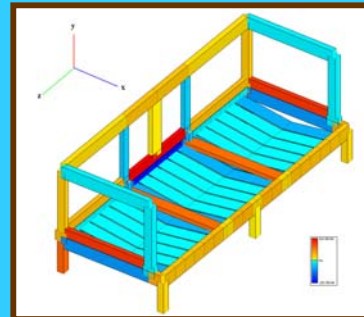


COUCH ANALYSIS

ARCH 614
SPRING 2007



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Why?

- The process and evaluation was documented to:
 - Model static structural behavior
 - Classify connections
 - Quantify capacity based on wood design practices
- This assignment is a practical application of taking structural formulas and concepts and applying them to a smaller, familiar object such as a couch that has similar behaving members.

Process

- Upholstery removal
 - Fabric
 - Burlap
 - Padding
 - Staples



Why?

Process

Structure

Assembly

Loads

Description

Conclusion

Process

- Upholstery Removal



Process

- Labeling Structural Members



Process

- Hardware Removal



Why?

Process

Structure

Assembly

Loads

Description

Conclusion

Process

- Hardware Removal



Process

- Hardware Removal



Why?

Process

Structure

Assembly

Loads

Description

Conclusion

Process

- Measuring Components



Process

- Recording Data Throughout Deconstruction



Process

- Final Deconstruction

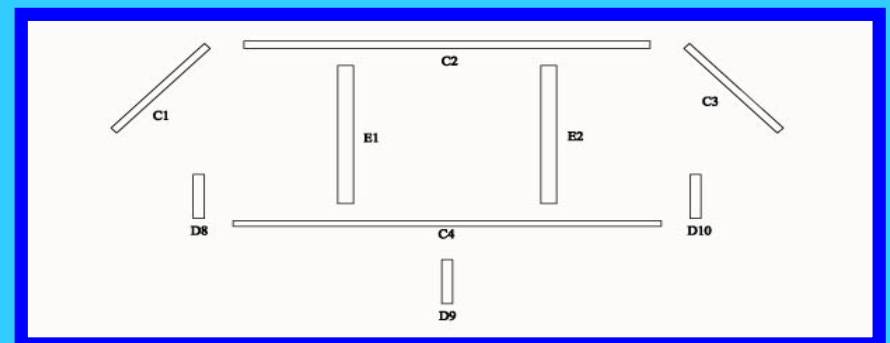
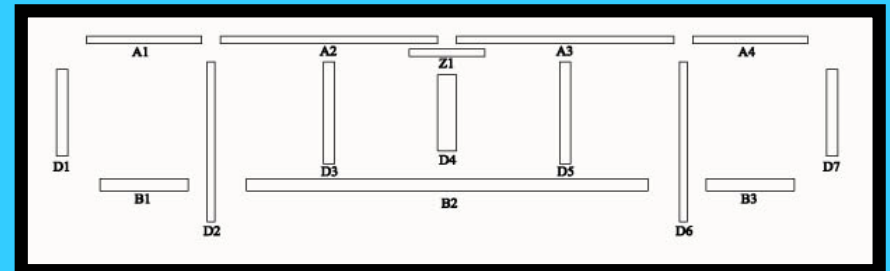


Structure

- General Couch Construction
 - Frame
 - Kiln-dried hardwood₁
 - Springs
 - Eight-way hand-tied knot system₁
 - Metal clips ₂
 - Coil placement₂
 - Connection techniques
 - Corners are wood glued, high pressure stapled and reinforced with blocks.₂

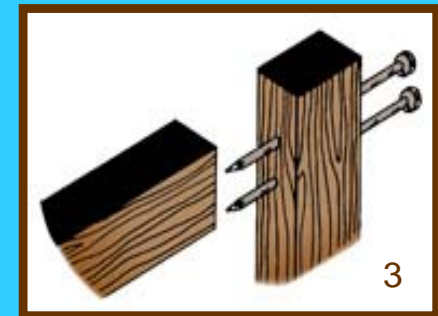
Structural Systems

- Structural Members
 - Vertical Components
 - Horizontal Components



Structural Systems

- Connection Types₃
 - Butt joints



- End lap joints

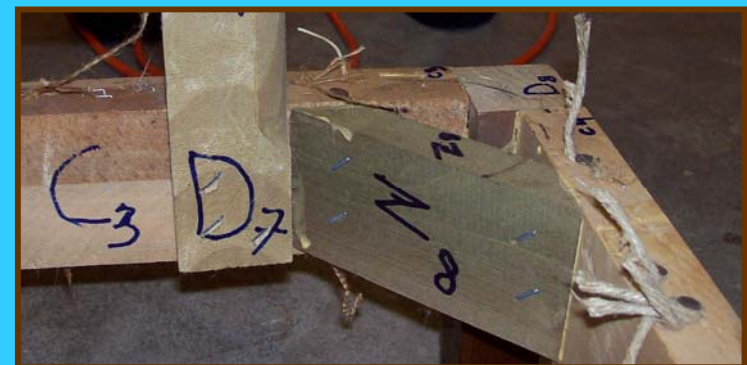


- Dowel joints



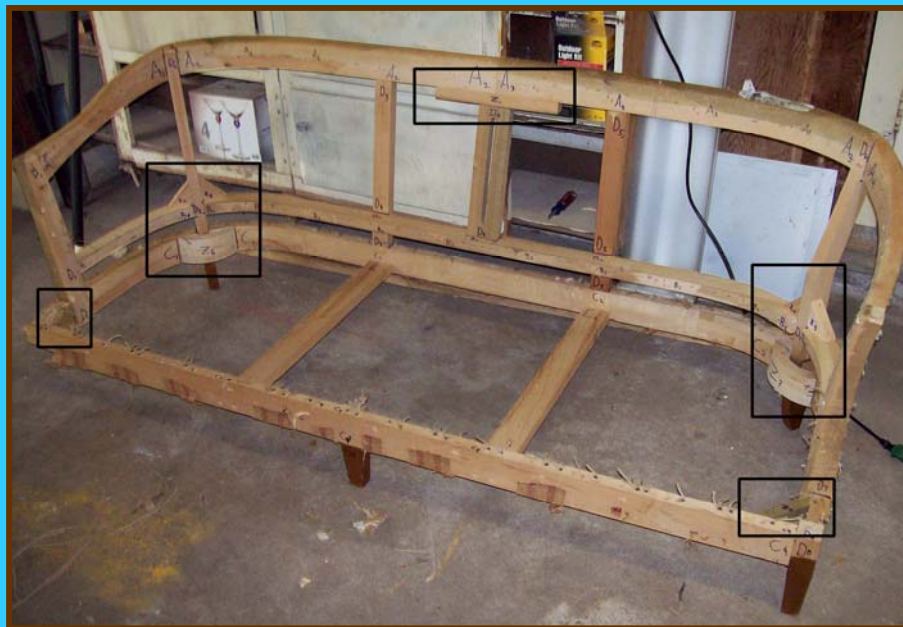
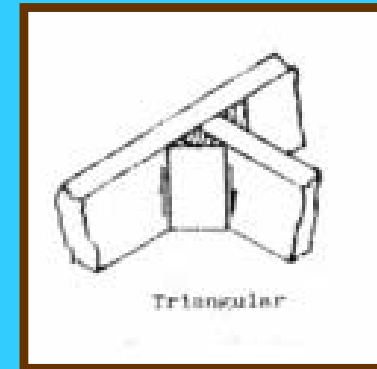
Structural Systems

- Connection Types₄
 - Adhesive
 - Wood glue
 - Dowels
 - Screws, Bolts, Staples



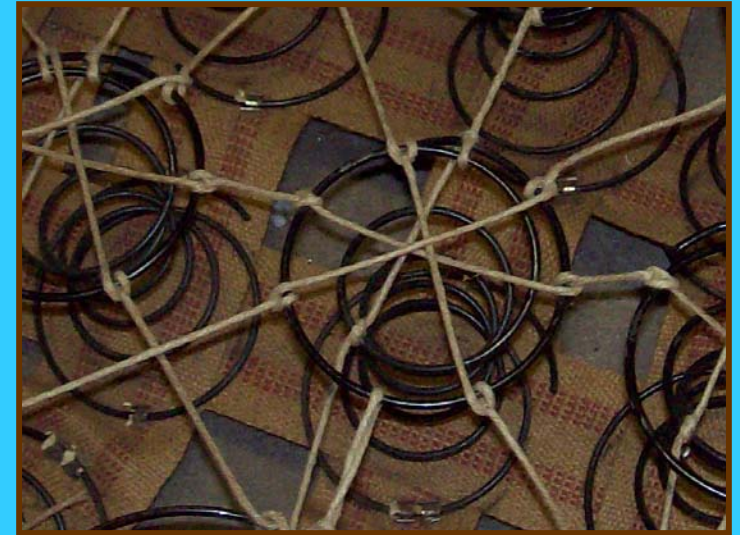
Structural Systems

- Bracing
 - Blocking for reinforcement



Structural Systems

- Bracing
 - 8 way hand tied knot system
 - Burlap straps
 - Metal straps



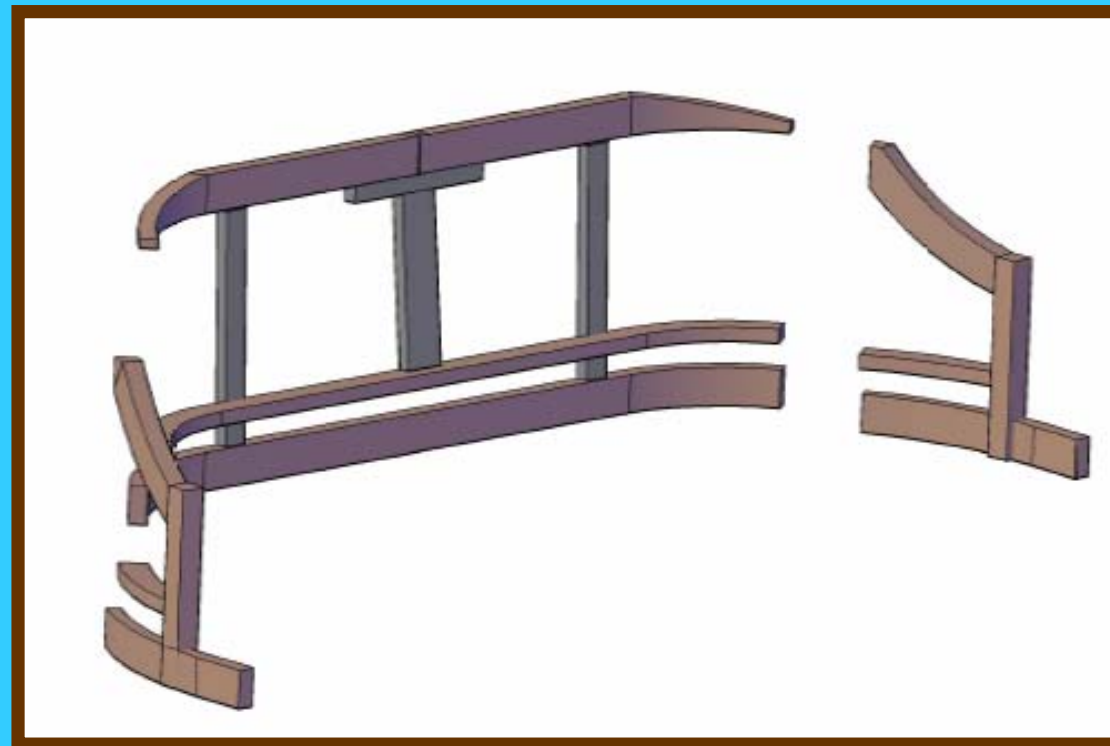
Non-Structural Components

- Springs
 - used to redistribute weight throughout the frame and as a cushioning device



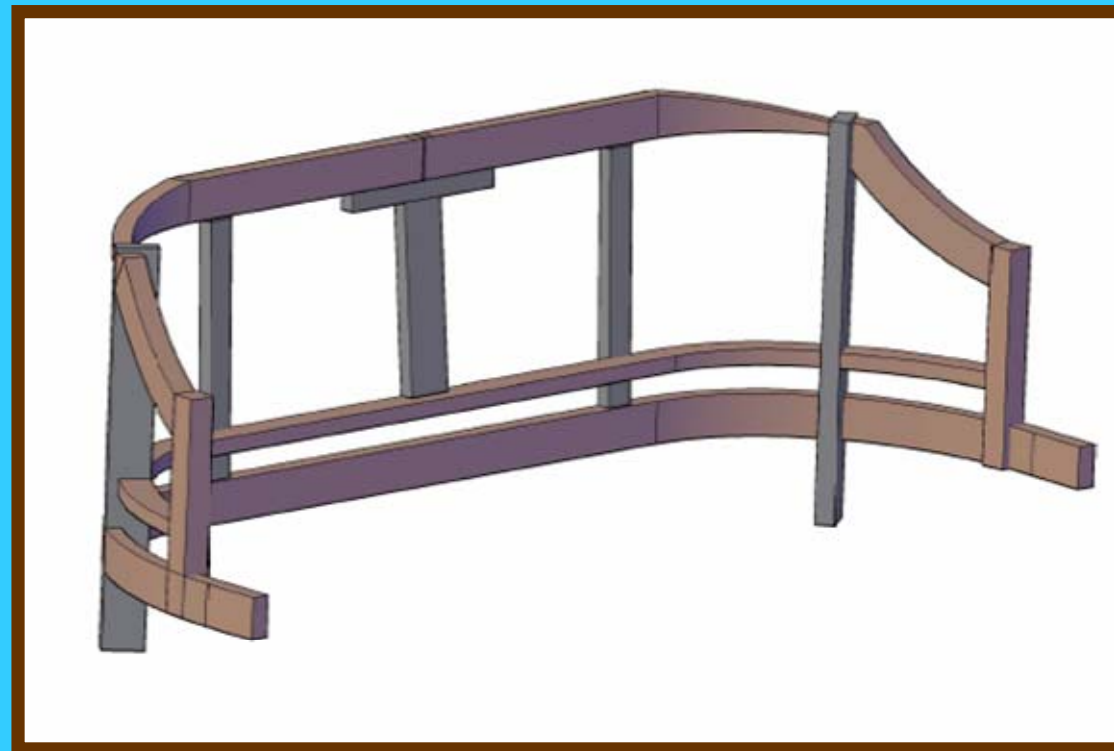
Assembly Order

- Step 1: Back section of couch constructed
- Step 2: Arm rest sides are constructed



Assembly Order

- Step 3: The sides and back are attached to the back legs.



Assembly Order

- Step 4: Webbing Bridge attached to C2



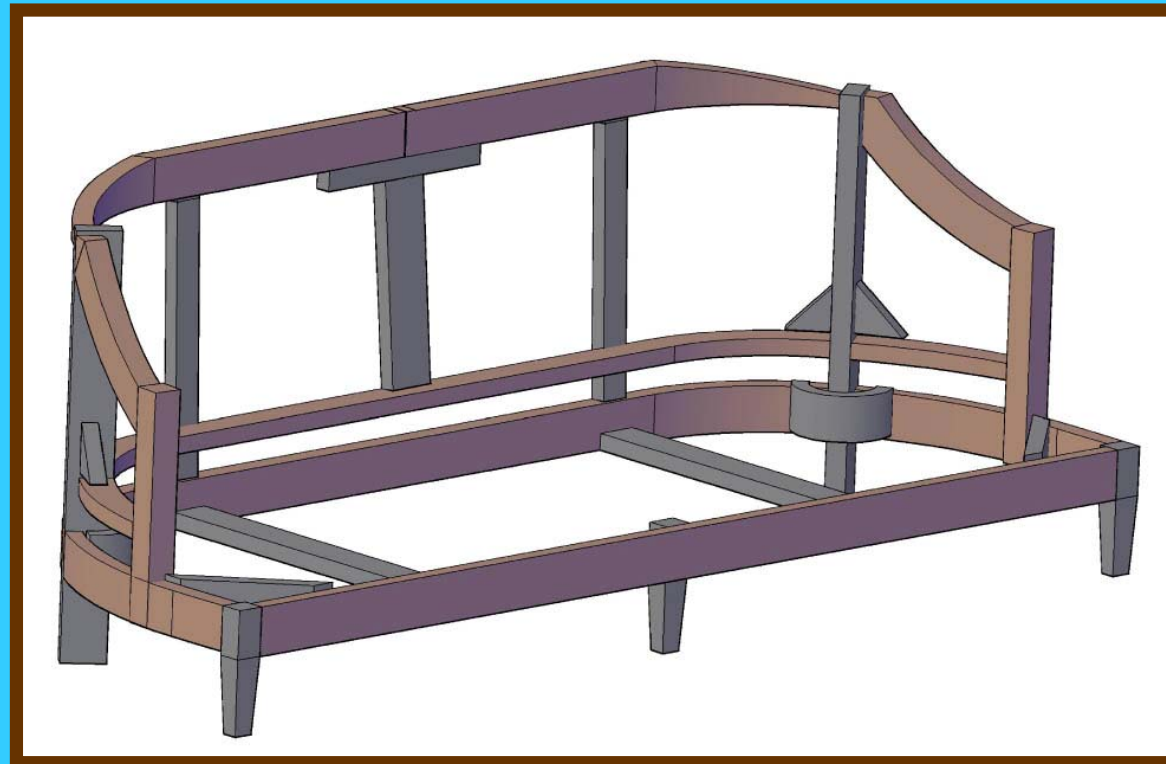
Assembly Order

- Step 5: The Front Legs are attached to C4
- Step 6: C4, with the legs joined, is attached to the front of the couch frame.



Assembly Order

- Step 7: Bracing installed



Assembly Order

- Step 8: Attachment of burlap and metal strap webbing to hold up the coil springs



Assembly Order

- Step 9: Springs and heavy cord installed



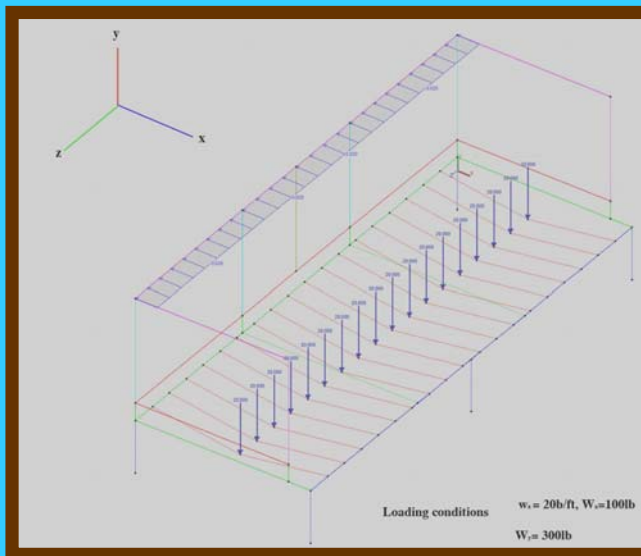
Assembly Order

- Step 10: Cushioning and Upholstery added



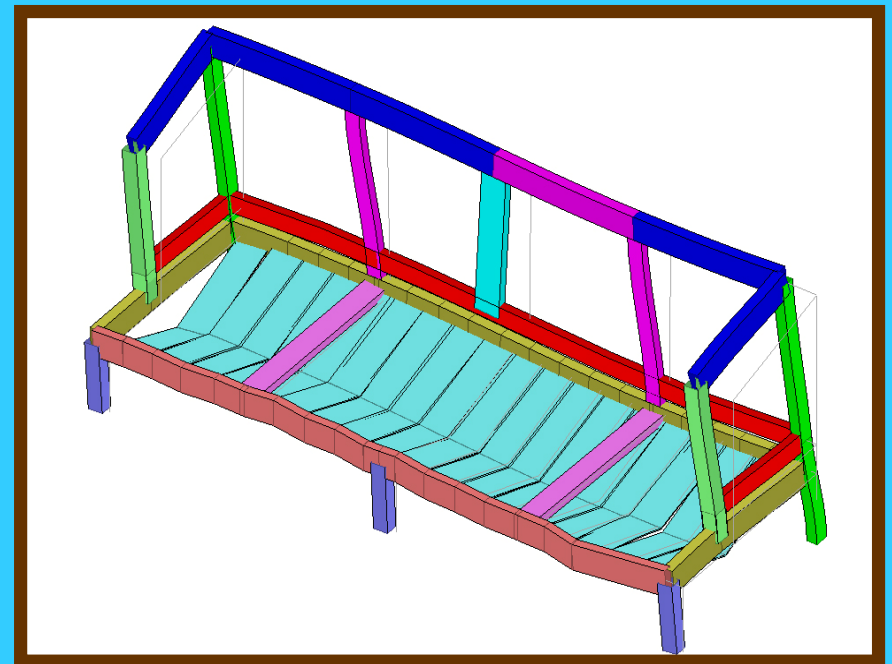
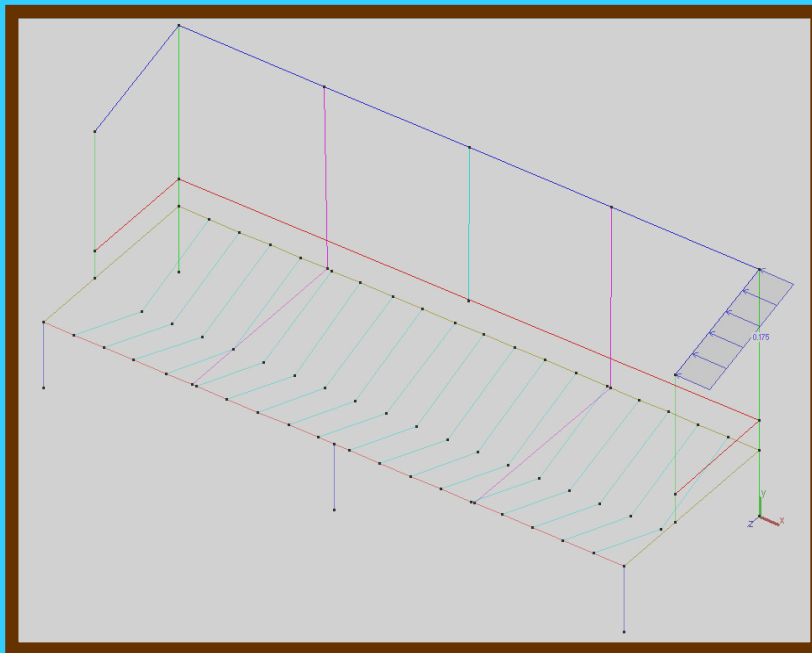
Loads

- Assumed Loads₆
 - 2 seated people
 - Vertical load (y-axis)
 - 150 lb x 2 people = total weight of 300 lb
 - point load of 20 lbs on 18 fabric straps
 - Lateral load (x-axis)
 - 55 lb/ person
 - Distributed load of 20 lbs/ft



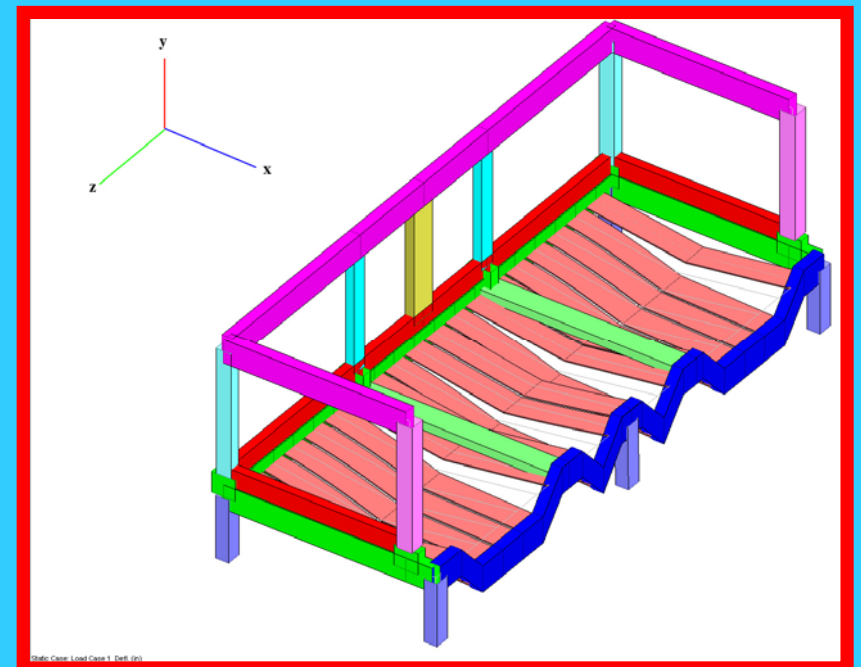
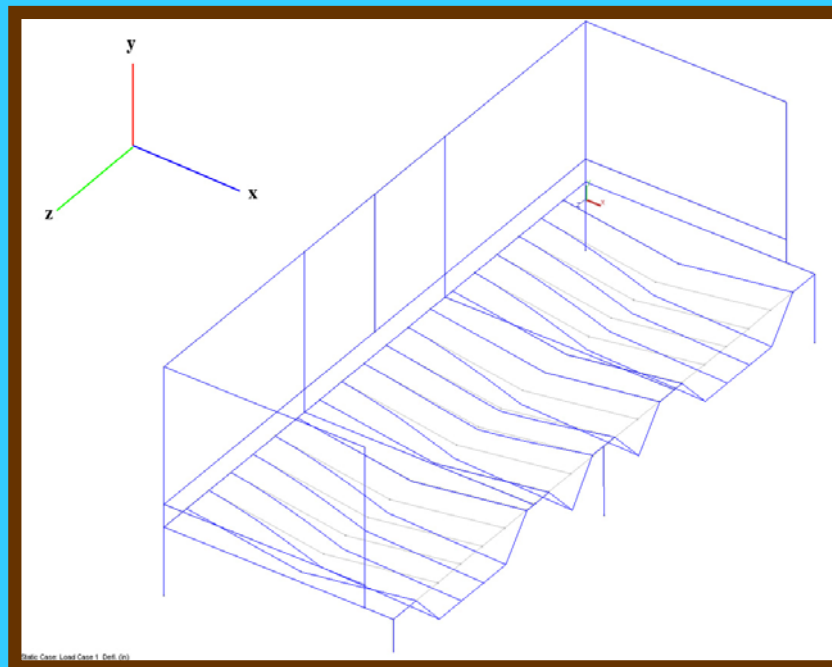
Loads

- Abnormal Loads
 - Arm rest load (z-axis load)
 - 175 lb/ft distributed
 - $175\text{lb/ft} \times 1.25\text{ ft} = 219\text{ lb total}$



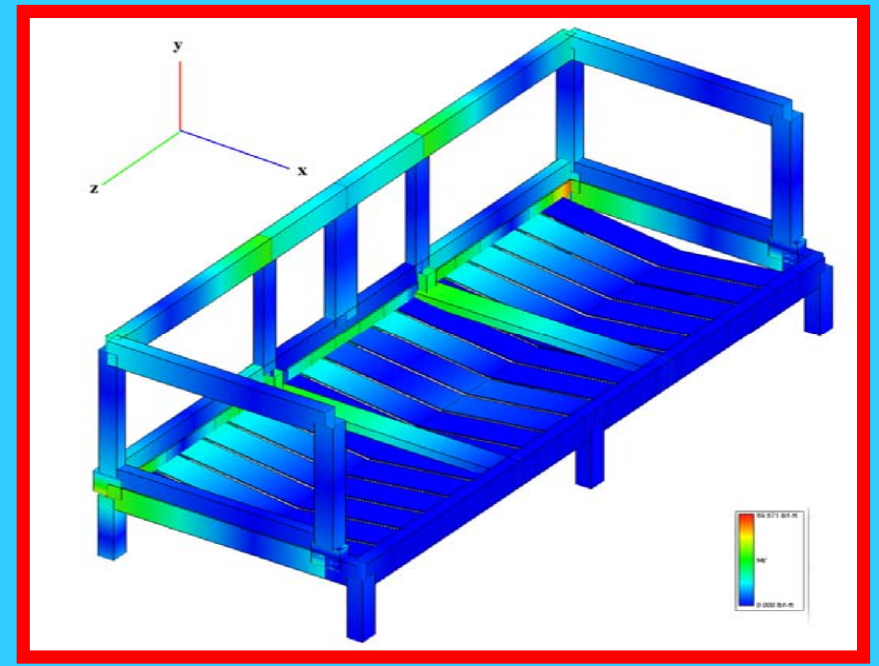
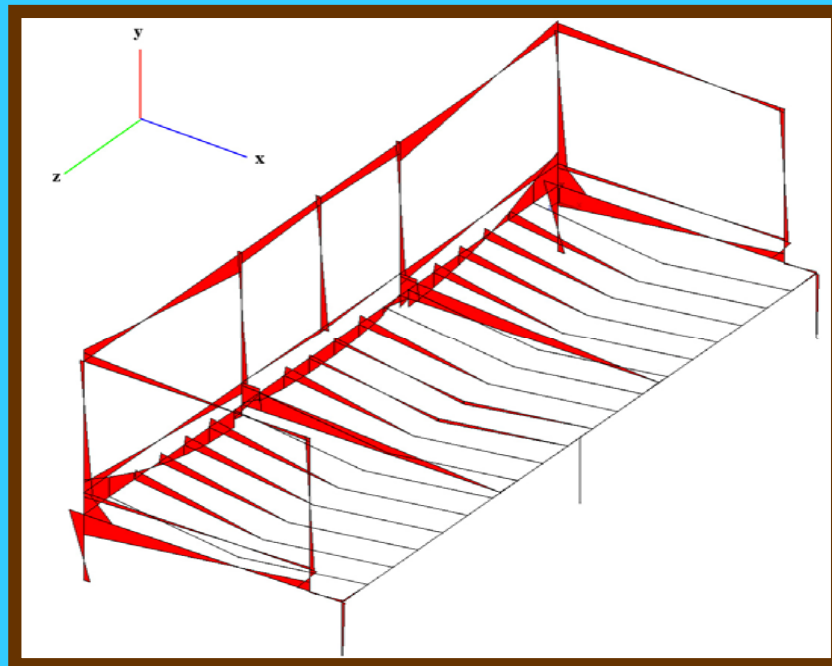
Description

- Deflection



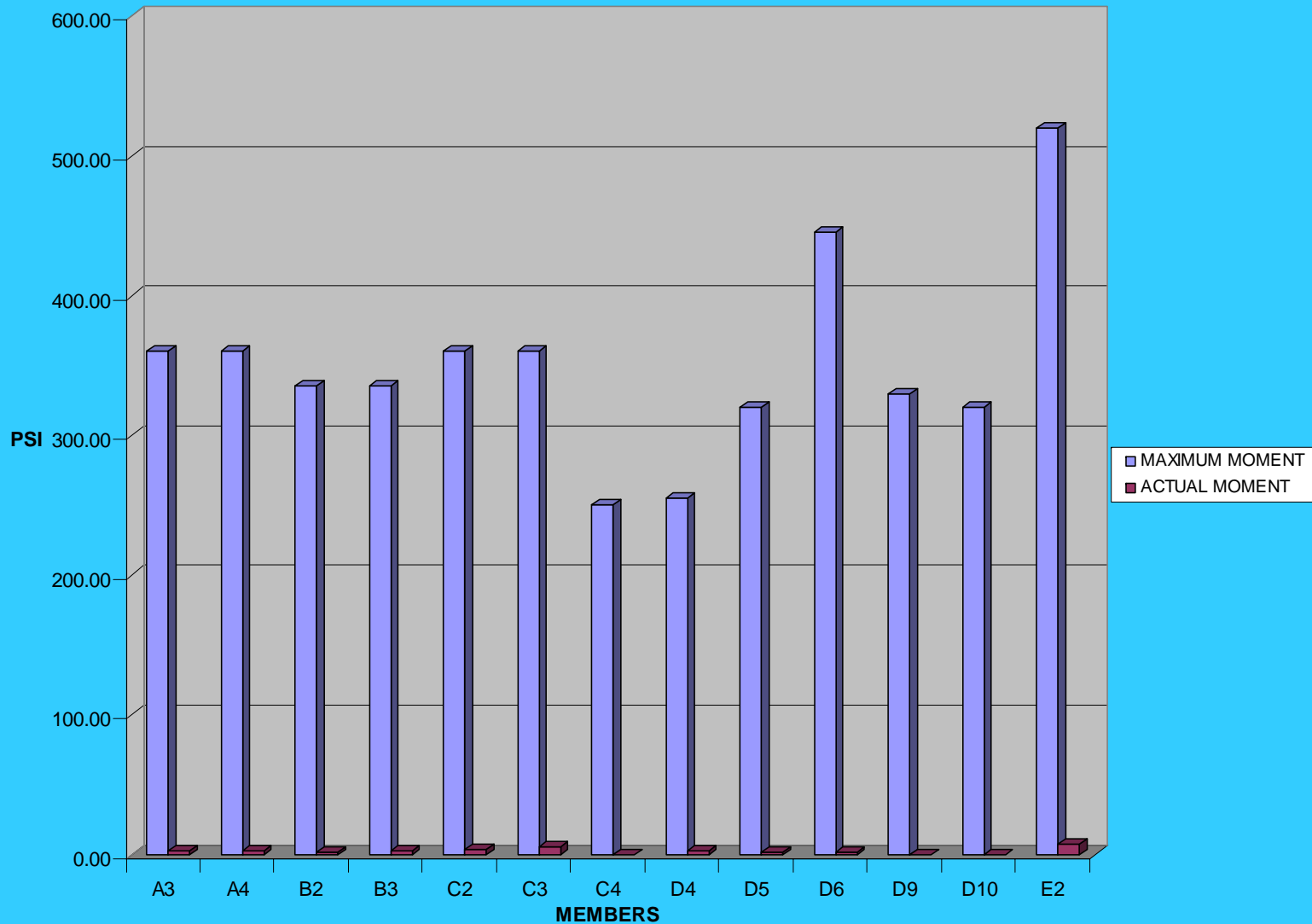
Description

- Moment



Description

MOMENT LOADS COMPARISON



Why?

Process

Structure

Assembly

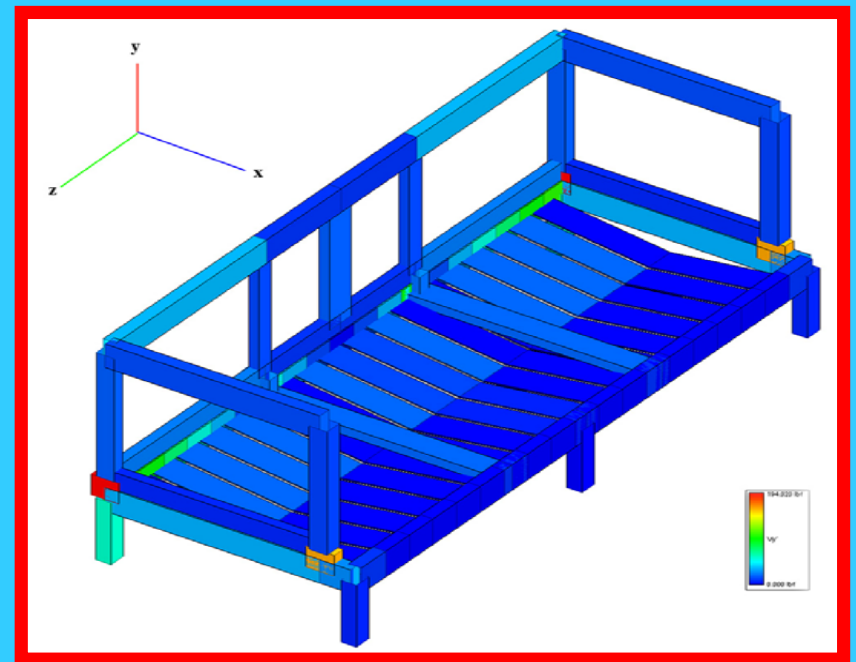
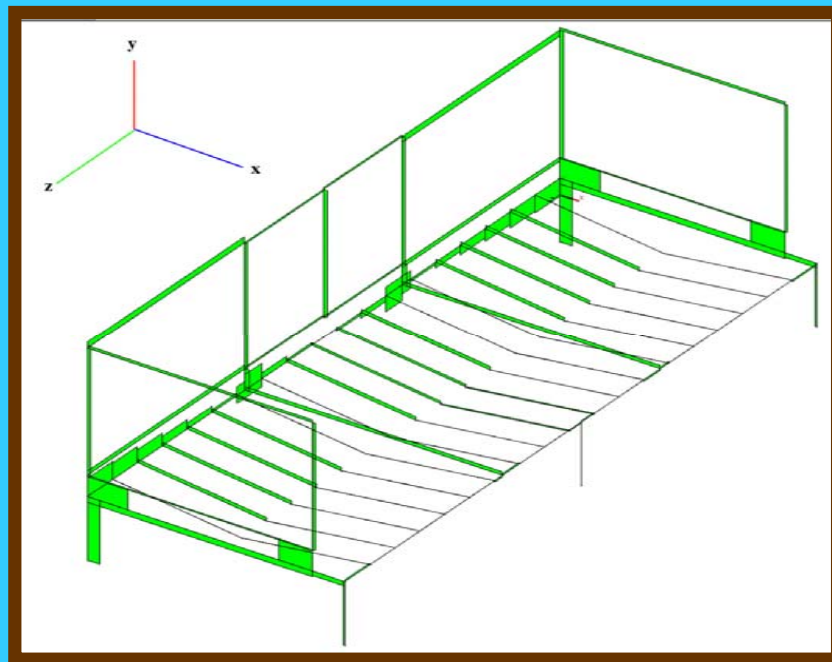
Loads

Description

Conclusion

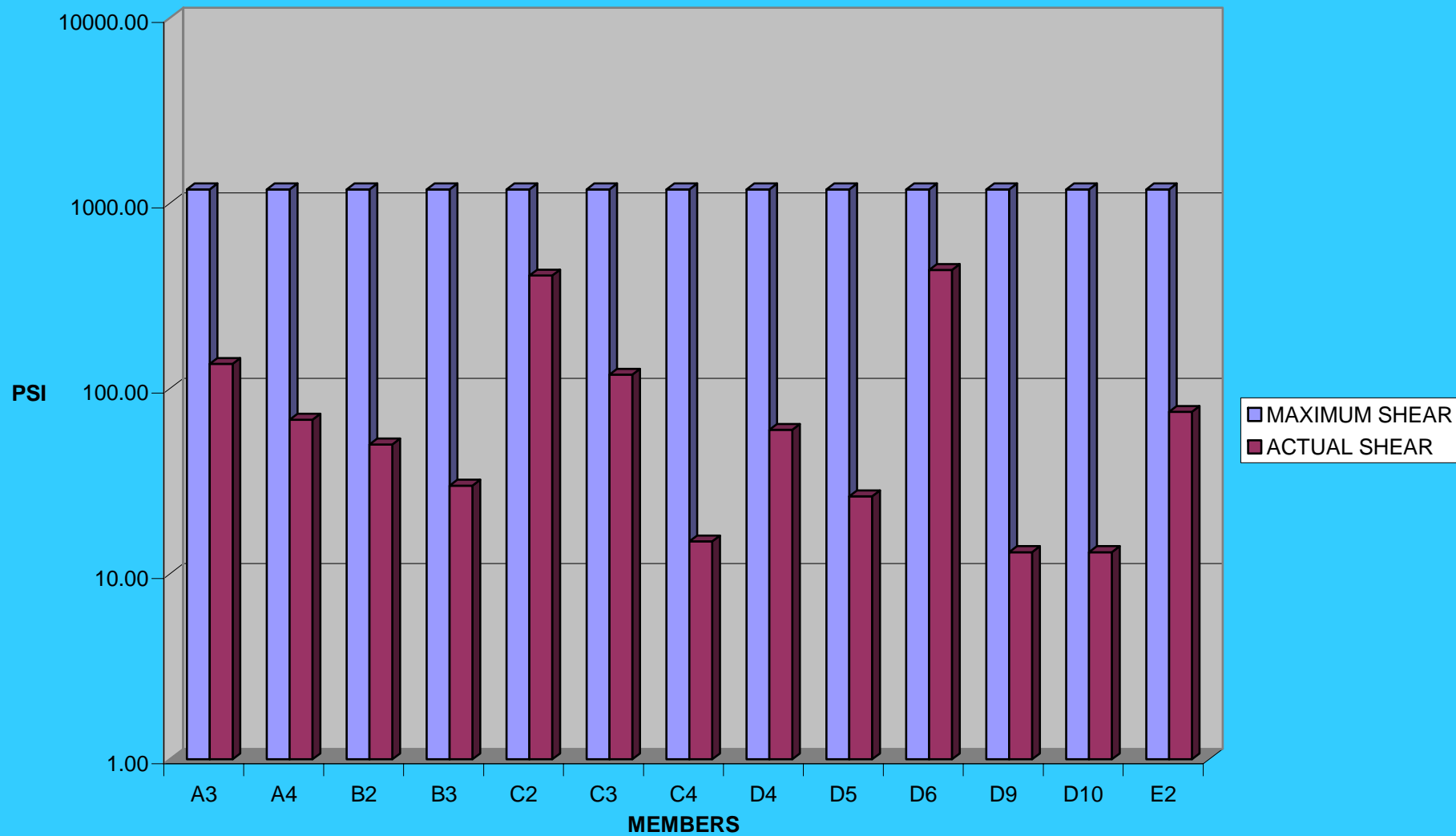
Description

- Shear
 - Along y-axis



Description

SHEAR LOADS COMPARISON
LOG PLOT



Why?

Process

Structure

Assembly

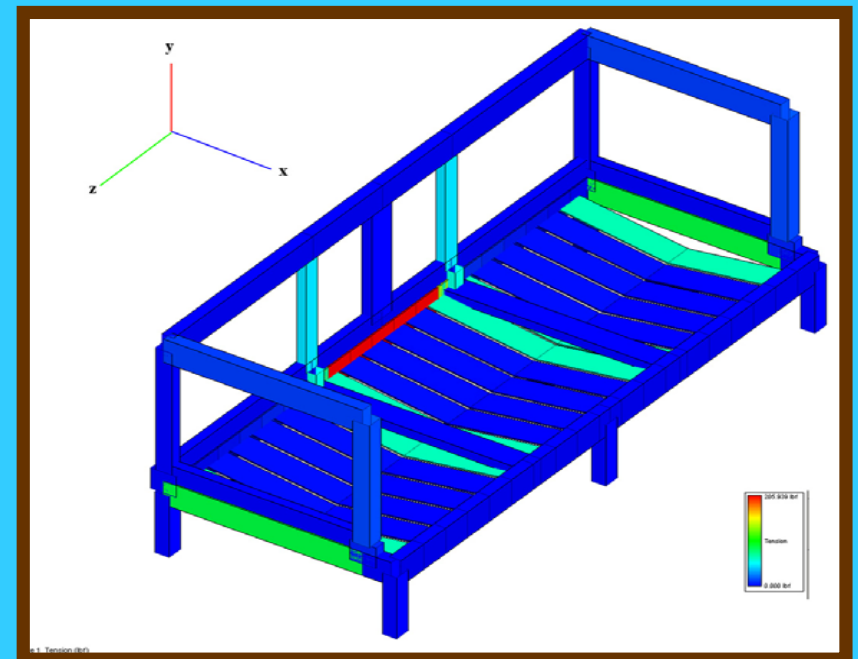
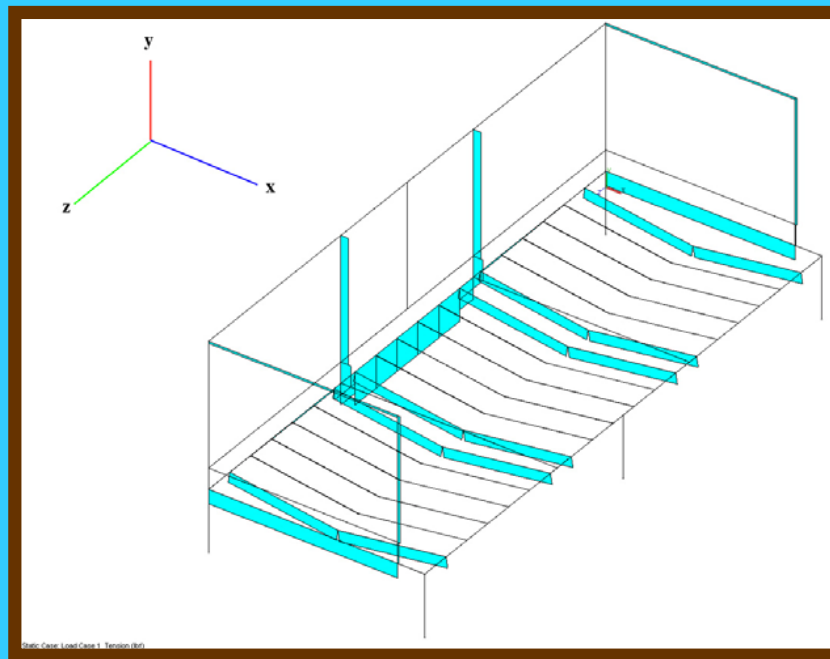
Loads

Description

Conclusion

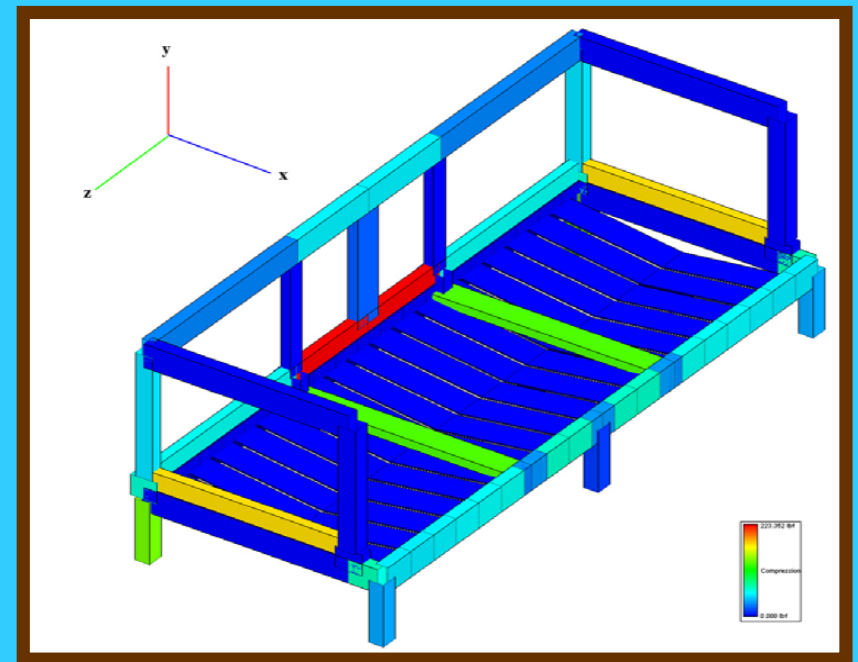
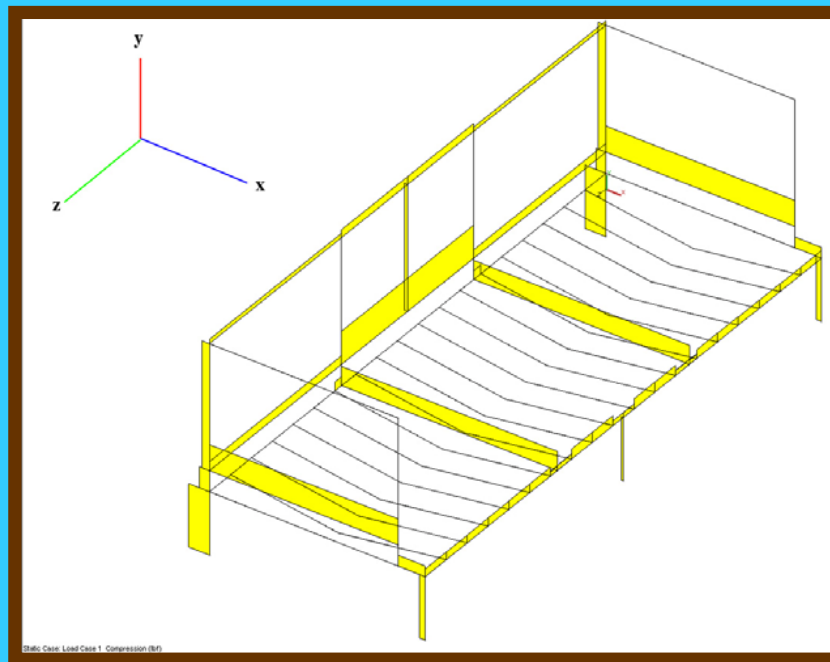
Description

- Tension



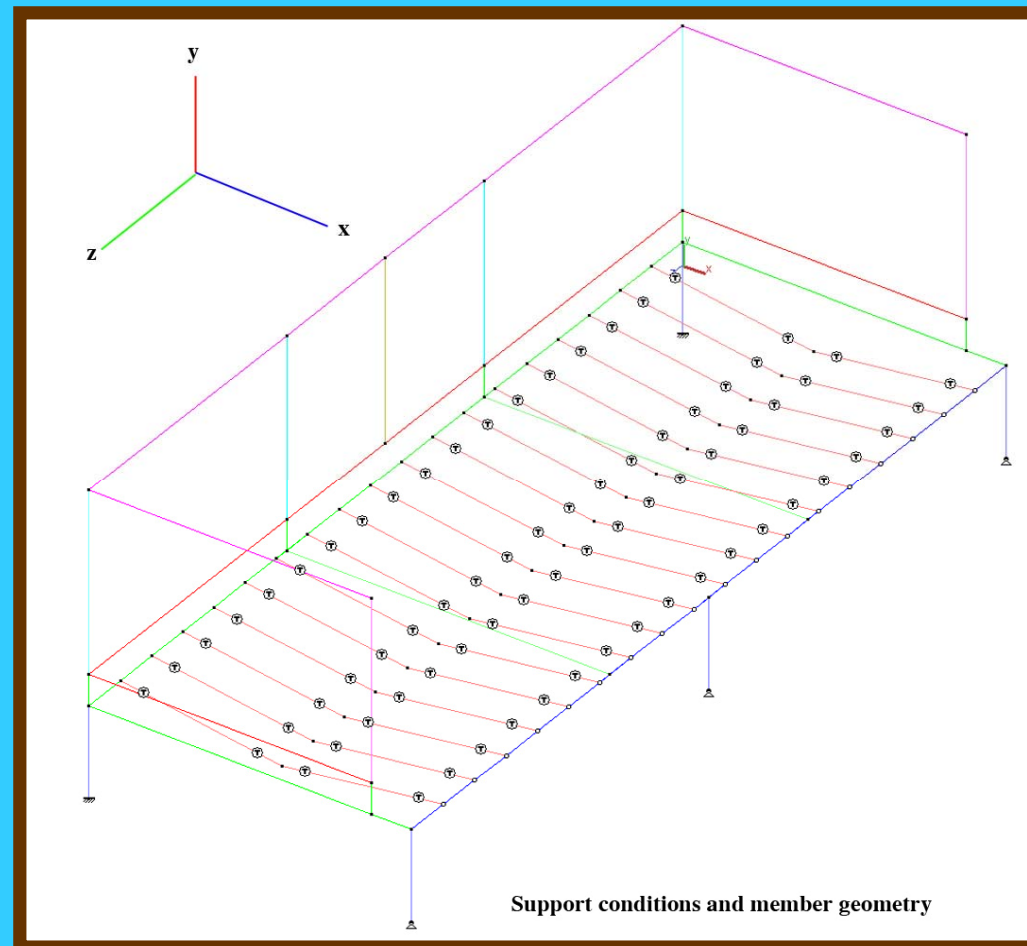
Description

- Compression



Description

- Support



Conclusion

- Deconstruction
 - Revealing of structure and frame geometries in addition to joint types.
- Measurement of Frame
 - Larger sections have greatest concentration of forces.
- Computer Models
 - Easy visualization from various loading conditions.
- The use of visual models to simulate numerical situations creates a great furniture design tool.

References

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