

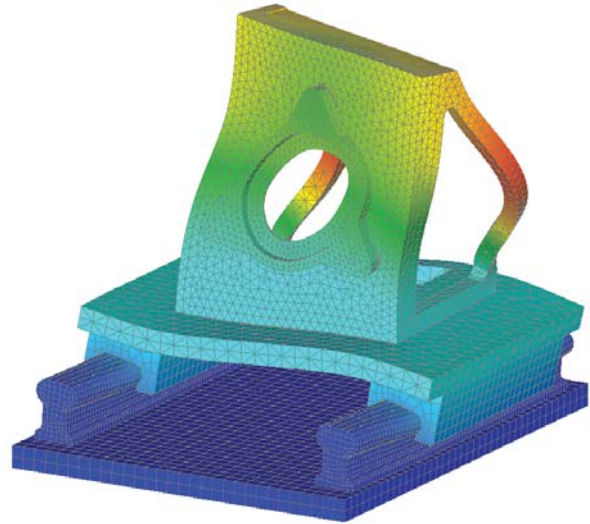
# Automated Contact Generation in NEi Nastran

## Application of Contact Generation in Industry

Modeling contact in large complex shell-like structures that are found in products like ships, aircraft, and automobiles is very time consuming, labor intensive, and tedious. NEi Nastran has unique tools not found in traditional pre-processors that automates contact generation in models resulting in dramatic increases in productivity. NEi Nastran's Automated Surface Contact Generation (ASCG™) and Automated Edge Contact Generation (AECG™) create contact between two discontinuous bodies. User input is significantly reduced, increasing productivity while reducing user-induced error. Parts can be easily remeshed and moved because there is no need to update contact definitions.

## Benefits of ASCG and AECG

- Significant productivity improvements over traditional preprocessor setups
- Rapid meshing is now possible, eliminating the need for large amounts of labor intensive meshing
- User error in contact surface definition and coupling is avoided
- Control of contact surface type can take place in the solver input file
- Parts may be remeshed or moved with no other changes required
- Parts may be moved in the solver input file via local coordinate systems

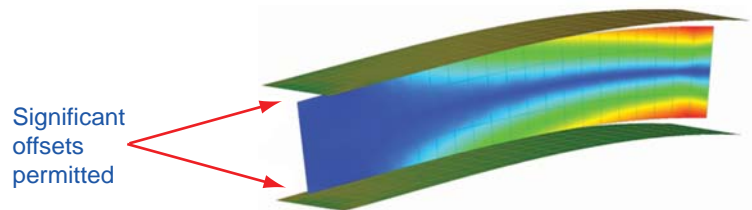
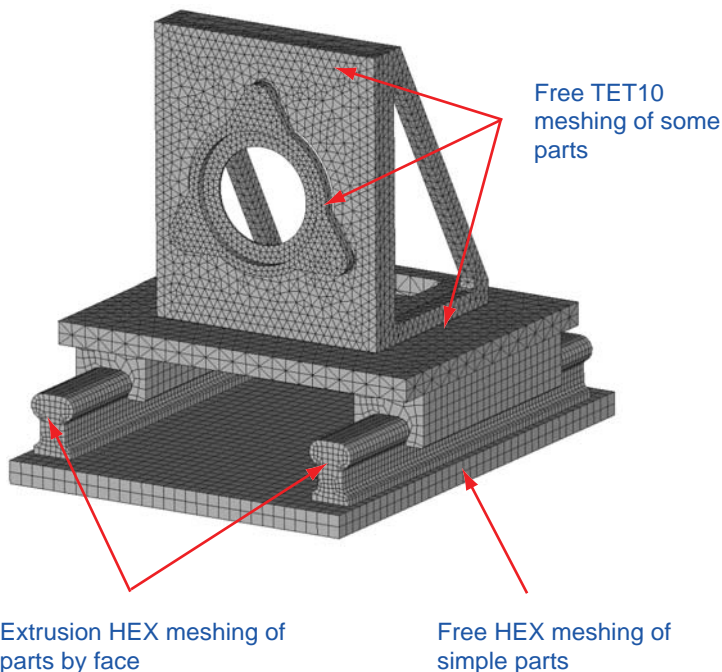


## Automated Surface Contact Generation (ASCG)

- ASCG connects multiple nodes on one part to multiple nodes on another part
- Nodes are not required to line up, allowing for dissimilar meshes
- Penalty Stiffness method between Master and Slave Nodes
- Configuration is updated in nonlinear analysis
- Conforming stiffness connection in linear analysis

## Automated Edge Contact Generation (AECG)

- Offset Weld contact - New contact type, allows for welded connections with significant separation between contact edges/surfaces
- Free edges contacting surfaces identified automatically
- Edge to face welding carried out automatically, offsets and gaps between edges and faces are permissible
- Nodes are not required to line up, allowing for dissimilar meshes

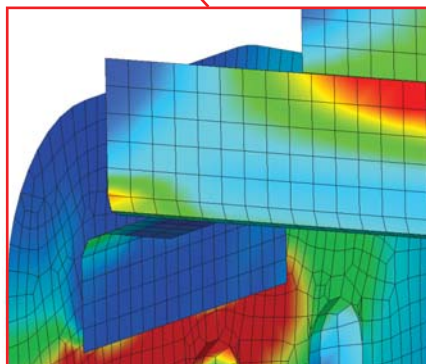
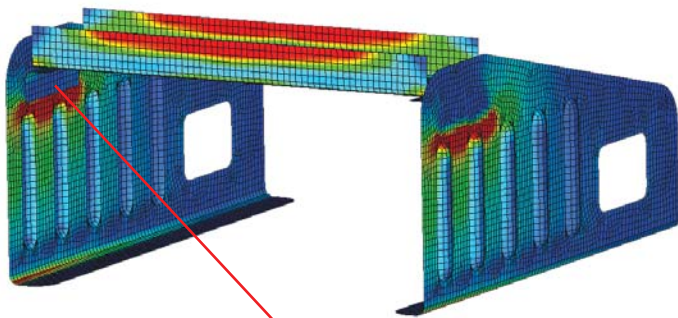


Mid surface solid models are ideal candidates. No need to close gaps.

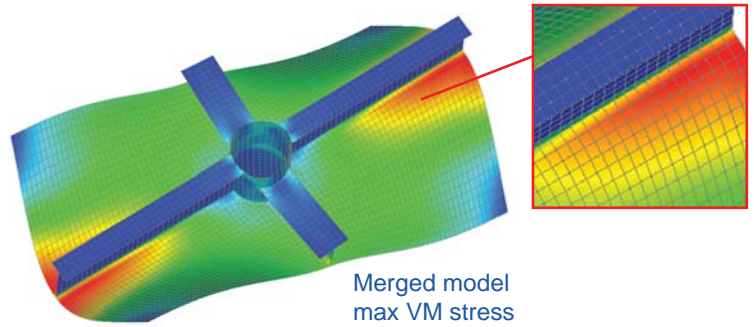
# Automated Contact Generation in NEi Nastran

## User Input

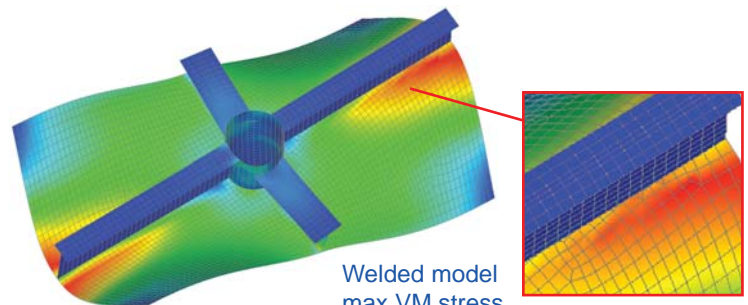
- Choose type of contact to be generated (i.e., general, welded, bidirectional sliding, rough, or offset weld)
- Designate which elements should be considered for each contact pair generated (optional, default is all elements)
- Specify near tolerance for objects to be considered in contact with each other (optional, default is based on model size)
- Advanced contact options for friction, stiffness scale factor, contact activation distance, allowable penetration, and surface offset available



Offsets and gaps between edges and faces are permissible



Merged model  
max VM stress  
1.03E+9

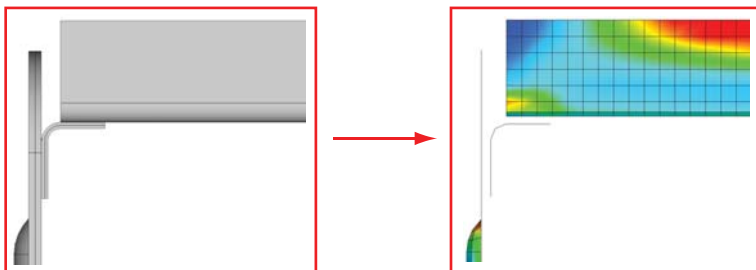


Welded model  
max VM stress  
1.09E+9

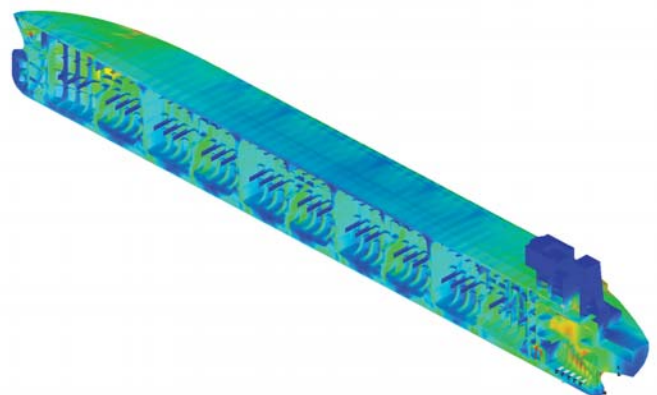
Free edges that contact surfaces can be identified and welded automatically. Element congruence is not required.

## Other Applications

- Rapid overlay of composite reinforcement straps using shells
- Local coordinate system origin becomes an optimization parameter to drive part positioning
- Fast idealization of honeycomb panels with complex curvature - core and face sheets meshed independently
- Dissimilar mesh coupling for hydrodynamic solutions
- Ideal for mid-surfaced solid models and large thin shell fabrications such as ship structures



Quickly analyze midsurface models without manually stitching the mesh



Major productivity gains for large complex models like ships, aircraft, and automobiles