



A Product of MechaTools Technologies,  
The Numerical Simulation in Engineering

**ShapeDesigner** is an advanced general beam section calculator. **ShapeDesigner** calculates, the cross-sectional torsion and flexural structural properties, including torsion (J) and warping (Cw) constants, normal, warping and shear stresses. **ShapeDesigner** is a useful tool for structural engineers, design or analysis of steel, aluminum, and polymeric or composite materials sections, *these properties are absolutely necessary for the design in static, free vibrations, dynamic and buckling analysis.*

**ShapeDesigner** calculates the stresses distribution including normal stresses, warping and shear stresses, also the equivalent Von-Mise stresses, principals stresses and residual stresses are given.

• **Warping and Torsion Properties**

Shape Designer makes no assumptions or restrictions on the calculation of shear and torsion properties. Shape designer use an advanced and efficiently finite element approach to calculate these constants, for more complicate properties see user's manual. For more information, see our web site.

• **Viewing Properties**

When you draw a shape and specify its material properties, as each change is made the sectional properties are automatically recalculated.

• **Mass moment of inertia and Axi-Symmetric bodies**

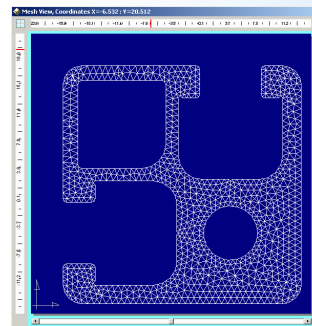
With shape designer you can also perform calculation of mass moment of inertia for non-homogenous, extruded solid and axi-symmetric bodies. Geometric properties computed by shape designer are: Area, volume, center of gravity and mass moment of inertia about x-axis and y-axis (polar mass).

• **Shape Optimization**

Optimization, give you many possibilities, the principal one is, that you can get one shape or more, by giving some constraints. Constraints can be applied to all the parameters and properties of the shape, to applied constrain to a parameter (ex. Area), you must input the upper and lower values

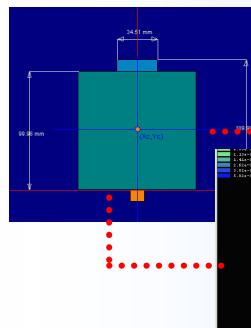
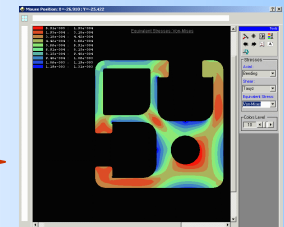
• **Axial Stress Distribution (Bending moment effects)**

You can get the stress distribution, you just move a mouse over the section and select the position of the axis that you want see the stress distribution. The axis moves also dynamically. This is applicable for the original and transformed composite sections.

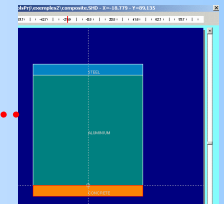


Finite element Mesh of the section: for advanced torsion, warping and stress analysis.

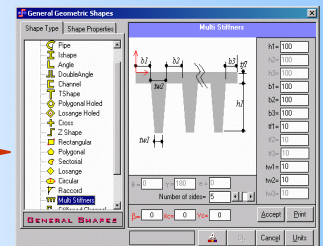
Visualization of the stress distribution: Axial, shearing and warping stresses and more...



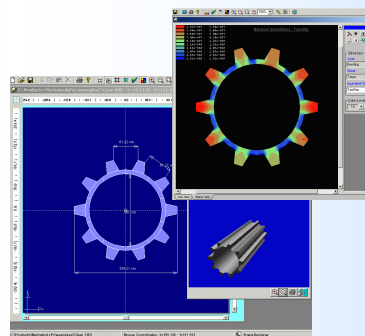
Composite section visualization of the transformed composite section



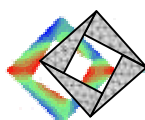
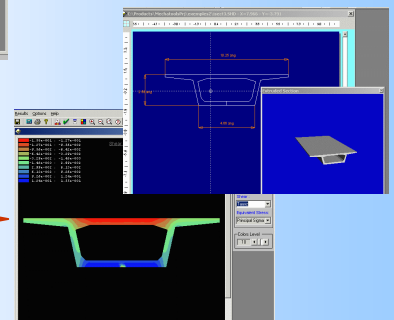
General and Standards Geometric Shapes: For fast sketching a predefined and parametric shapes with custom dimensions



Stresses Distribution: Calculation of the geometric properties of gear shaft section, used in the systems with rotors in mechanics



Visualization of the 3D extruded section: Box-girder bridge cross section, and visualization of the stresses





# ShapeDesigner™

MechaTools Technologies

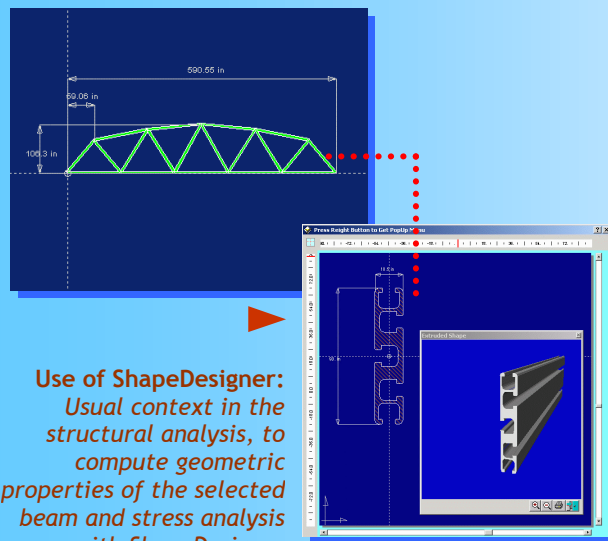
*ShapeDesigner is an Engineering Value Added.  
It is a complementary and essential design tool for all  
the users of structural and finite elements software*

## Key Program Features

- Selection of materials and properties from a library
- Multi-criterion Optimization for standards sections
- Advanced Integrated CAD for sketching and drawing
- Pan, rotate and zoom using the mouse or keyboard
- Copy, paste and delete commands
- Integrated automatic 2D mesh generator
- Library of commonly used complex and standards sections
- DXF import-export
- Isocolour representation of the stresses
- Stresses results are Normal, warping, shear, Von-Mises stresses, and principal stresses.
- Professional output results
- Integrated units converter
- Adding dimensions and notes
- Locate the plastic neutral axes of a composite section
- View the transformed composite section with stress distributions
- Residual stress state representation
- Elastic-plastic bending analysis
- Detailed user's manual with practical examples and references.

### The geometric and structural calculated properties:

Mass	Mass of the extruded section
Volume	Volume of the extruded section
Area	Area of the section
CMass	Mass of the extruded transformed composite section
Cvolume	Volume of the extruded transformed composite section
C Area	Area of the extruded transformed composite section
Ixx	Moment of inertia about x-axis
Iyy	Moment of inertia about y-axis
Ixy	Product of inertia about origin o
Io	Polar moment of inertia about origin o
rx	Radius of gyration about x axis
ry	Radius of gyration about y axis
Ixc, Ixp	Moment of inertia about centroid x axis, about principal x axis
Iyc, Iyp	Moment of inertia about centroid y axis, about principal y axis
rxc, rxc	Radius of gyration about centroid x axis, about principal x axis
ryc, ryc	Radius of gyration about centroid y axis, about principal y axis
Ioc, Iop	Polar moment of inertia about centroid c, about origin p
$\beta$	Angle of orientation (direction) of the principal x axis
Imax	maximum magnitudes of principal moment of inertia
Imin	minimum magnitudes of principal moment of inertia
J	Torsion constant
Cw	Constant of warping
Stopx	Elastic Modulus about x-axis at top
Sbotx	Elastic Modulus about x-axis at bottom
Stopy	Elastic Modulus about y-axis at top
Sboty	Elastic Modulus about y-axis at bottom
Zpx	Plastic Modulus about x-axis
Zpy	Plastic Modulus about y-axis
fx	shape factor in x(Plastic neutral) direction
fy	shape factor in y(plastic neutral) direction
$\theta$	Angle of orientation of the neutral axis
PNA	Position of the plastic neutral axis
xc	x location of centroid
yc	y location of centroid
xs	x location of shear center
ys	y location of shear center
Mpmax	Fully plastic moment
Memax	Maximum elastic moment.
$\beta_x, \beta_y$	constants of stability



**Use of ShapeDesigner:**  
*Usual context in the structural analysis, to compute geometric properties of the selected beam and stress analysis with ShapeDesigner*

**Results window, in addition to the graphical output and the saved results in ASCII format**

Variables	Values
Area	+57.2000E+...
Total Masse	+11.5955E+...
Volume	+57.2000E+...
Centroide Xc	+11.9407E-01
Centroide Yc	+27.0768E-01
J (Torsion Co...)	+33.9690E+...
Cw (Warping ...)	+24.3430E+...
Xs Shear Ce...	+73.0450E-02
Ys Shear Cen...	+28.4340E-02
Neutral Angle...	-53.1545E-01
Elastic Sectio...	+10.1204E+...
Elastic Sectio...	+87.9760E+...

### System Requirements

- 100 MHz Pentium® class or higher processor
- Microsoft® Windows® 9x/NT®/2000/XP
- 32 MB (64 MB recommended)
- 20 Mo of available hard disc space
- CD-ROM drive and mouse

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