



## SJ MEPLA Version 4.0 August 2015

The dimensioning and stress calculation of structural glass is a standard task of the daily engineering practice. Panes varying from a rectangular form, point supported glass or laminated glass can no longer be calculated by tabulations or formula but have to be evaluated by the method of the finite elements. For insulating glass units, there is hardly a possibility for calculation if any shape, any kind of fitting, laminated glass, the gas pressure law or geometrically non-linear approaches shall be considered.

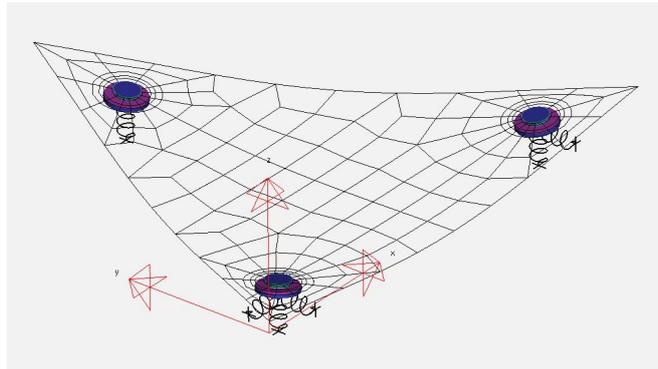
This is where this program SJ MEPLA applies:

All inputs, like the geometry, the bearing conditions, the kind of loads, the calculation approach or the requested output, are guided and displayed by input masks. The control and output of the results occurs visually in a graphics window and some calculation protocols, which can be used for the design assessment. Special new finite element methods allow the simple input and quick calculation of sandwich structures (laminated glass), so that the entire problem can be solved at shortest time (within a few minutes). Thus the program is suited for static calculations as well as also for dimensioning, for which it offers a variety of calculation possibilities:



## Geometry

- Automated mesh generation for any system build from straight or curved borders only by defining the corner points
- Mesh refinement by only one element size value (The user, however, is not aware of the fact that he is working with a Finite Element Program).
- Any system shapes including cut-offs and holes are possible
- The mesh including point support is build automatically too

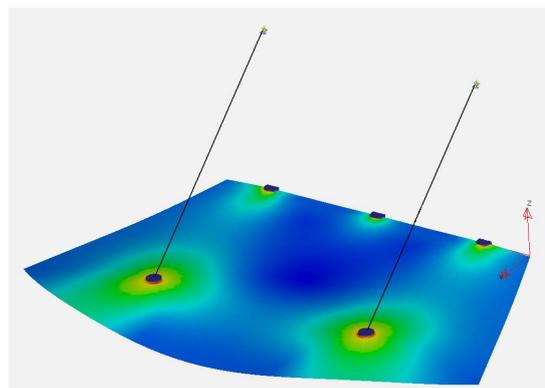
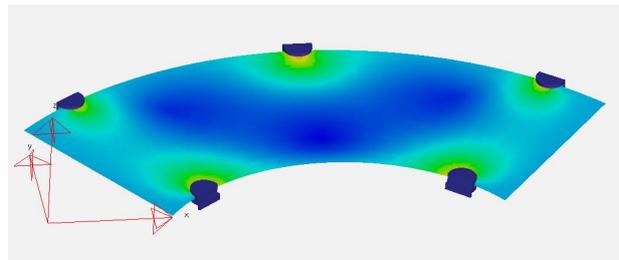


## Layer

- Laminated glass considering the stiffness of the compound material PVB. The user has only to define the layer order.
- Sandwich theory is used
- Any layer design up to 20 layers is possible - even for insulating glass
- Calculation of insulation glass considering the real gas pressure law
- Up to 3 gaps under any loading (climate loads like pressure differences, thermal expansion of the gas, external loads, pendulum impact,...) can be given

## Boundary Conditions

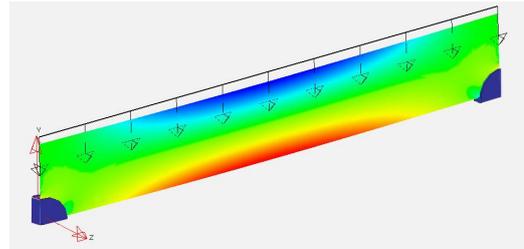
- Automated generation of point fixings only by defining the position
- Eccentricities for bending effects are considered
- Properties of the point fixings can be stored in a database and can be directly chosen for insertion
- All point fixings can be calculated with contact algorithms
- Countersunk, disk or special fixings with covering layers
- Balustrade clips with circular or angular shape (usable as glass shoes for e.g. glass beams or fins)
- Downholders with circular or angular shape
- Bonded point fixing without a generated hole
- Special insulated glass fixings
- Considering the stiffness of the sub--construction or special mechanisms (e.g. a ball shaped head)
- Applying also loads or moments at point fixings
- Optional use of springs or tie bars at the point fixing



- Point supported insulating glass units
- Spacers in insulation glass (e.g. unsupported borders)
- Elastic edge or line supports including contact conditions
- Elastic beams acting at the borders
- Any position of local springs with translational and rotational degrees of freedom
- Elastically bonded edges and structural glazing

## Loads

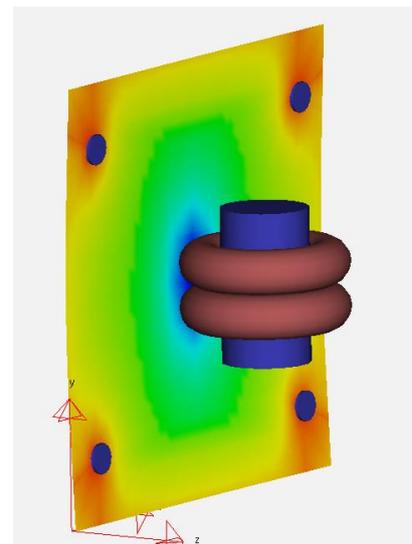
- Face loads, line loads, water pressure, dead weight
- Any point loads distributed over a definable area
- All loads can be combined
- Calculation of stresses resulting from temperature differences given for each layer
- Dynamical calculation of the pendulum impact for single-layer glass, laminated and insulation glass of any design
- The drop height of the pendulum and the impact point can be chosen freely
- Dynamically calculated pressure hits like wind blasts
- Calculation of load cases with any combinations of loads by related safety factors



### (NEW V4.0)

Automated load case generation and design proof

- Standard/Codes can be set freely
- Preset Codes: DIN 18008, TRLV or rudimentary ASTM E1300
- Automated load case generation depending on pre-selected loads
- Optional load combination rules are possible



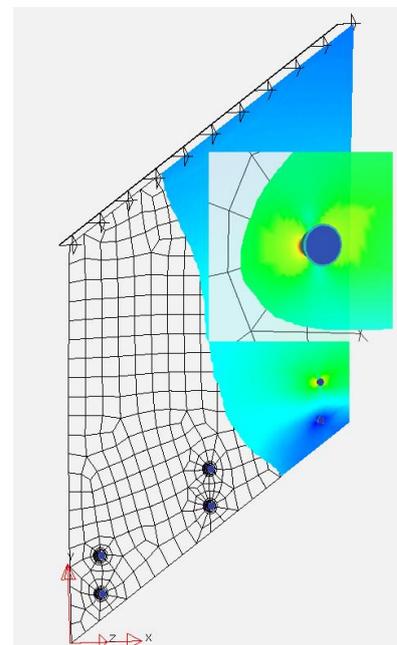
## Options

- All subsequent calculations can be made linear or geometrically non-linear (large deformations)
- Special output selections like reaction forces ,...
- Additional output points possible for special stress and deflection results
- In-Core or Out-Of-Core solver for largest projects

### (NEW V4.0)

Design Check related to preset Norm/Standard

- Checking load resistance or servability or both in one calculation
- Considering of load duration effects in resistance ( $k_{mod}$  or other)
- Parallel check of free glass edges with reduced strength



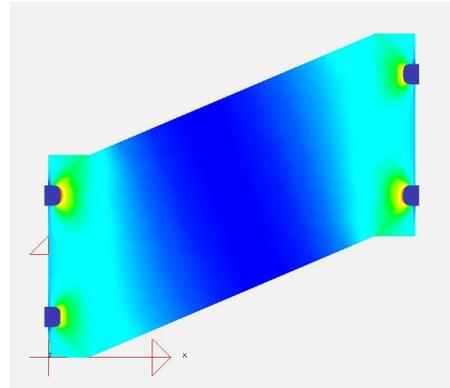
- Parallel check of coated glass surfaces (enamelled)
- Proof of shortening effects
- Considering special factors for laminated glass

**(NEW V4.0)**

Enhanced multiprocessor usage (parallel computing) for faster solution process

## Results / Graphics

- Output of curve diagrams for forces, deformations and stresses during the impact period for any predefined position
- Printable protocol for the structural assessment including all settings, maximum stresses, deflections, reaction forces
- Multi-language protocol version (German, English, French, Dutch, Italian, Spanish, Portuguese and new Polish, Czech)



**(NEW V4.0)**

Additional protocol with load case results and resistance check

- Tabulated condensed output
  - Open format to be used in any word processing program
  - Tabulated listing of each load case result
  - ULS and SLS design check
- Manifold evaluation possibilities in the post-processor
  - Stresses over the plate thickness and the layer order at any point
  - Display of the pendulum impact in slow-motion
  - Output of all stress components
  - Display of the spring reaction forces
  - Vector-plot of the principal stresses
  - Magnification of deformations and much more

## References

- See Internet <http://mepla.eu/en/references>

