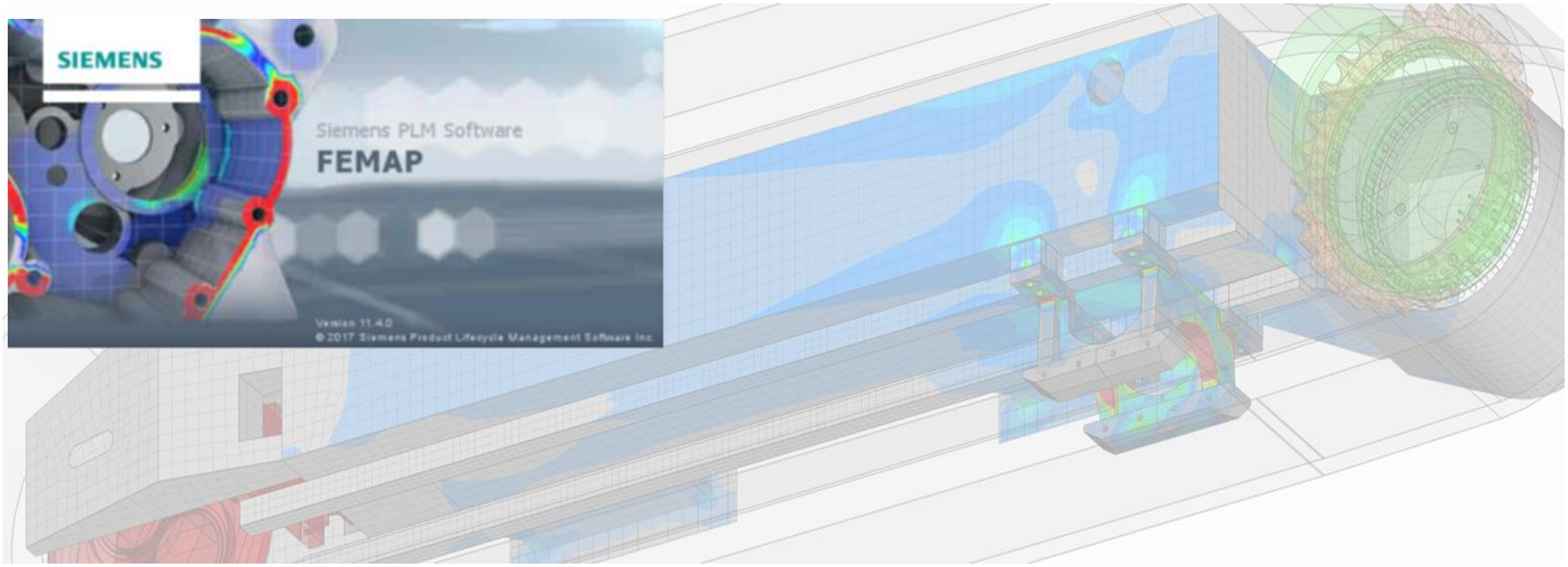

Global-Local Modeling

A Seminar for FEMAP and NX Nastran Users

Adrian Jensen, PE - Senior Staff Mechanical Engineer

Brian Kolb – Staff Mechanical Engineer

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Senior Systems Engineer
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Interested in becoming a client or in training?

Please contact Andy Whitesides
(503) 962-0287
Andy.Whitesides@AppliedCAx.com

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We do this *every day*

TABLE OF CONTENTS

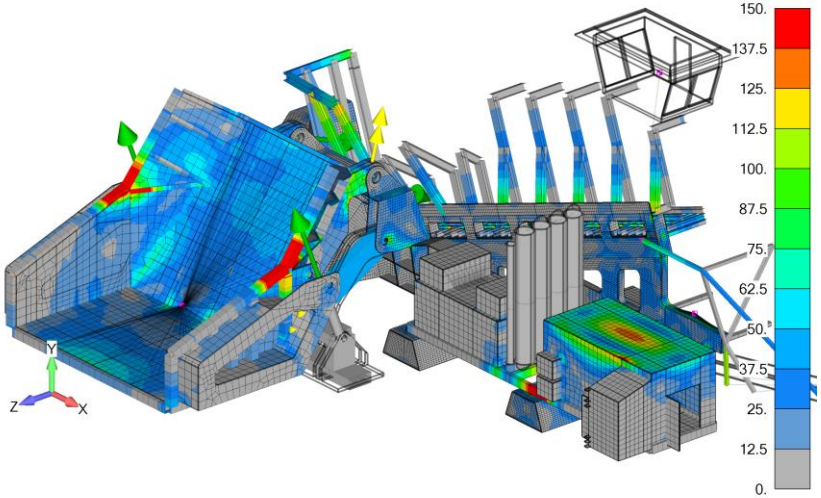
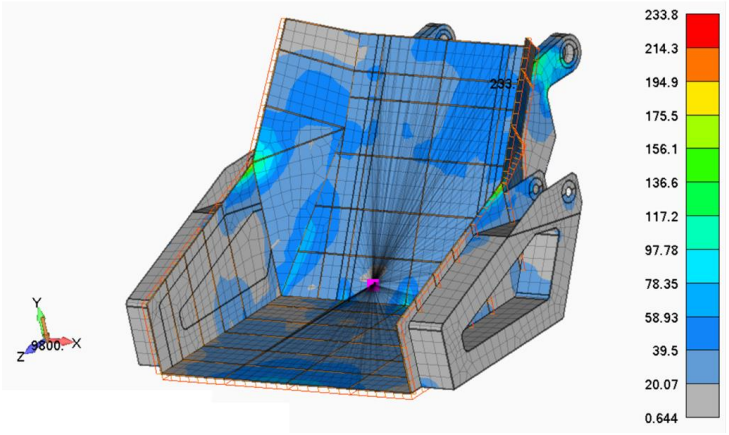
1. AN INTRODUCTION TO GLOBAL-LOCAL MODELING

What is it?

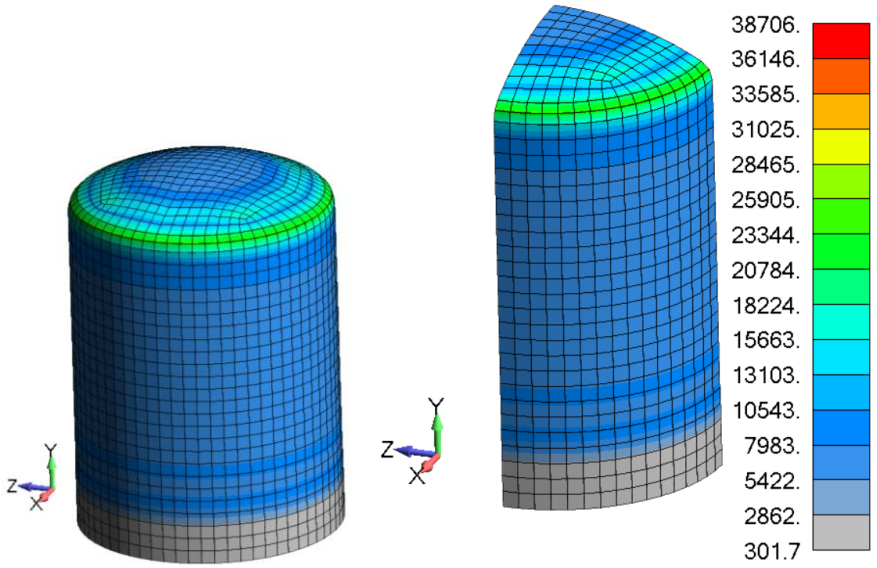
- Global-local modeling takes a very large assembly and reduces it to something that is quick and easy to optimize.

Why do you want to do it?

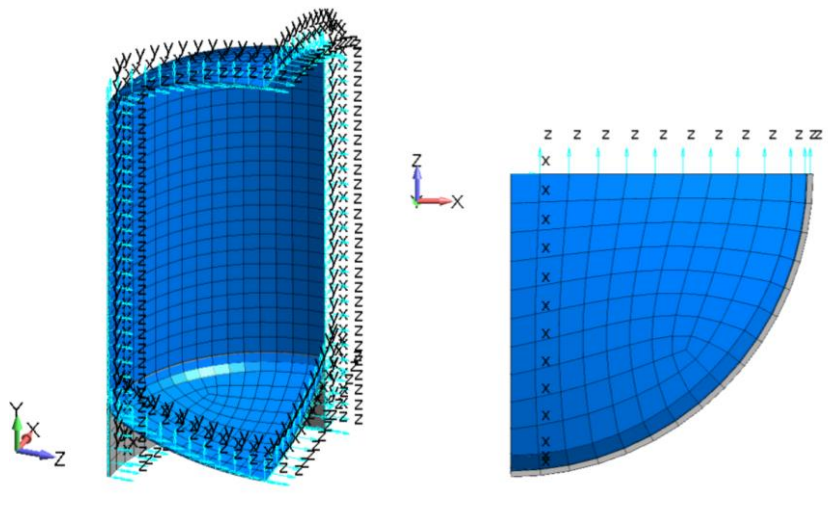
- Despite continuous improvements in software and hardware large assemblies, models with large node counts, and non-linear analysis techniques still require long solve times and large amounts of computational resources.
- It is possible but not practical to pull in a complex CAD assembly, put a fine tet-mesh on it, set up automatic connections and let it spin for a few hours.
- Global-local modeling decreases solve times and reduces computational resources required by allowing the large models and assemblies to be analyzed with a coarser meshes and simpler modeling techniques.

	
Global Model	**Local Model**

1.1 Symmetry Modeling: Simple Pressure Vessel



Full and ¼ Symmetry Models

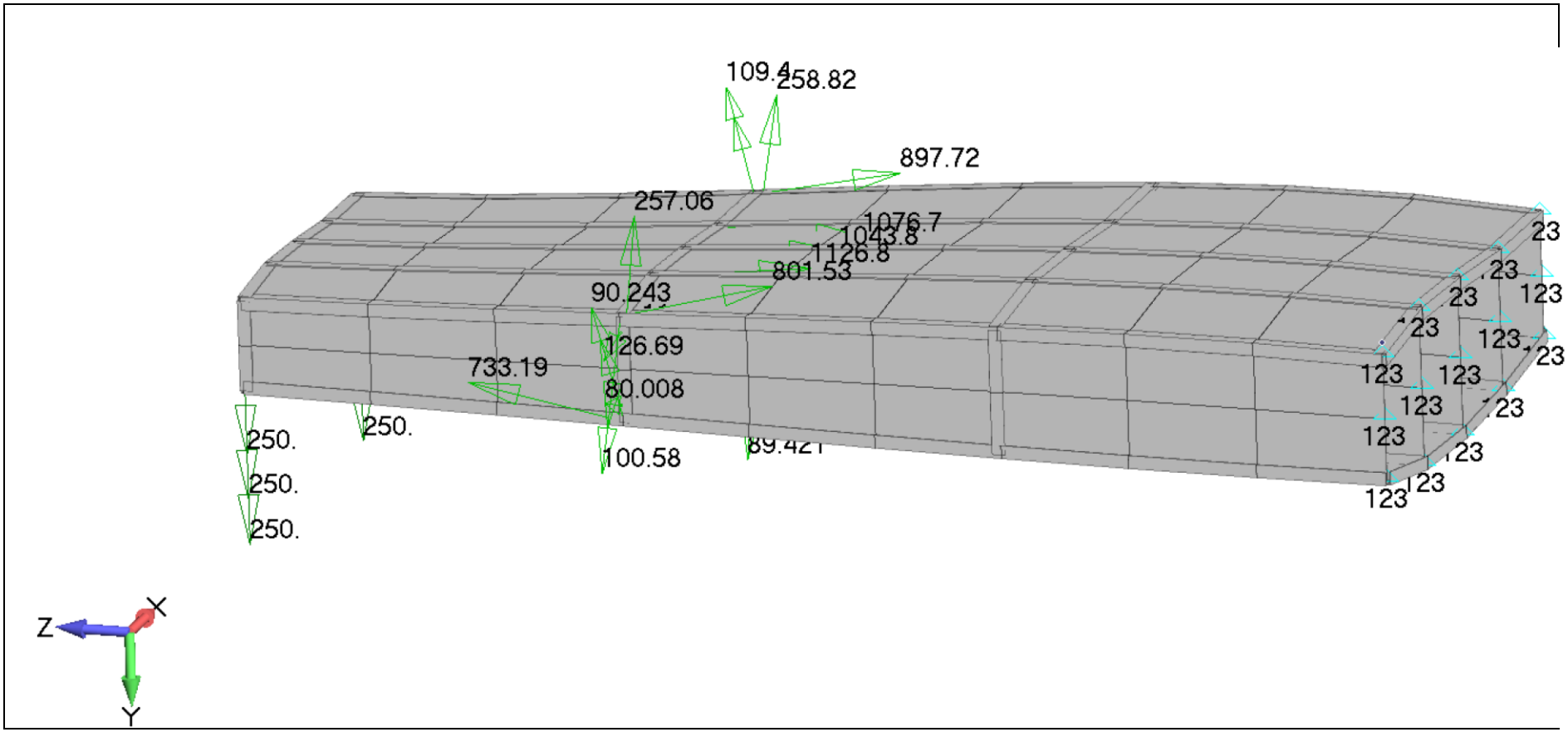


Symmety Boundary Condition

- One of the earliest forms of model simplification.
- If the loads applied to the structure are symmetric relative to the planes of symmetry of the structure's geometry, then the full model can be replaced with a symmetric model.
- Boundary conditions are applied on the symmetric planes constraining out of plane motion but allowing the structure to move freely in the other directions.

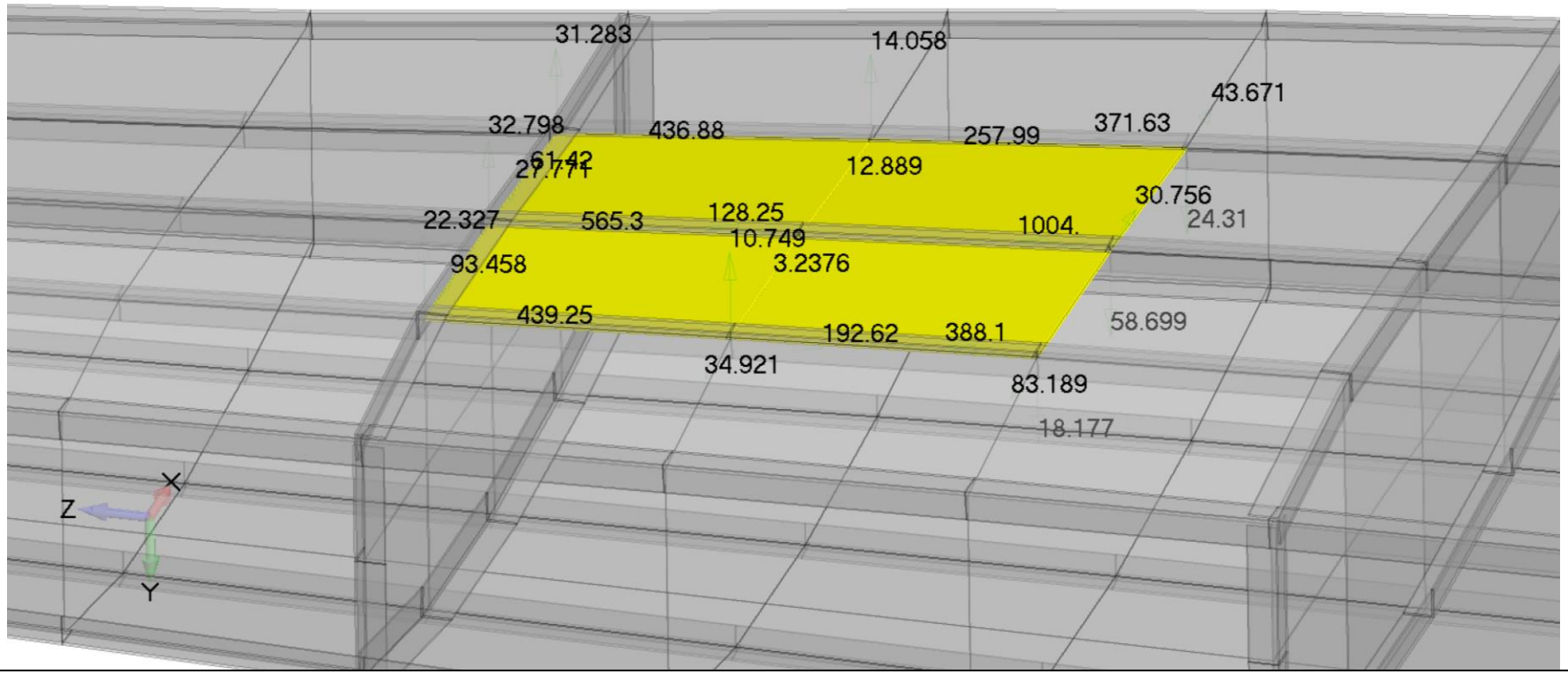
2. FREEBODY DIAGRAMS

2.1 OVERVIEW



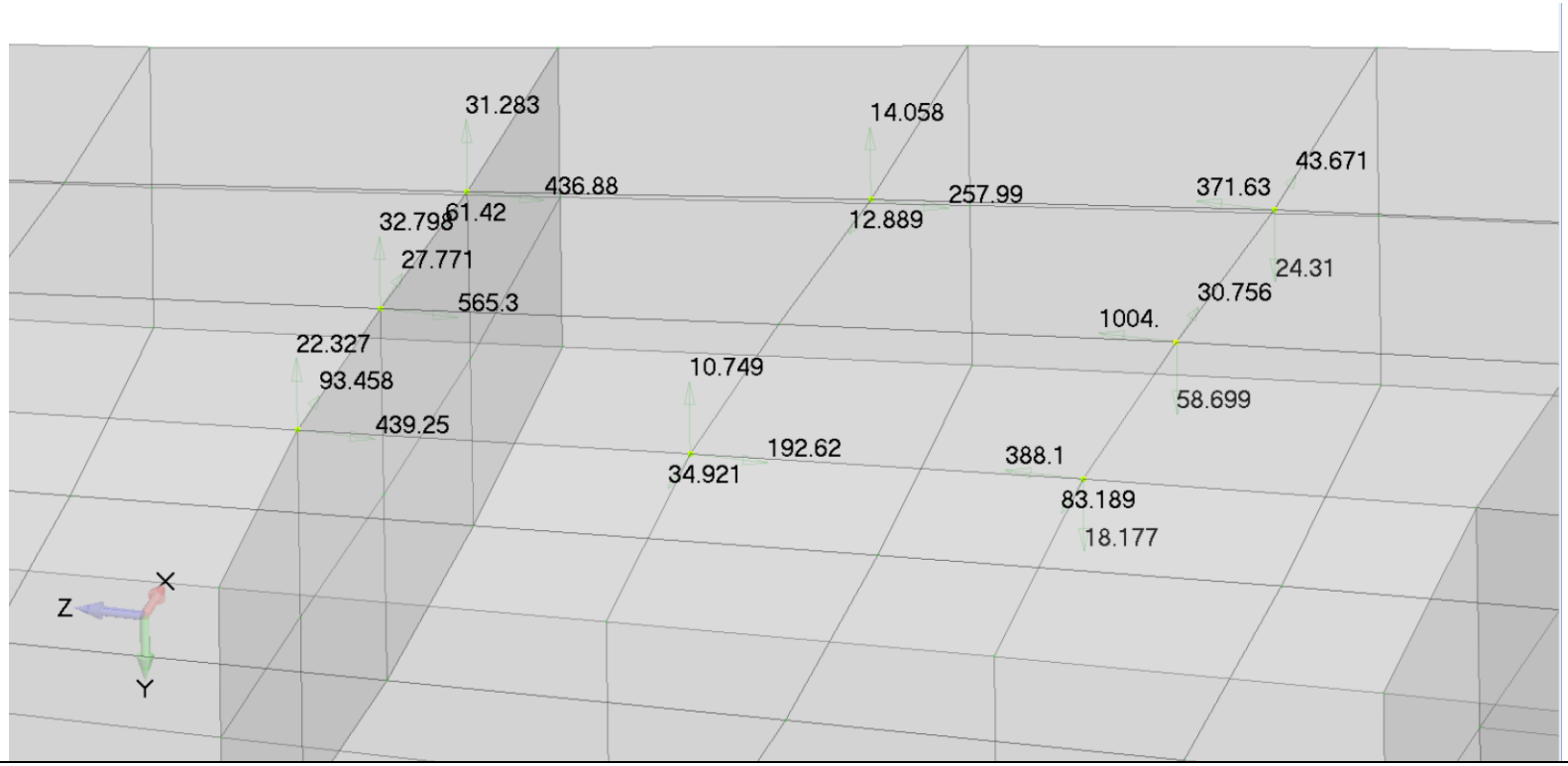
- THE Critical Tool for Global-Local Modeling.
- Powerful tool that is effective in trouble shooting models.
- Used to create the loads applied to the local models.

Freebody Method



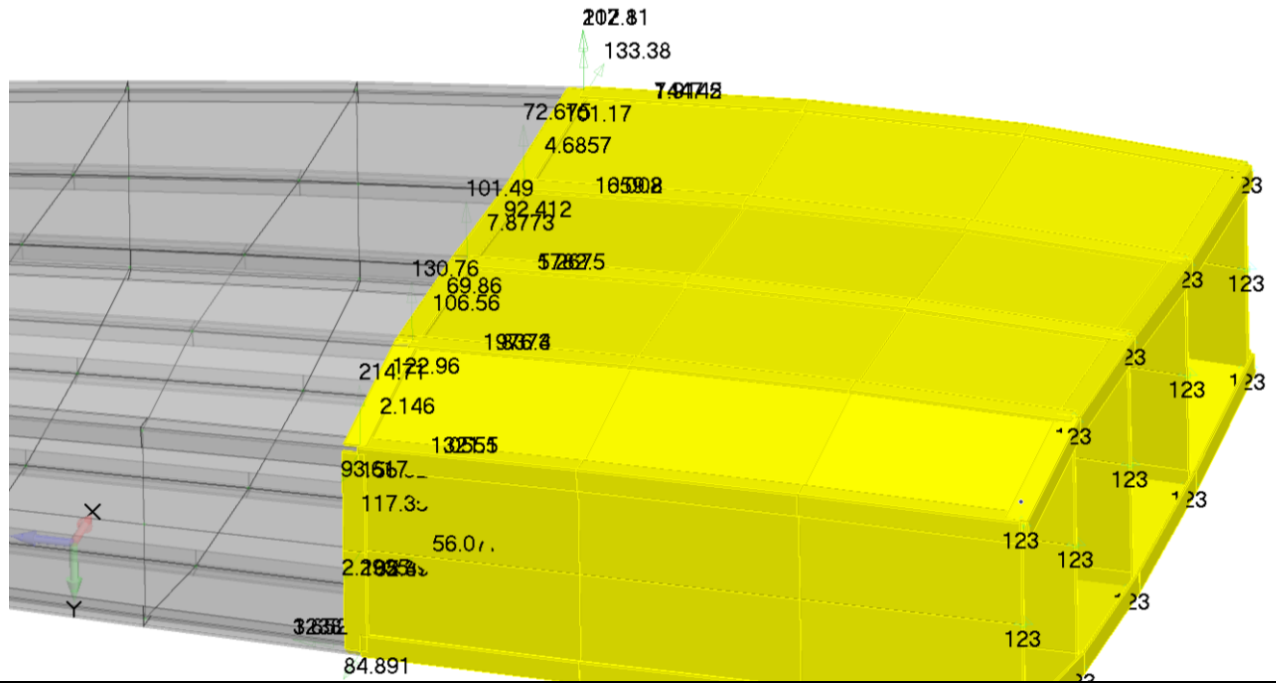
- Requires selecting the elements of interest.
- FEMAP automatically selects related nodes.
- Displays a balanced set of loads on a specific set of elements.

Interface Load Method

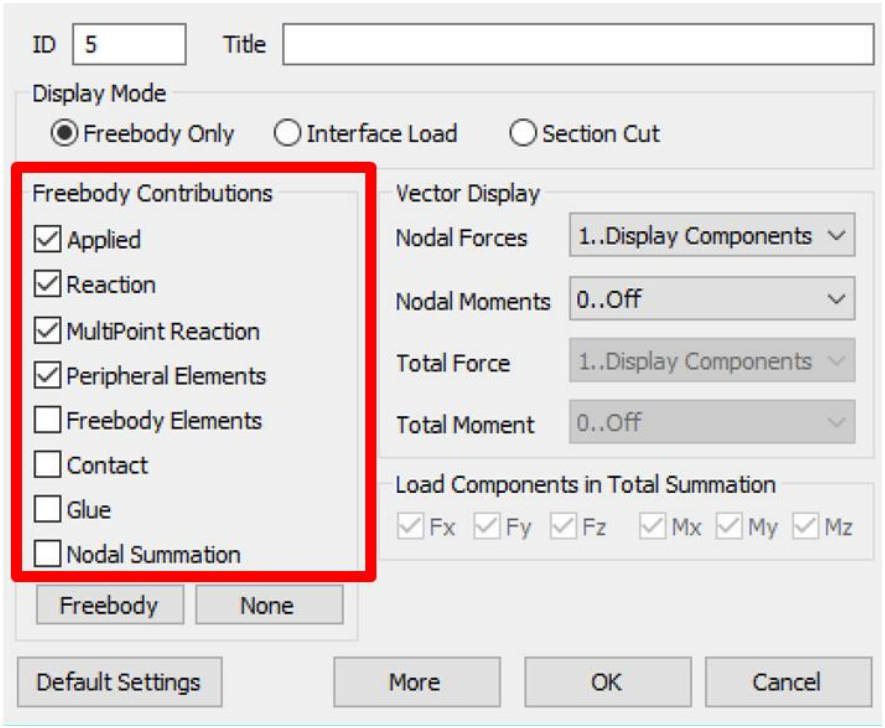


- Requires selecting both the nodes and elements.
- FEMAP calculates a summation of loads and forces across the interface.
- Displays nodal vectors for selected nodes as well as a total summation vector at a selected location.
- Unlike the freebody method, interface load freebodies are not likely to be in equilibrium.

Section Cut Method



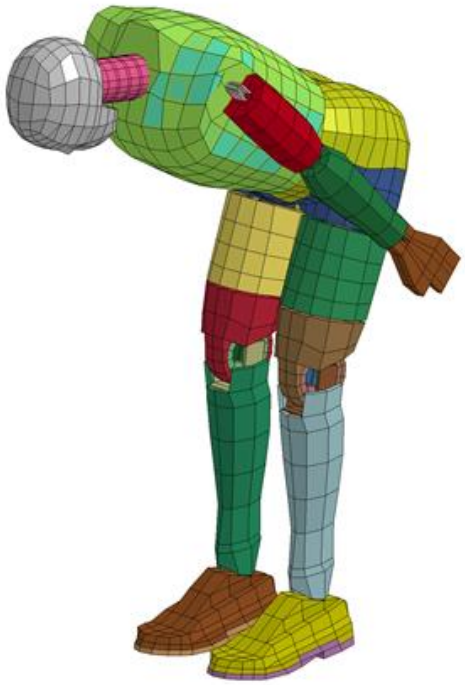
- Requires selecting a “cutting plane”, defined by a plane, vector or a curve.
- The contributing freebody nodes and elements are determined automatically.
- A summed load across the interface is displayed and calculated.
- The total summation location can be placed at the plane path intersection, nodal centroid, or static location
- Nodal and total summation vectors can be aligned tangent to the path without creating additional coordinate systems.
- The cutting plane can be moved dynamically within the model.



- **Applied:** Includes contributions from all loads applied to the model.
- **Reaction:** Includes contributions from all reaction forces and moments at a single point constraint in the model.
- **MultPoint Reaction:** Includes contributions from reaction forces and moments from constraint equations, rigid elements, and interpolation elements in the model.
- **Peripheral Elements:** Includes grid point force and moment contributions from the elements surrounding the selected freebody elements.
- **Freebody Elements:** Includes grid point force and moment contributions from the selected freebody elements.
- **Contact:** Includes contact force contributions from the selected output set.
- **Glue:** Includes glue contact force contributions from the selected output set
- **Nodal Summation:** Includes force and moment contributions from nodal summations. Typically very small unless there is a “non-balanced” force or moment in the model.

3. AND NOW A WORD FROM OUR SPONSORS

Thank You



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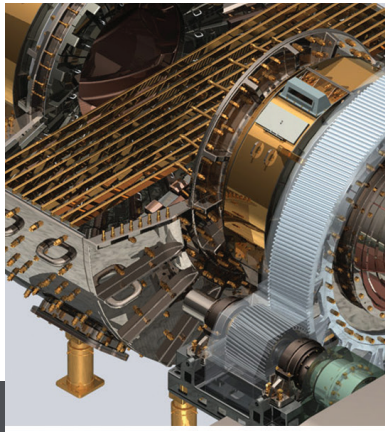
Our combination of a mechanical design firm, machine shop and FEA consultancy allows us to provide the strongest support for Siemens PLM Software in the US.



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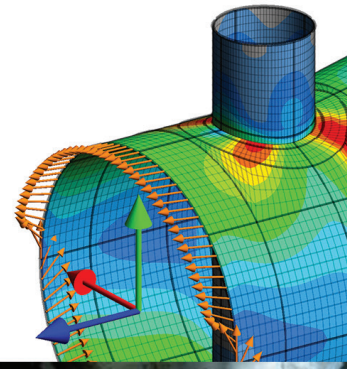

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