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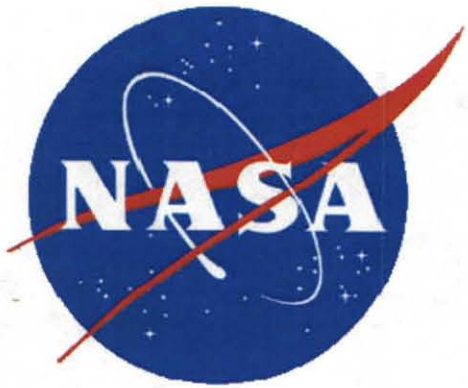
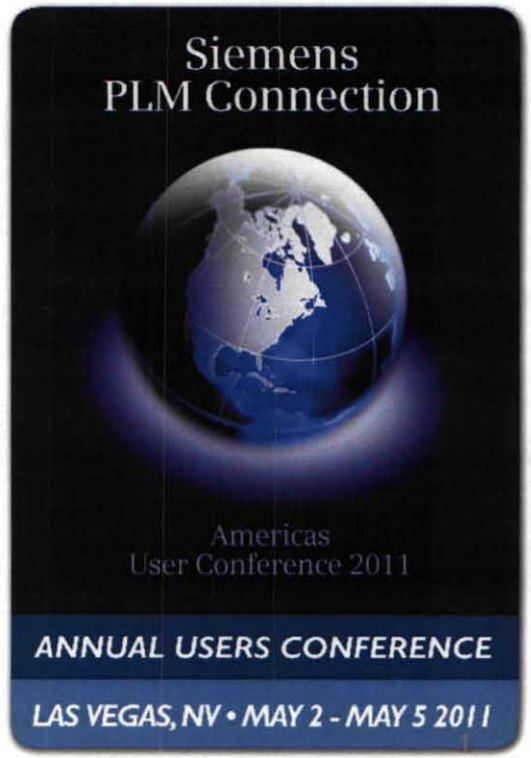
Parametric Modeling in the CAE Process: Creating a Family of Models



Christopher Brown
NASA
Kennedy Space Center



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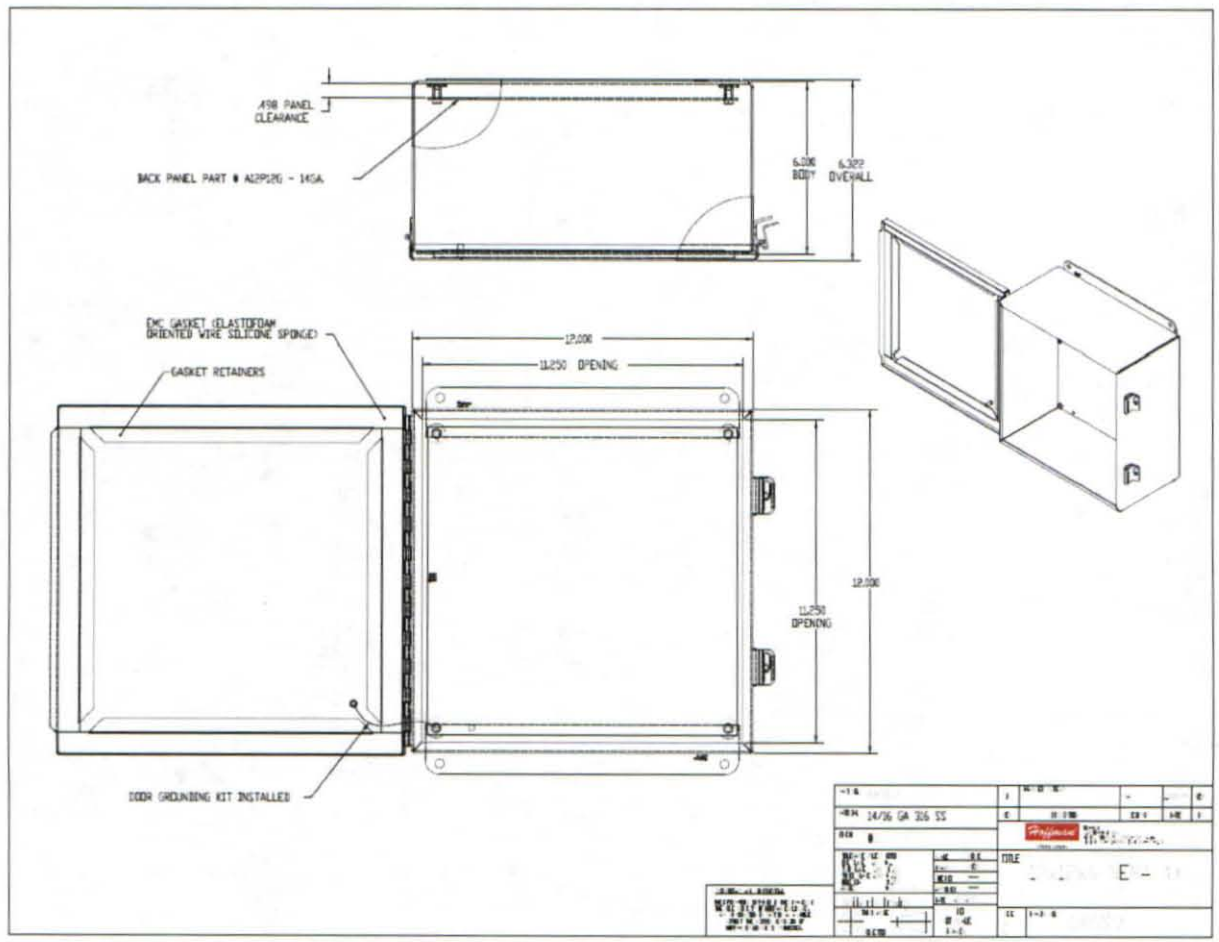
Introduction

- This Presentation meant as an example
  - Give ideas of approaches to use
  - The significant benefit of PARAMETRIC geometry based modeling
- The importance of planning before you build
- Showcase some NX capabilities
  - Mesh Controls
  - Associativity
  - Divide Face
  - Offset Surface

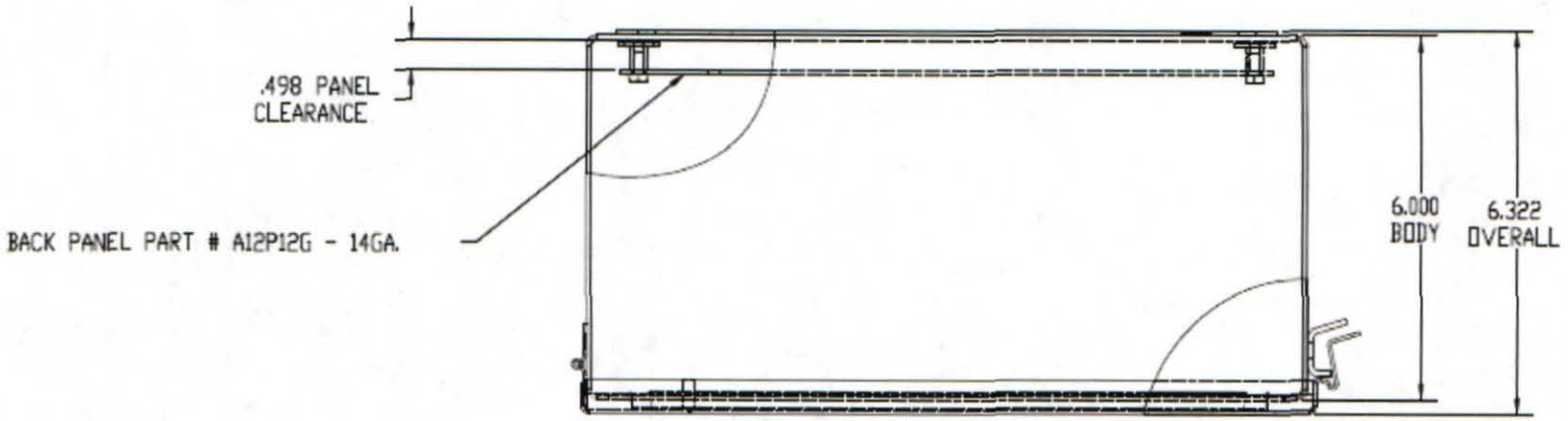
Typical Electrical Enclosure



Notice the Back Panel

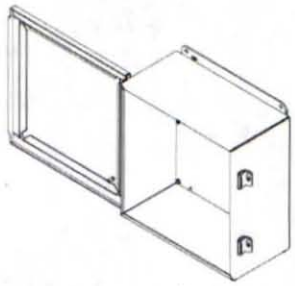
Back Panel holds components and has coupled vibration response

Back Panel often acts as an "amplifier" when resonant



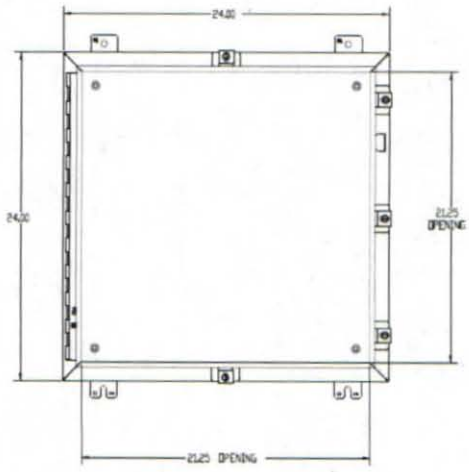
Top View

Multiple Configurations

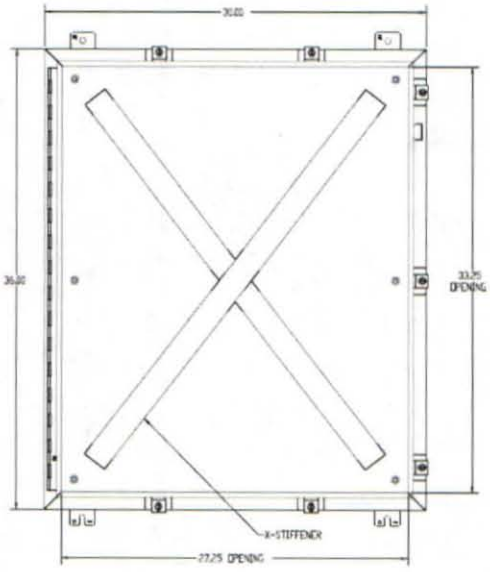


Cabinets in the ML are varied in shape and size

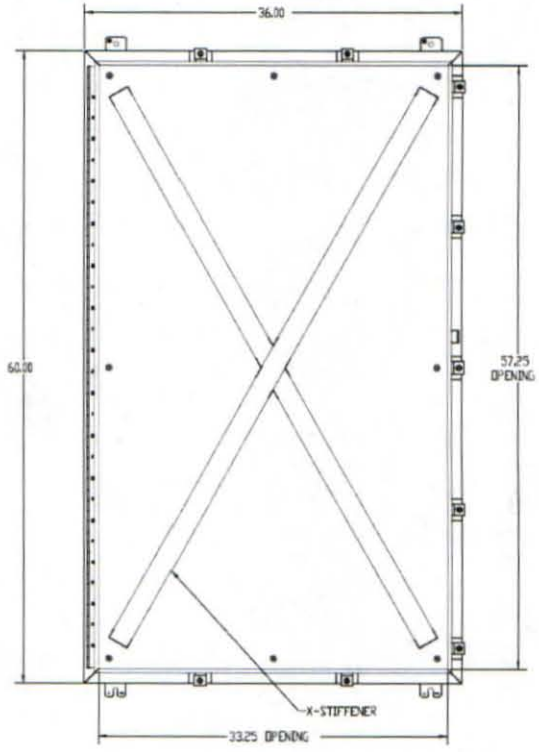
PANEL AND DOOR ARE NOT SHOWN IN THIS VIEW



PANEL AND DOOR ARE NOT SHOWN IN THIS VIEW

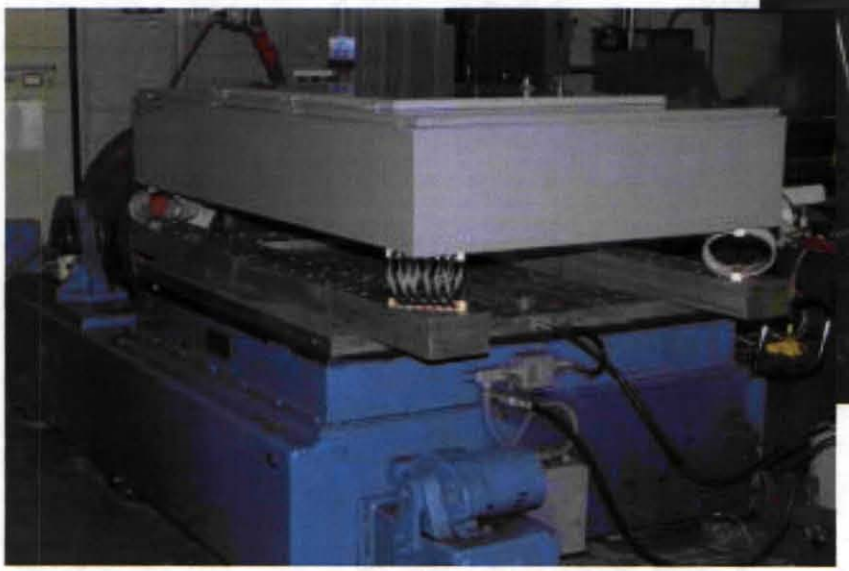


PANEL AND DOOR ARE NOT SHOWN IN THIS VIEW

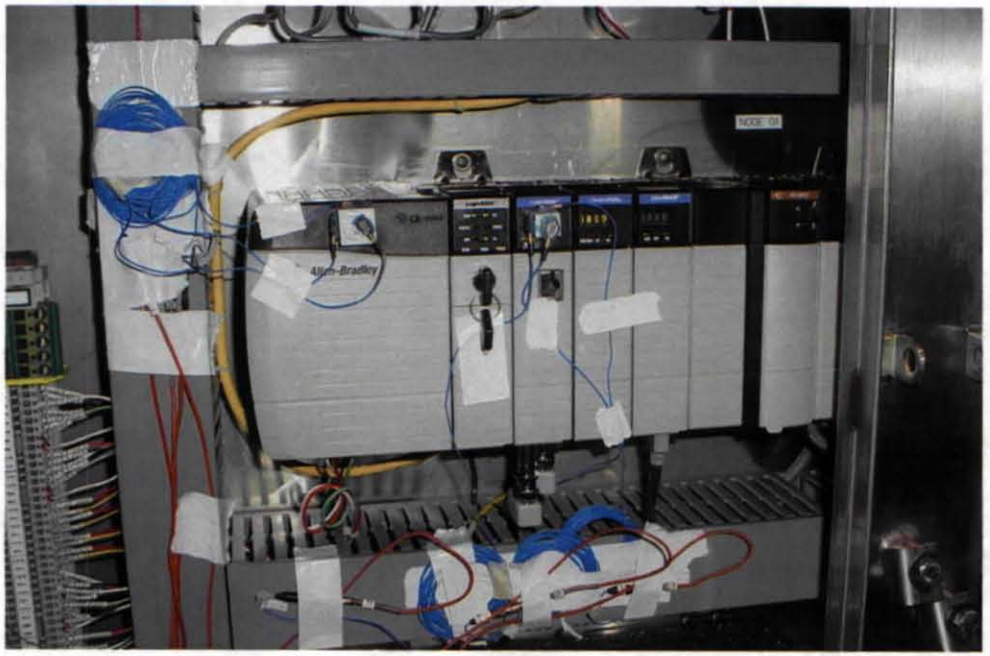


Vibe Lab Test Article

Cabinets mounted on wire rope isolators to shaker table

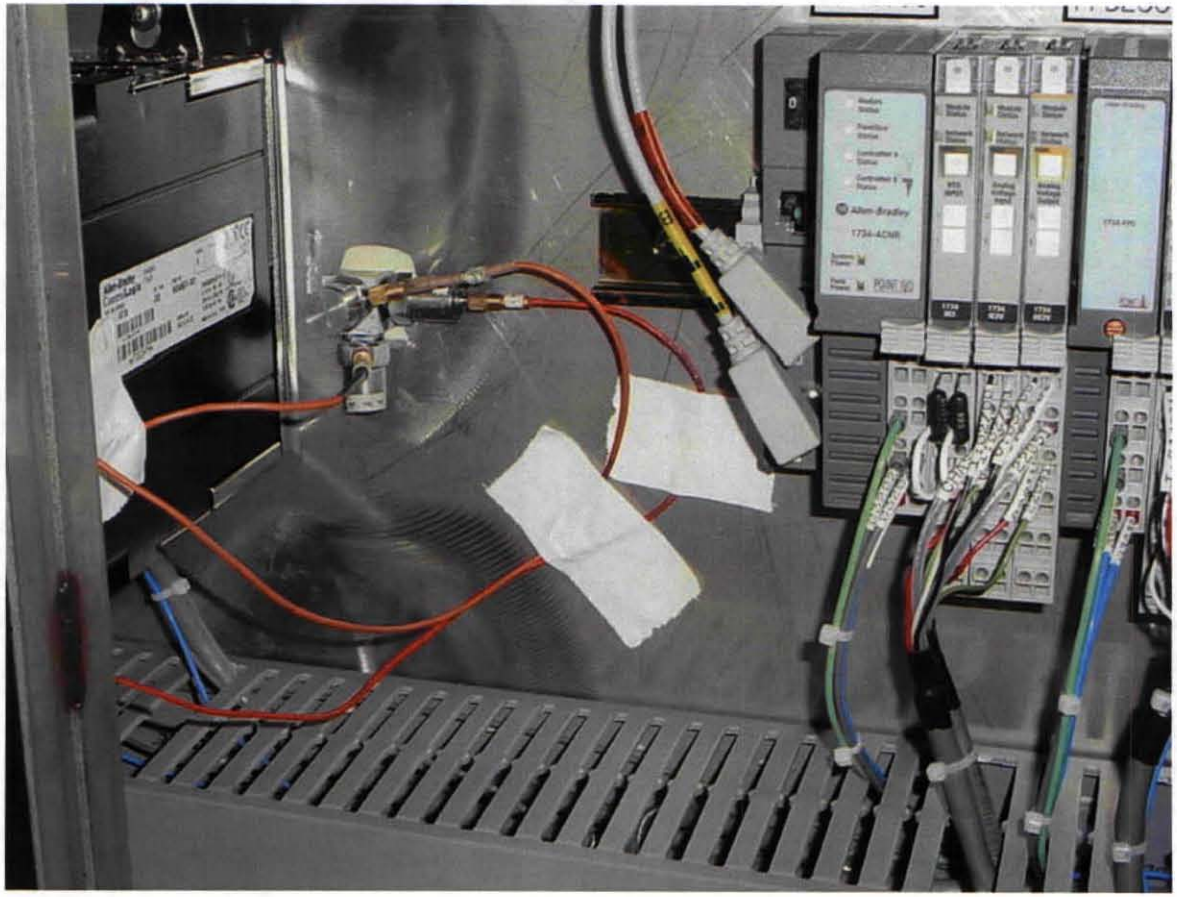


Typical Rack Components



Interested in developing qualification curves for assembled racks AND individual components to test separately

Another Test Setup

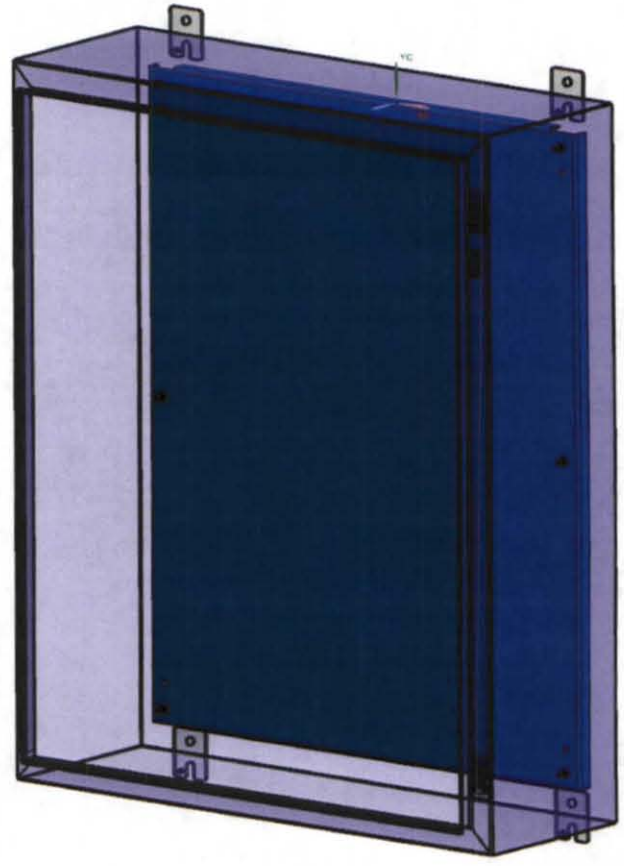


3D Solid Geometry From Vendor

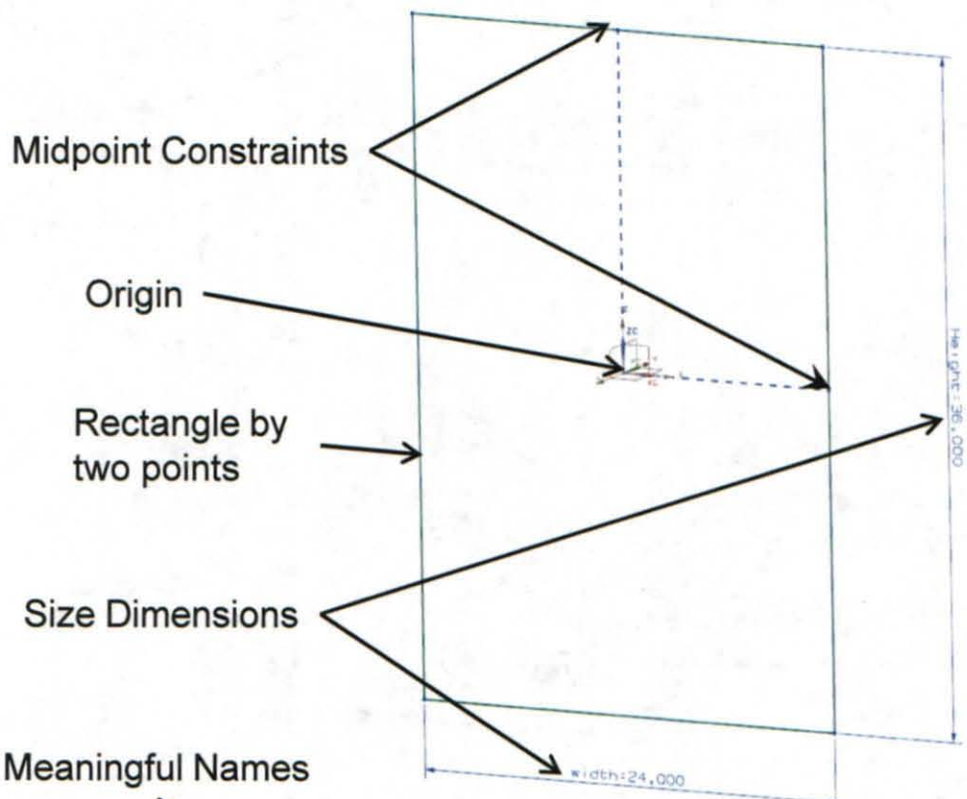
- Many vendors provide this data.
- Take advantage of it.
- In this case not used.

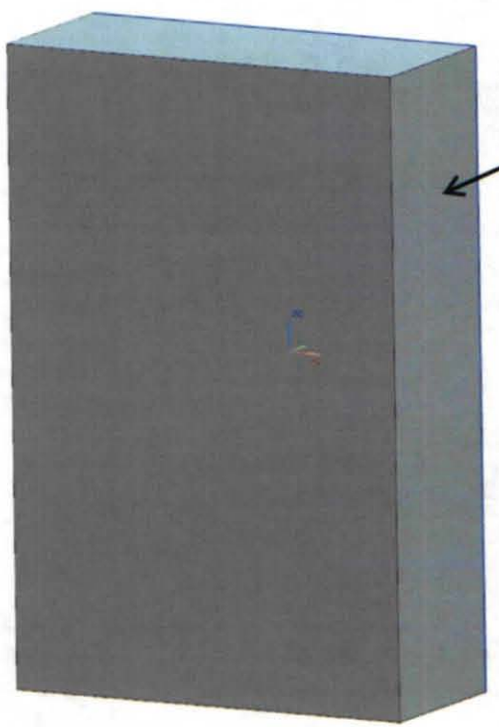
Cad geometry can easily be mid-surfaced.

"Dumb" CAD geometry can be parameterized (made "smart") with Synchronous Modeling in NX



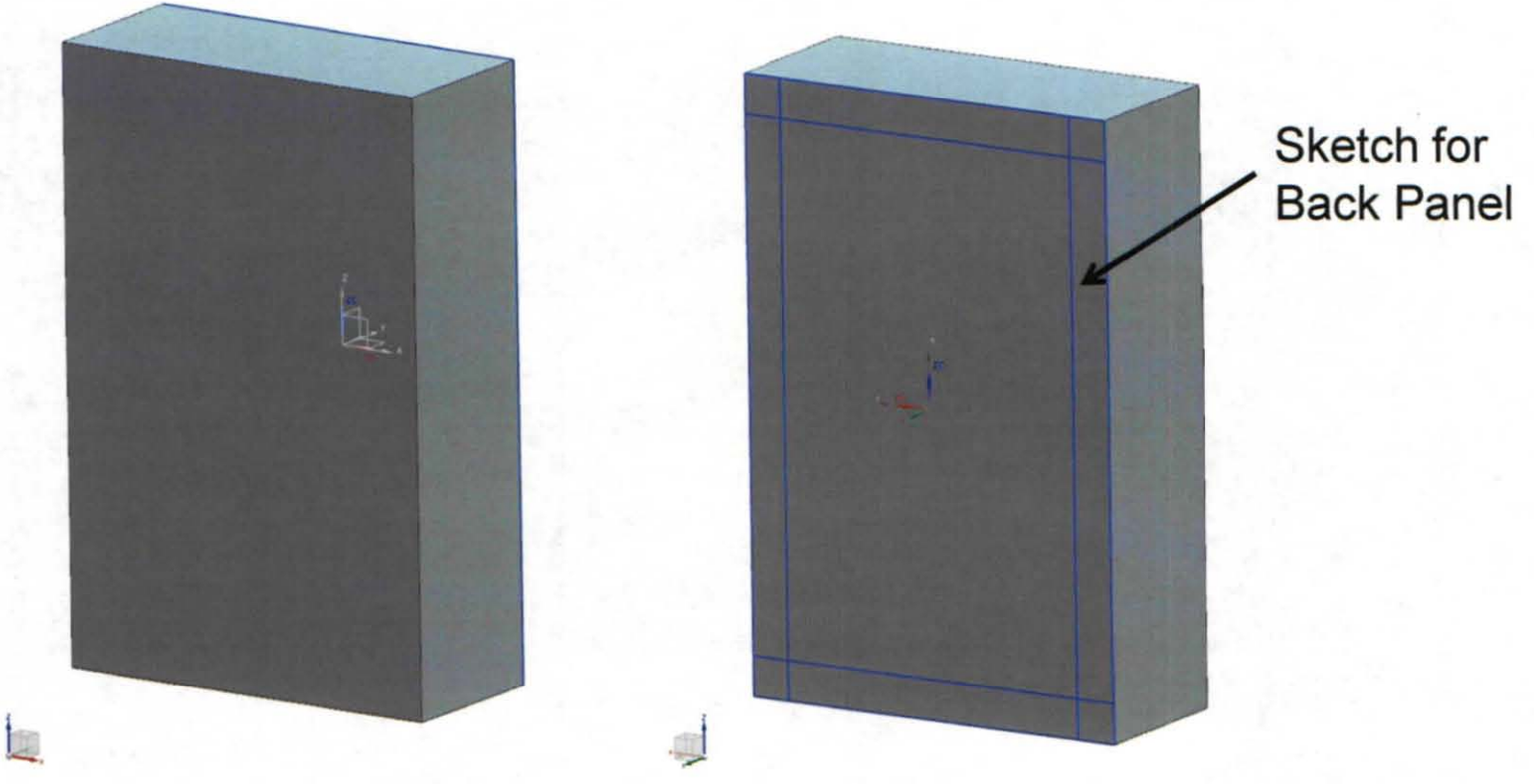
First Sketch and Extrude





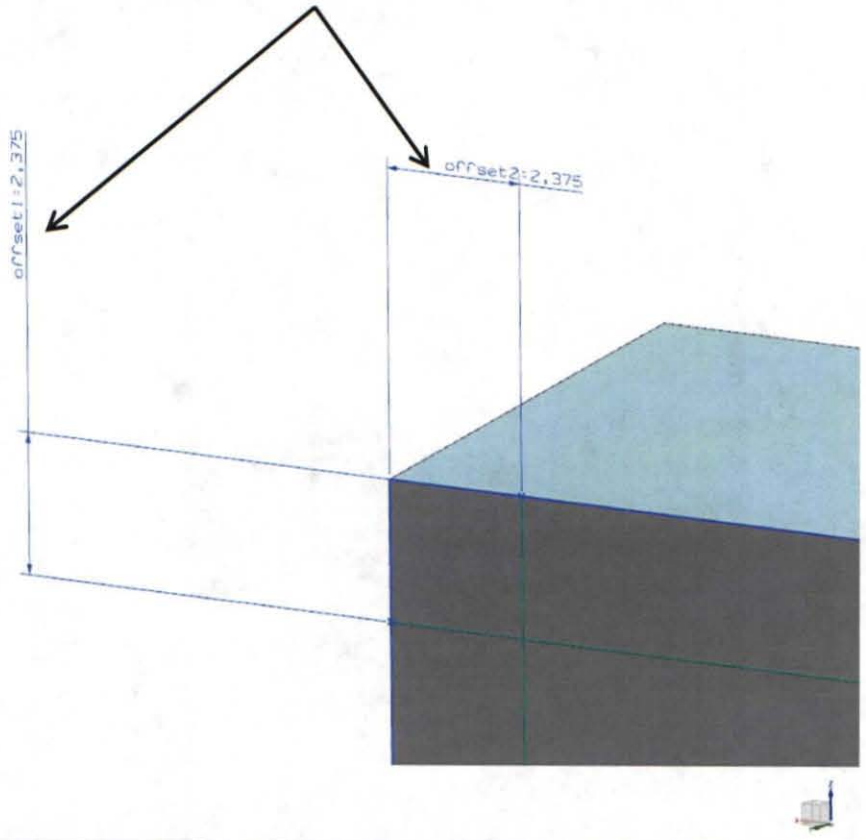
3D Solid

Initial Simplified Cabinet

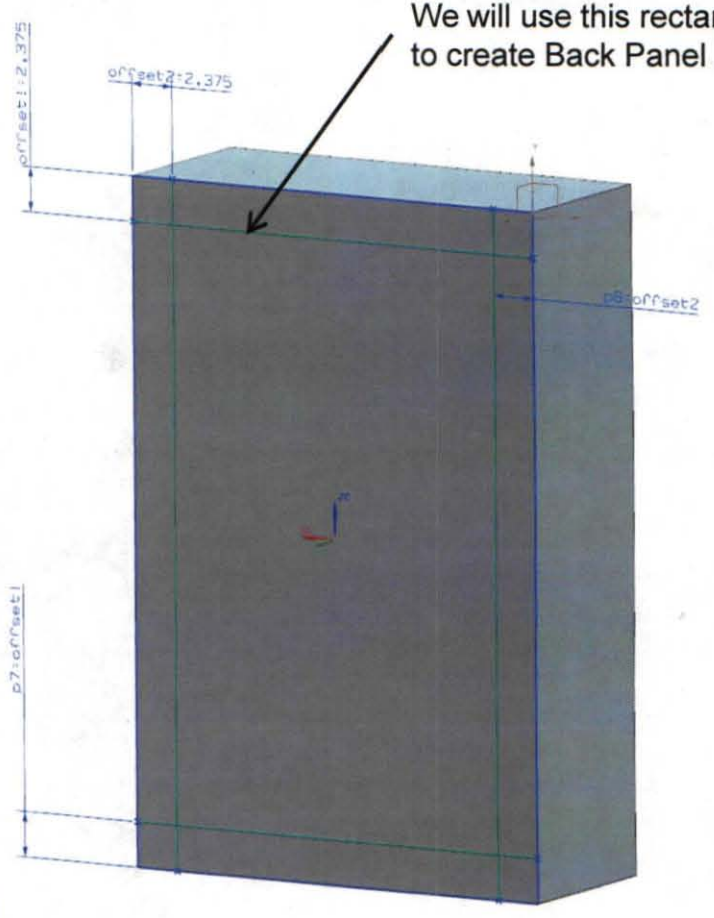


Sketch for Back Panel

Dimension from corners to standoff location



We will use this rectangle to create Back Panel

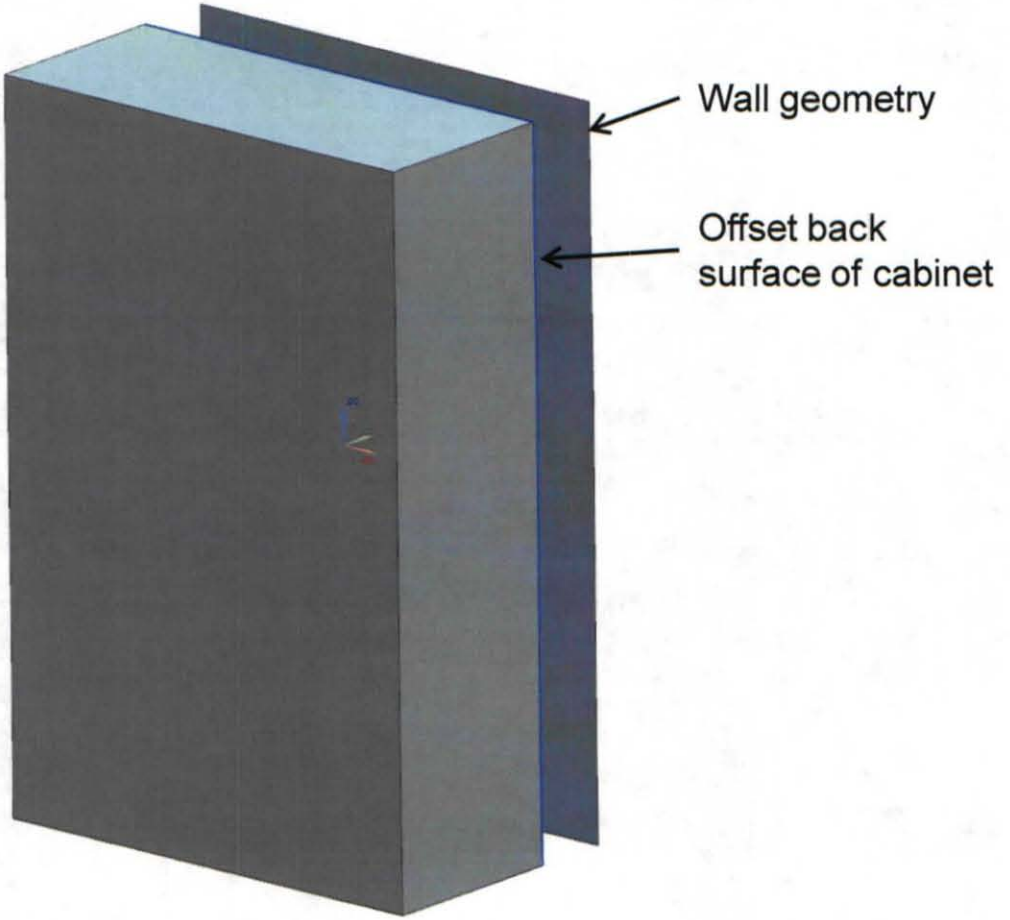


Cabinet Back

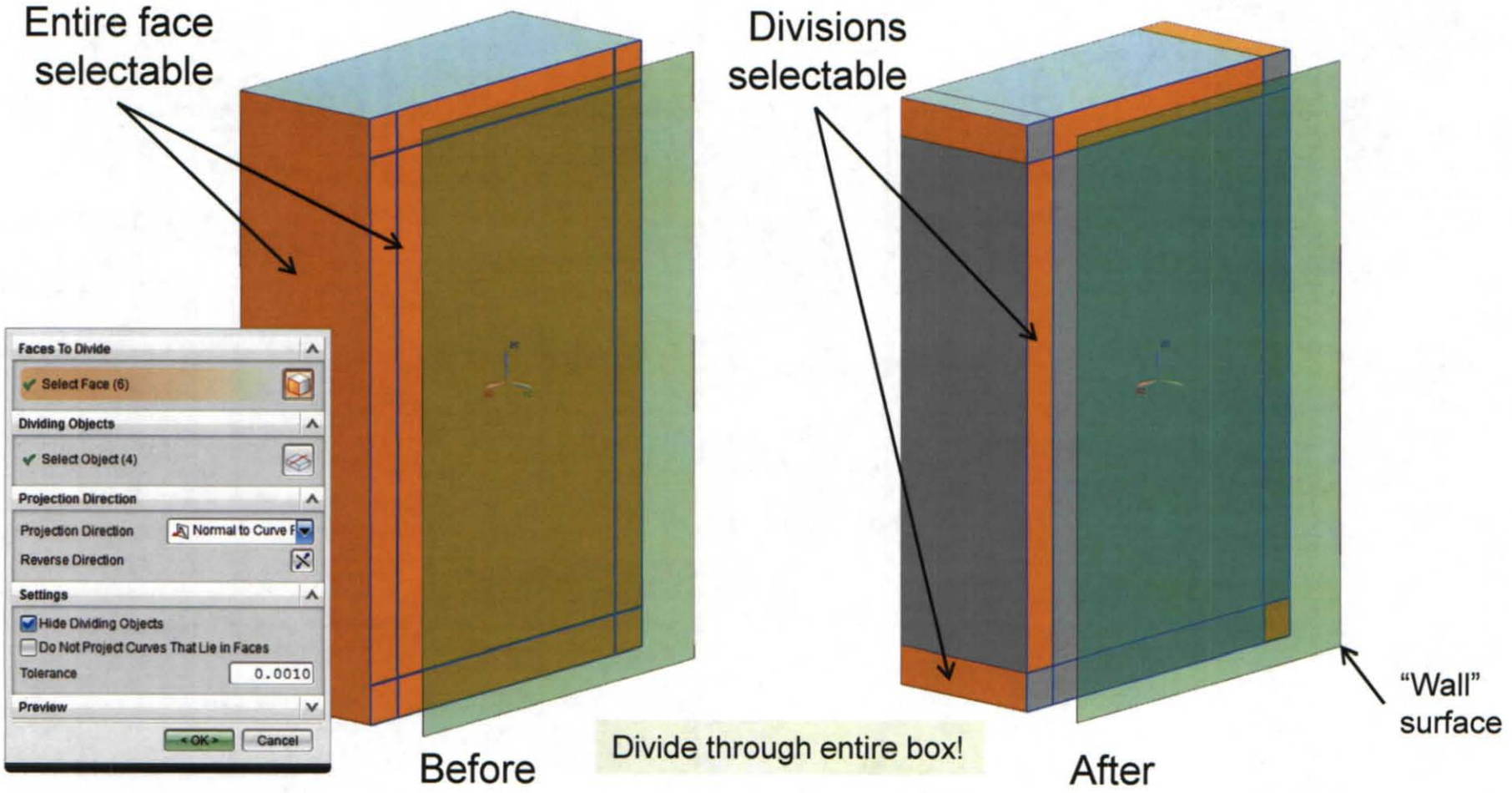
All features are still associative to the master part

Create "Wall" for Mounting

Perform "Offset Surface" to create "wall" that cabinet is mounted too. This is needed to apply base excitation.

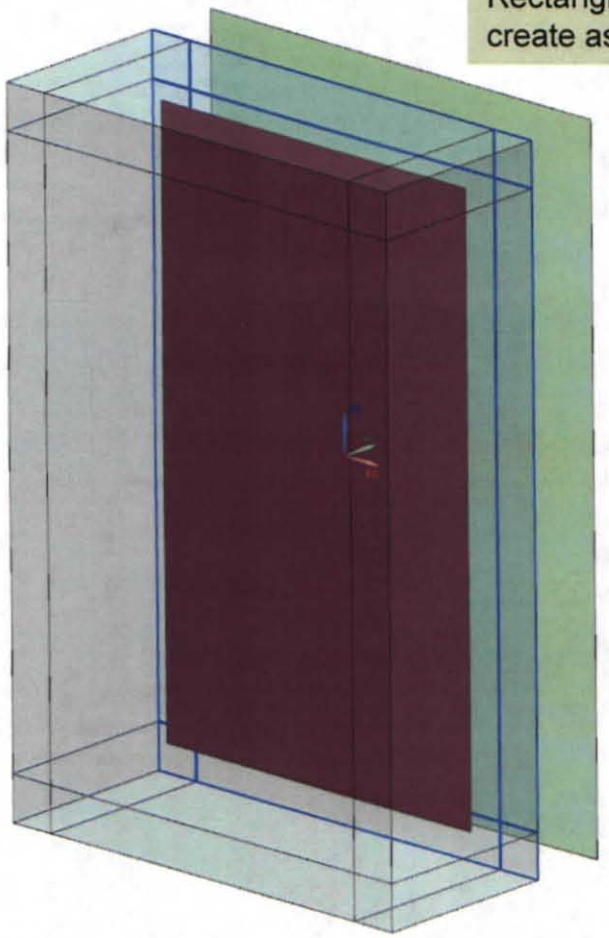


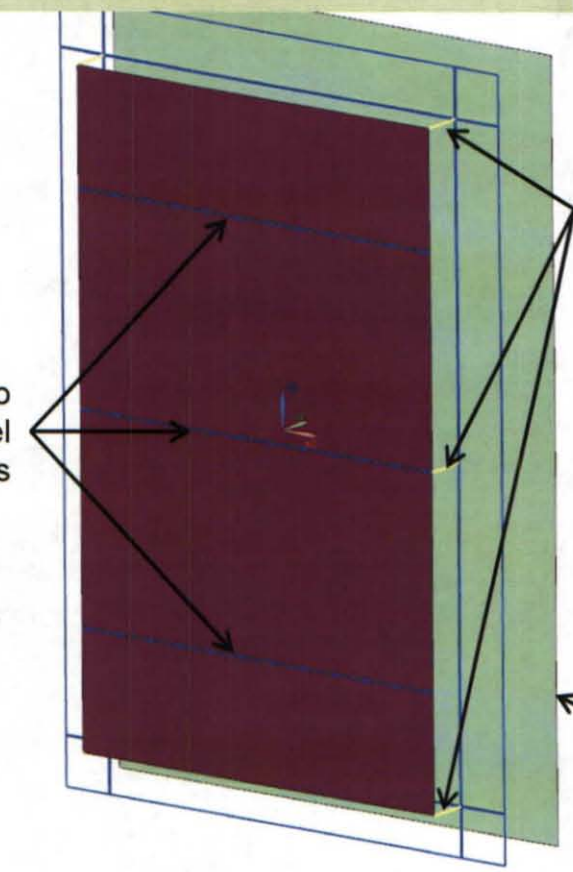
Divide Face


Entire face selectable
Faces To Divide
Select Face (6)
Dividing Objects
Select Object (4)
Projection Direction
Projection Direction
Normal to Curve F
Reverse Direction
Settings
Hide Dividing Objects
Do Not Project Curves That Lie in Faces
Tolerance
0.0010
Preview
< OK >
Cancel
Before
Divide through entire box!
Divisions selectable
"Wall" surface
After

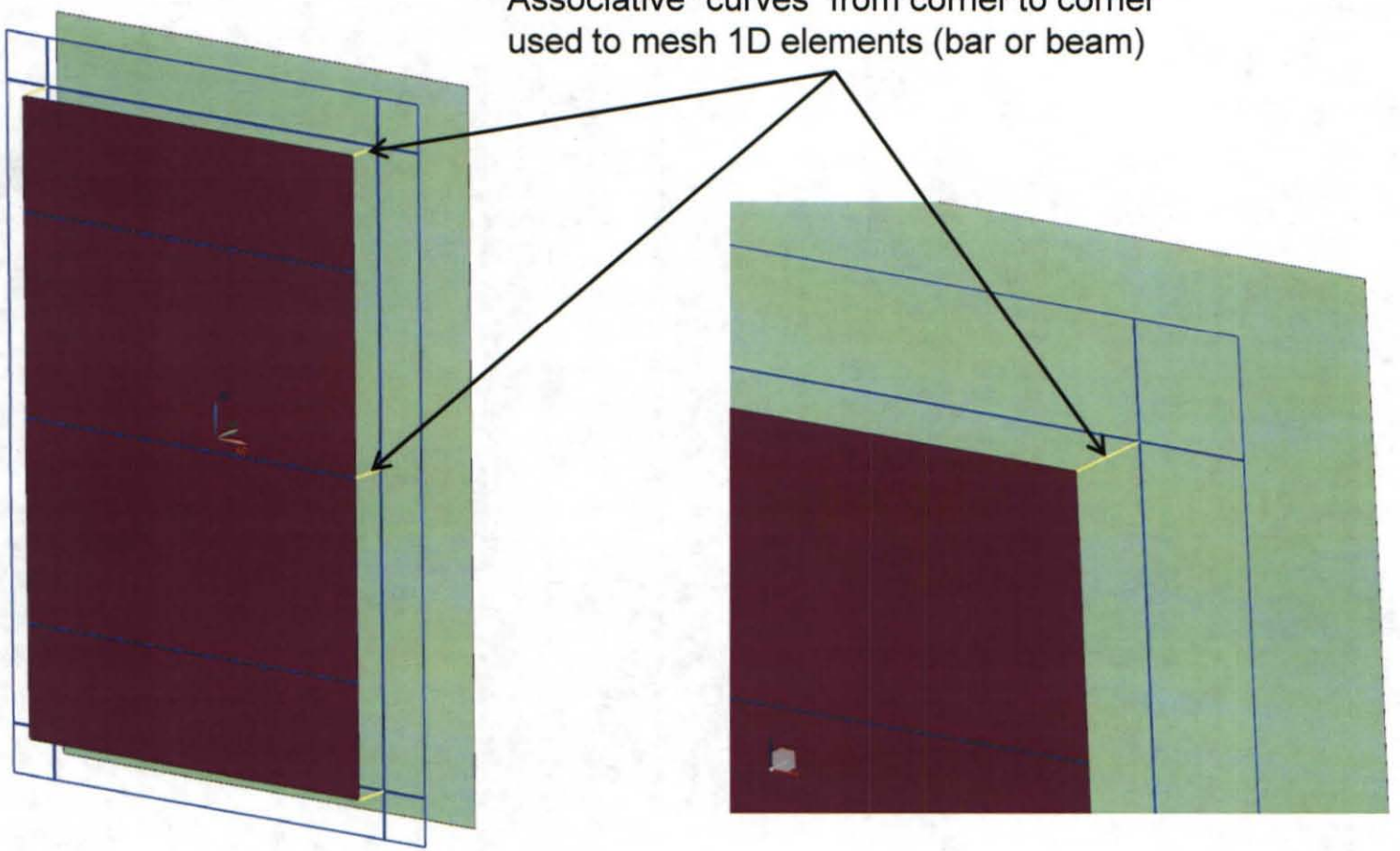
Create and Section Back Panel

Rectangle created by "Divide Face" is used to create associative "Offset Surface" to create Back Panel



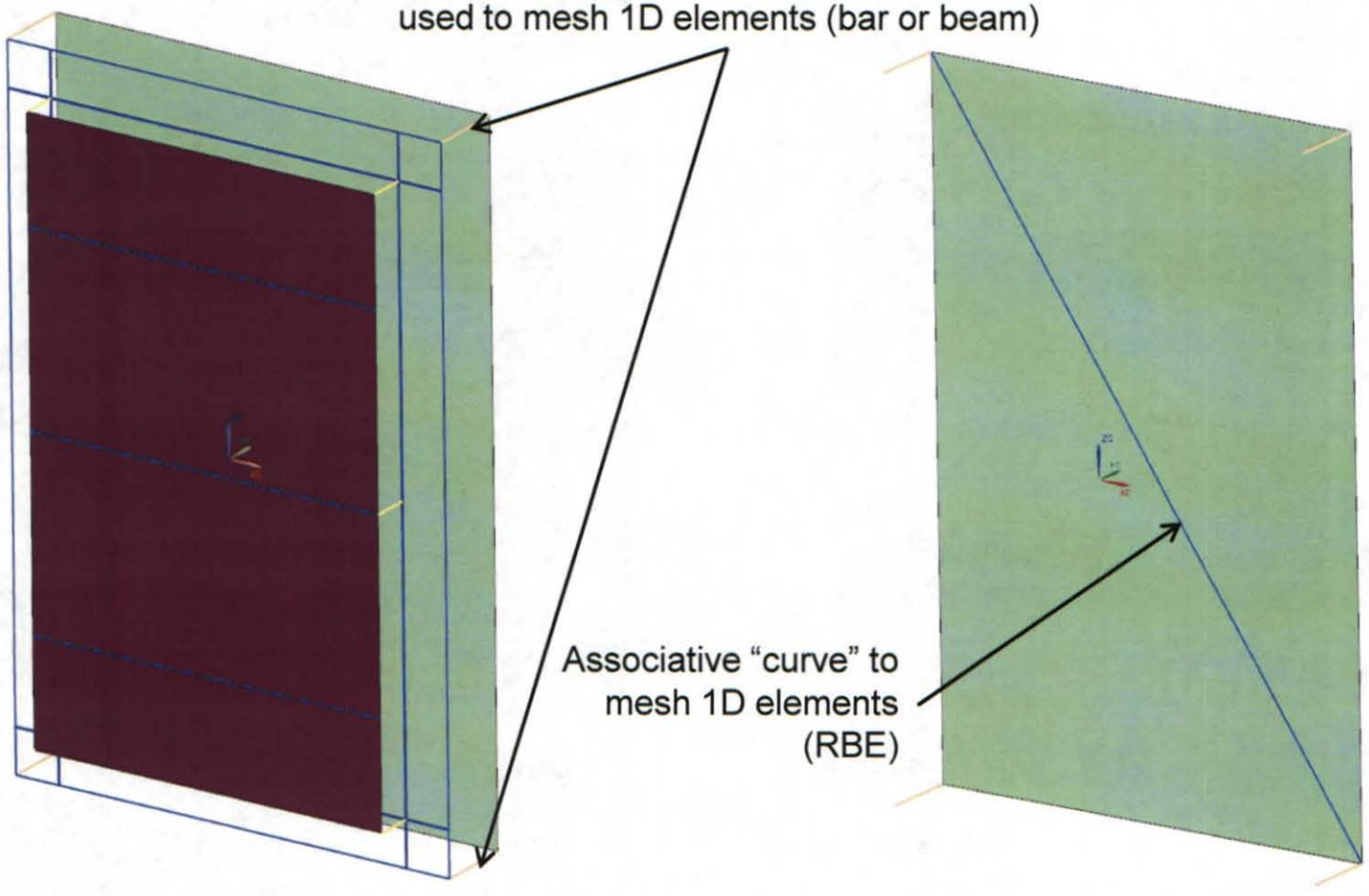


Create Standoffs



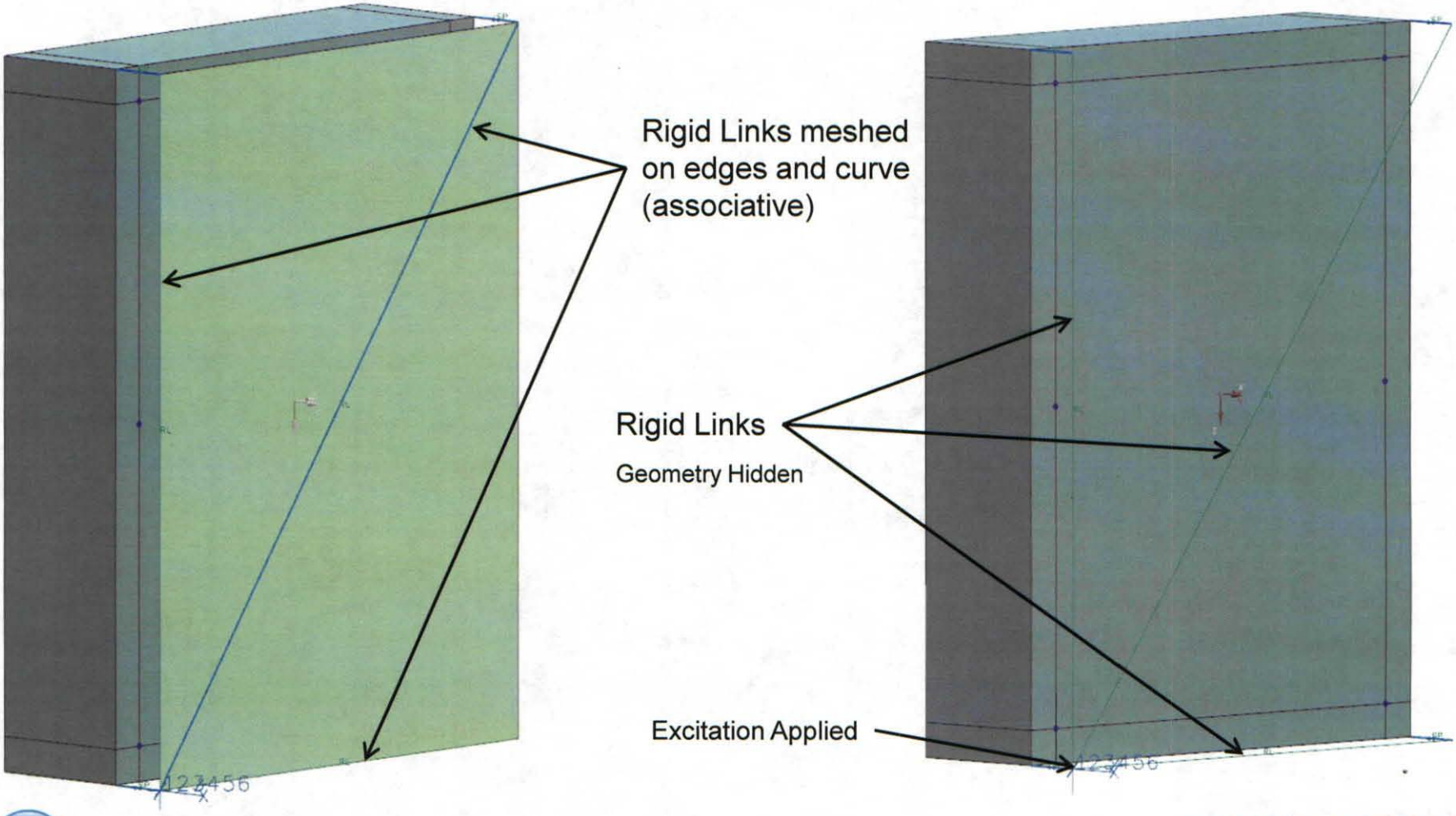
Create Isolators to Wall

Associative "curves" from corner to corner
used to mesh 1D elements (bar or beam)

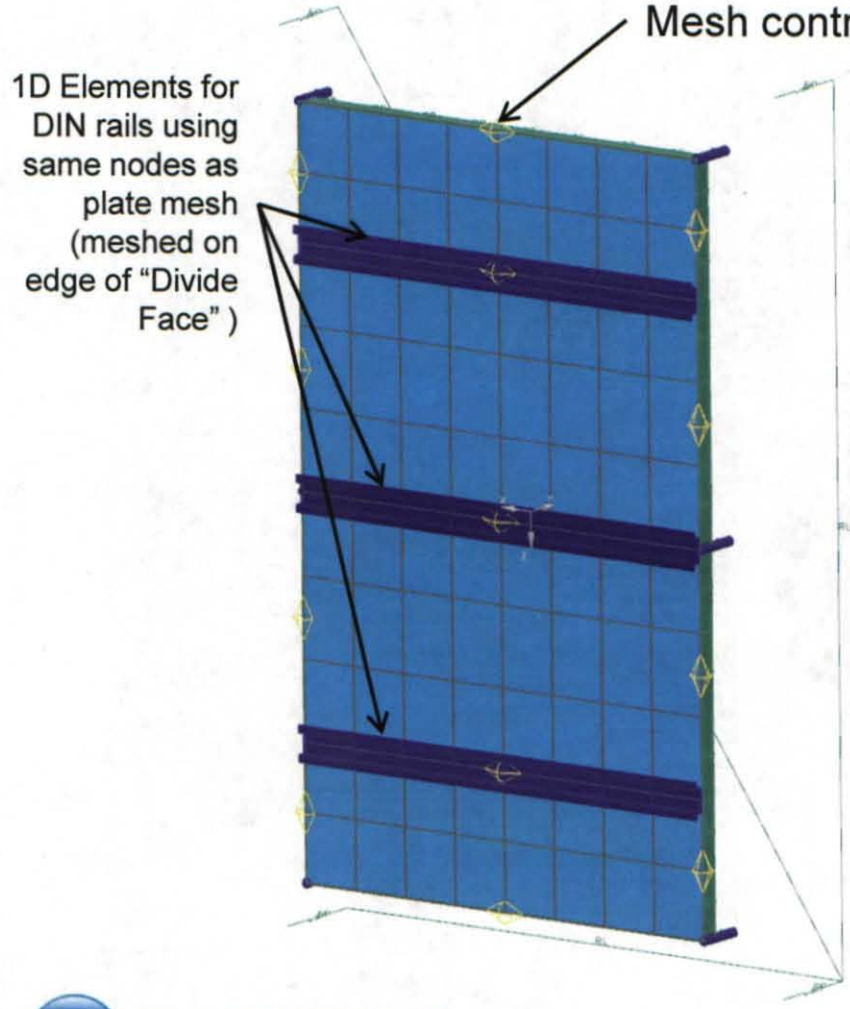


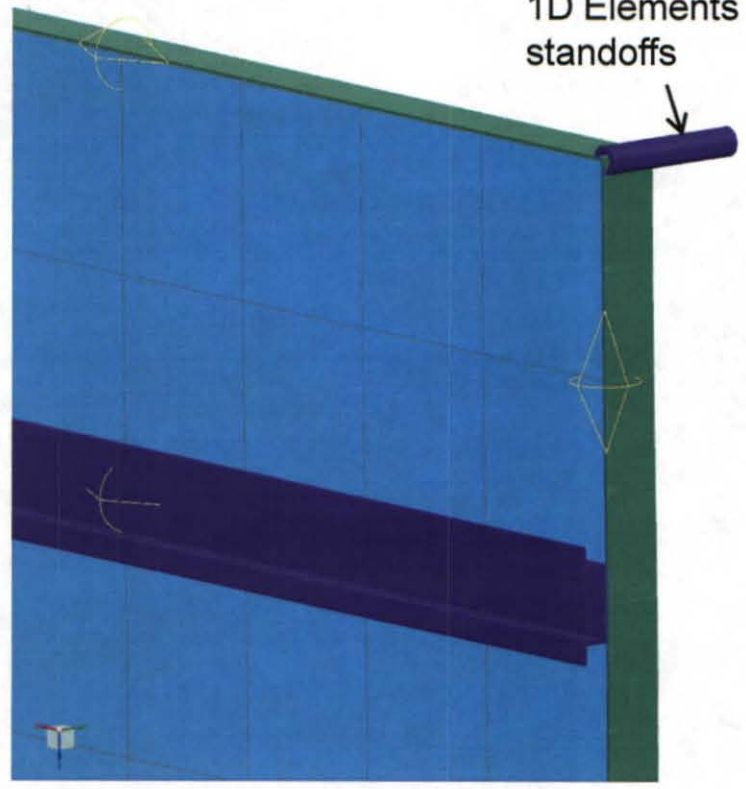
Associative "curve" to
mesh 1D elements
(RBE)

Wall Structure



Back Panel Mesh Controls

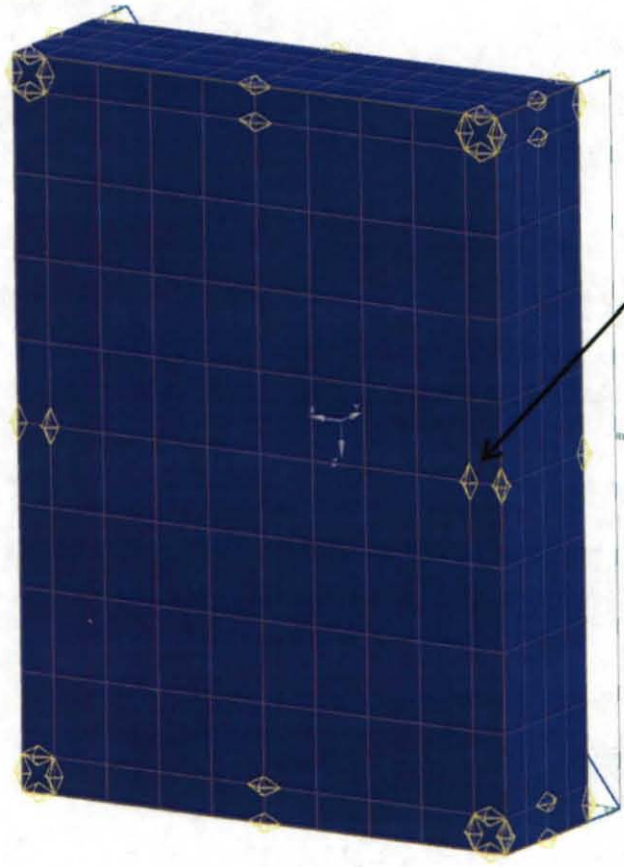




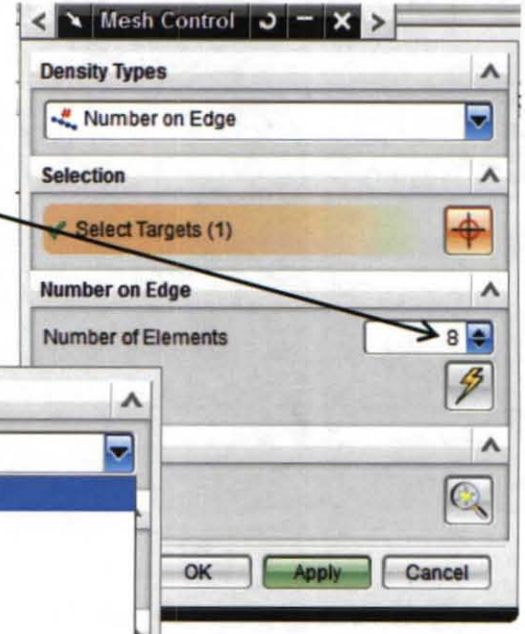
Solid Beam Sections turned on in Mesh Display preferences

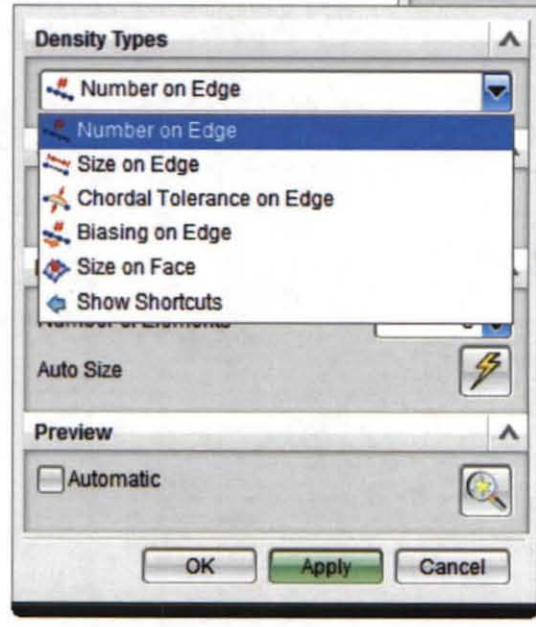
Mesh Controls

Keeps each mesh consistent and "tidy"

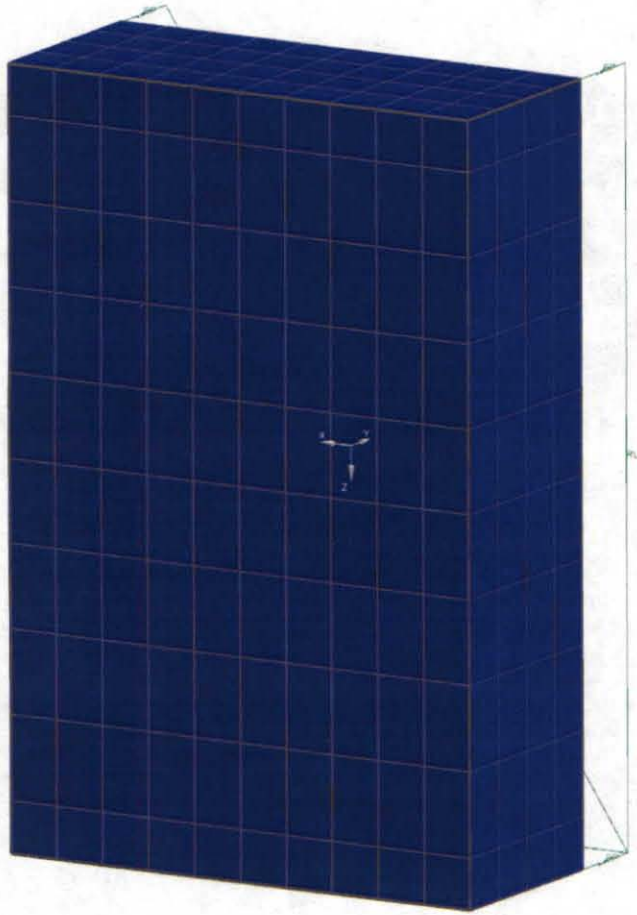


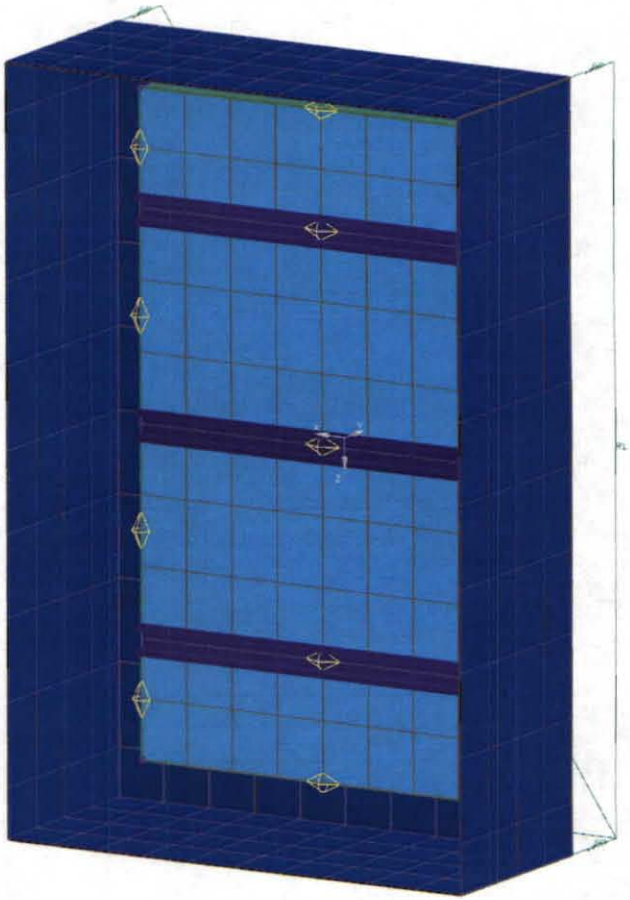
Number on Edge





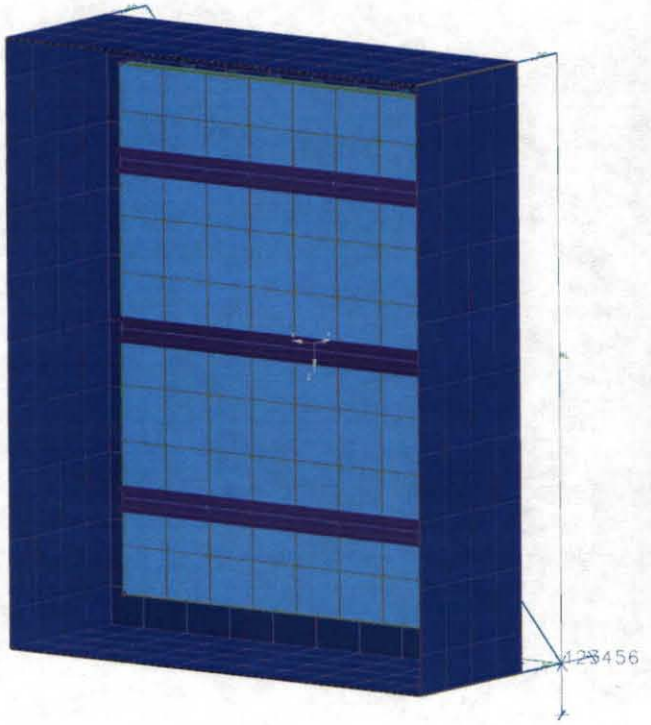
Final Cabinet



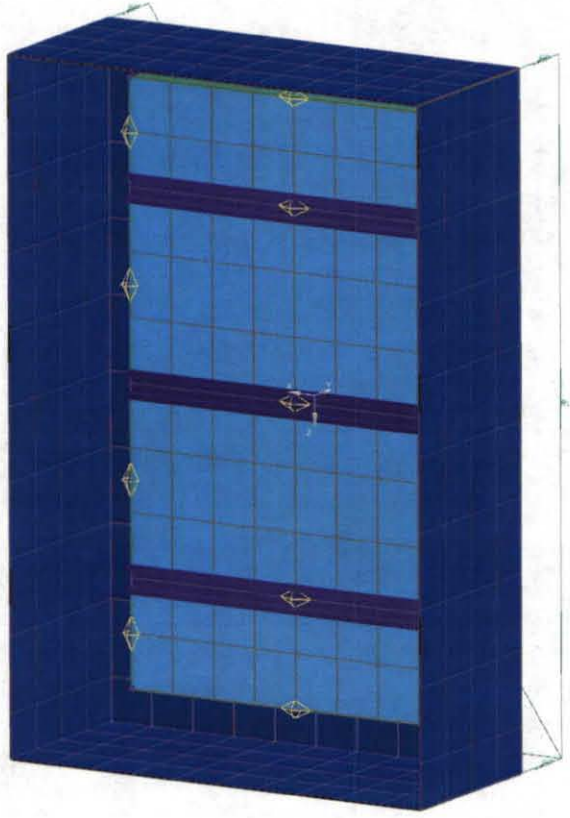


Front Panel Removed

Multiple Cabinets

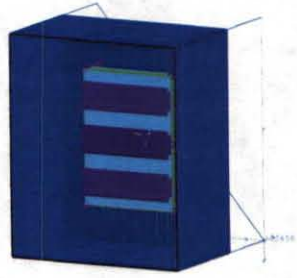


36x30x10



48x36x10

Extreme Example



12x10x6

Conclusion

- Reminder
  - This only had to be done once!
  - Can be used for any cabinet in that "family"
- Saves a lot of time if pre-planned
- Allows re-use in the future

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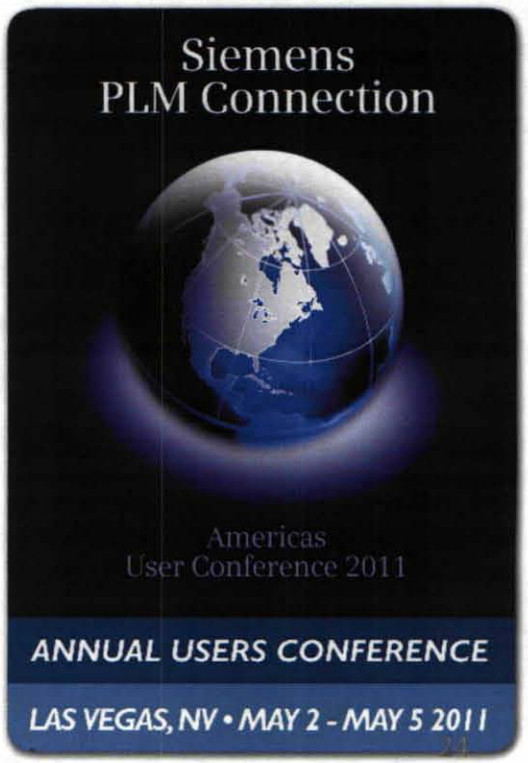
Thank You!

Siemens PLM Connection 2011

Las Vegas, NV

May 2-5



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