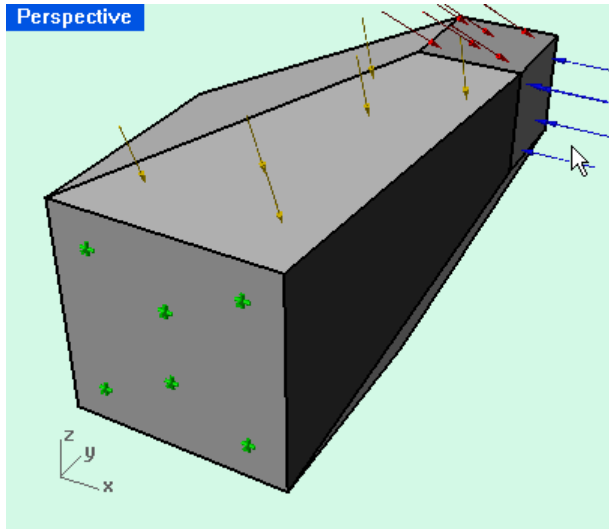
Pressure per Face

A “Pressure per face” load is a load specified in terms of force per unit area. Positive pressures push into the surface, negative pressure pull. Pressure loads are annotated with blue arrows in the direction of the applied pressure. Examples of pressure loads include wind on the side of a building or the air pressure keeping a soccer ball inflated.

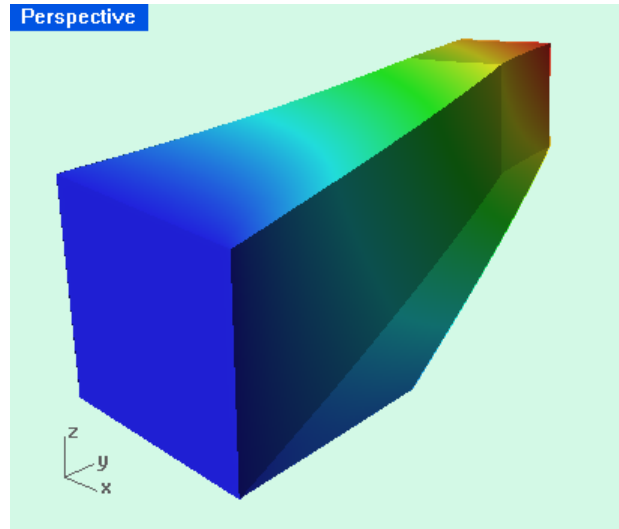


Example pressure load applied to a face of a solid. A pressure of 100 Pa (N/m^2) is applied in a direction perpendicular to the surface at each point.

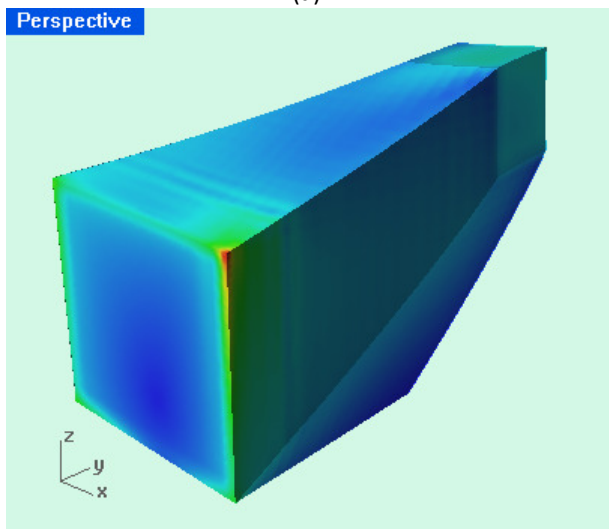
Example Result



(a)



(b)



(c)

Figure shows results after restraining the near face and applying the previously described loads.

(a) Shows the restraints and boundary conditions.

(b) Shows the loaded with exaggerated deflection. The color scale corresponds to the total deflection, blue corresponds to the minimum deflection, and red corresponds to the maximum.

(c) Shows the von Mises stress computed for the specified restraints and loading. Red corresponds to highest stress, blue corresponds to the lowest.