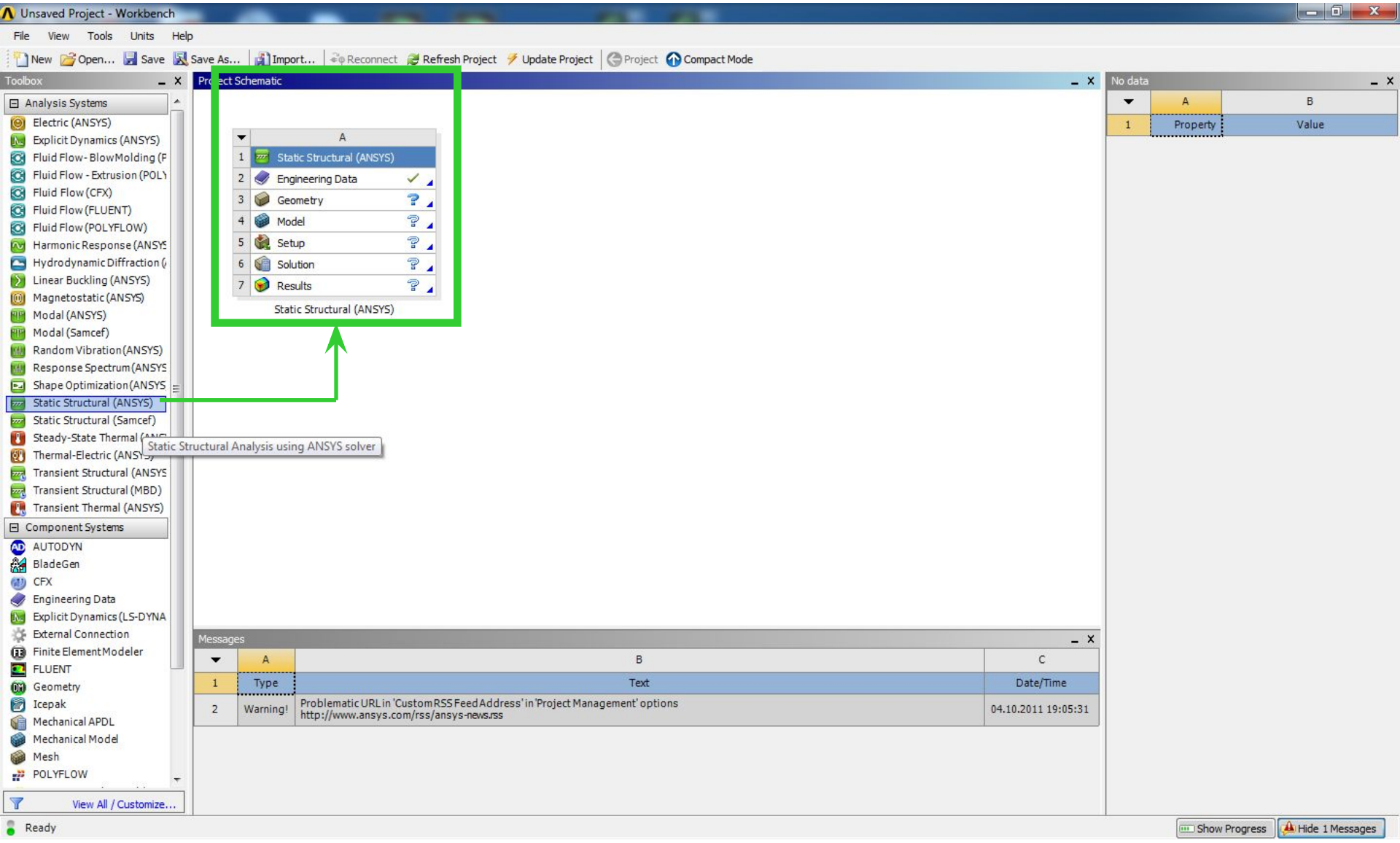
Расчет опорной конструкции котельного агрегата

Порядок выполнения работы:

Моделирование неразрезной балки при статической нагрузке (Static Structural)

- Создание схемы балки согласно заданию.
- Задание материалов.
- Генерация сети балочных элементов.
- Задание граничных условий.
- Проведение расчета.
- Интерпретация результатов.

Определение частот и форм собственных колебаний (Modal)


Unsaved Project - Workbench
File View Tools Units Help
New Open... Save Save As... Import... Reconnect Refresh Project Update Project Project Compact Mode
Toolbox
Analysis Systems
Electric (ANSYS)
Explicit Dynamics (ANSYS)
Fluid Flow- BlowMolding (F
Fluid Flow - Extrusion (POLY
Fluid Flow (CFX)
Fluid Flow (FLUENT)
Fluid Flow (POLYFLOW)
Harmonic Response (ANSYS
Hydrodynamic Diffraction (
Linear Buckling (ANSYS)
Magnetostatic (ANSYS)
Modal (ANSYS)
Modal (Samcef)
Random Vibration (ANSYS)
Response Spectrum (ANSYS
Shape Optimization (ANSYS
Static Structural (ANSYS)
Static Structural (Samcef)
Steady-State Thermal (ANS
Thermal-Electric (ANSY
Transient Structural (ANSYS
Transient Structural (MBD)
Transient Thermal (ANSYS)
Component Systems
AUTODYN
BladeGen
CFX
Engineering Data
Explicit Dynamics (LS-DYNA
External Connection
Finite Element Modeler
FLUENT
Geometry
Icepak
Mechanical APDL
Mechanical Model
Mesh
POLYFLOW
View All / Customize...
Project Schematic
A
1 Static Structural (ANSYS)
2 Engineering Data
3 Geometry
4 Model
5 Setup
6 Solution
7 Results
Static Structural (ANSYS)
Static Structural Analysis using ANSYS solver
No data
A B
1 Property Value
Messages
A B C
1 Type Text Date/Time
2 Warning! Problematic URL in 'Custom RSS Feed Address' in 'Project Management' options
http://www.ansys.com/rss/ansys-news.rss
04.10.2011 19:05:31
Ready
Show Progress
Hide 1 Messages

Unsaved Project - Workbench

File View Tools Units Help

New Open... Save Save As... Import... Reconnect Refresh Project Update Project Return to Project Compact Mode

Toolbox

- Physical Properties
- Linear Elastic
- Experimental Stress Strain Data
- Hyperelastic
- Plasticity
- Life
- Strength

View All / Customize...

Outline Filter

	A	B	C	D
1	Data Source		Location	Description
2	Engineering Data		A2	Contents filtered for Static Structural (ANSYS).
3	General Materials			General use material samples for use in various analyses.
4	General Non-linear Materials			General use material samples for use in non-linear analyses.
5	Explicit Materials			Material samples for use in an explicit anaylsis.
6	Hyperelastic Materials			Material stress-strain data samples for curve fitting.

Outline of Schematic A2: Engineering Data

	A	B	C	D
1	Contents of Engineering Data		S..	Description
2	Material			
3	Stainless Steel			
4	Structural Steel			Fatigue Data atzero mean stress comes from 1998 ASME BPV Code, Section 8, Div 2, Table 5-110.1
*	Click here to add a new material			

Properties of Outline Row 3: Stainless Steel

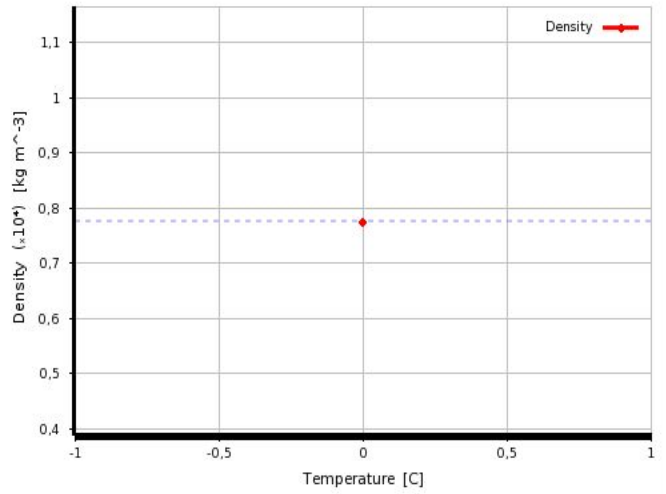
	A	B	C	D
1	Property	Value	Unit	
2	Density	7750	kg m^-3	
3	Isotropic Secant Coefficient of Thermal Expansion			
6	Isotropic Elasticity			
7	Derive from	Young's Modulus and Poisson's Ratio		
8	Young's Modulus	1,93E+11	Pa	
9	Poisson's Ratio	0,31		
10	Bulk Modulus	1,693E+11	Pa	

Table of Properties Row 2: Density

	A	B
1	Temperature (C)	Density (kg m^-3)
2		
*		

Ascending
Descending
Sort Settings...
Cancel sorting
K
C
R
F

Chart of Properties Row 2: Density



Ready

Show Progress Show 1 Messages

A: Static Structural (ANSYS) - DesignModeler

File Create Concept Tools View Help

Undo Redo Select:

YZPlane Sketch1 Generate Share Topology Extrude Revolve Sweep Skin/Loft Thin/Surface Blend Chamfer Point Parameters

Tree Outline

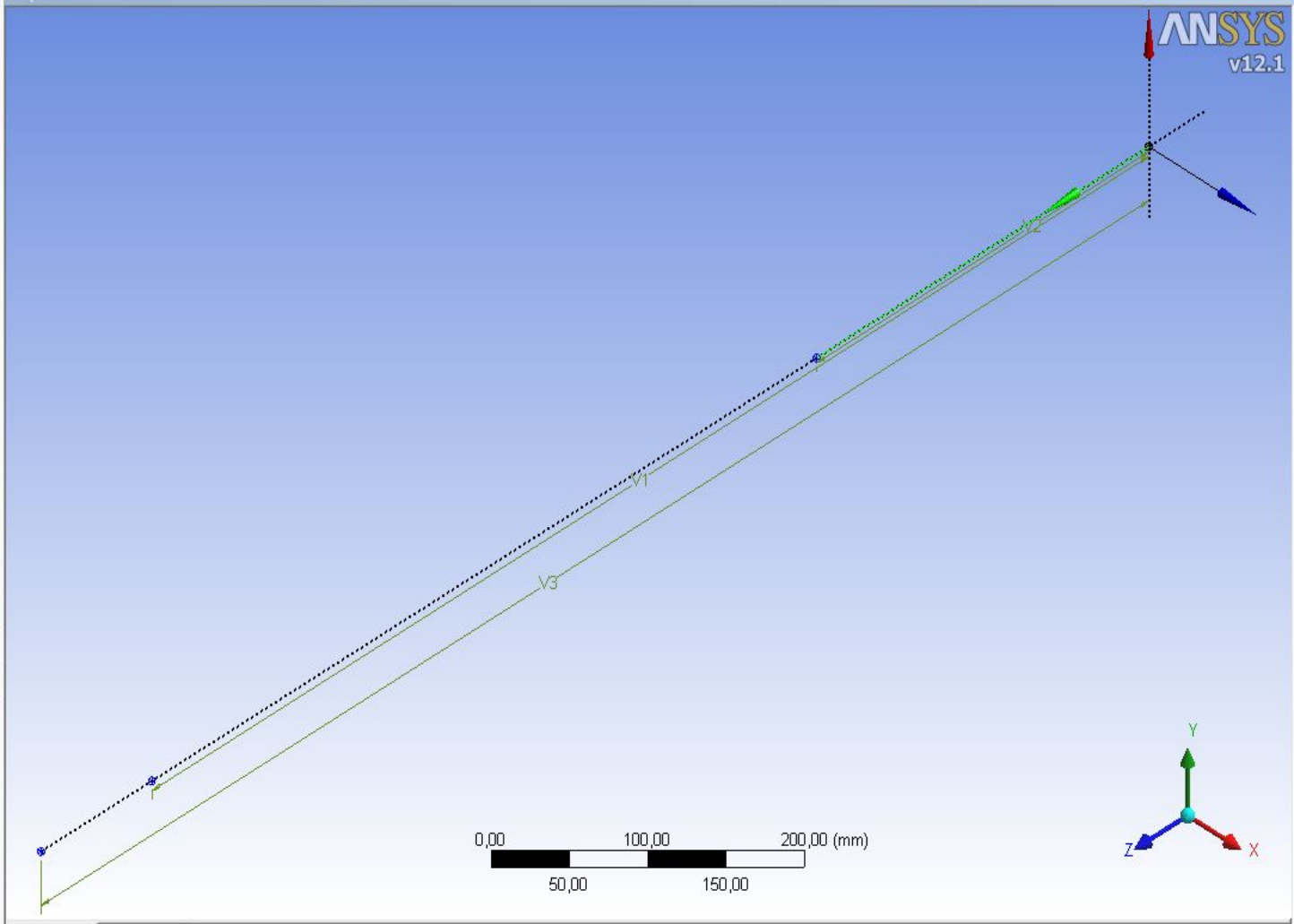
- A: Static Structural (ANSYS)
  - XYPlane
  - ZXPlane
  - YZPlane
    - Sketch1
  - Line1
  - 0 Parts, 0 Bodies

Sketching Modeling

Details View

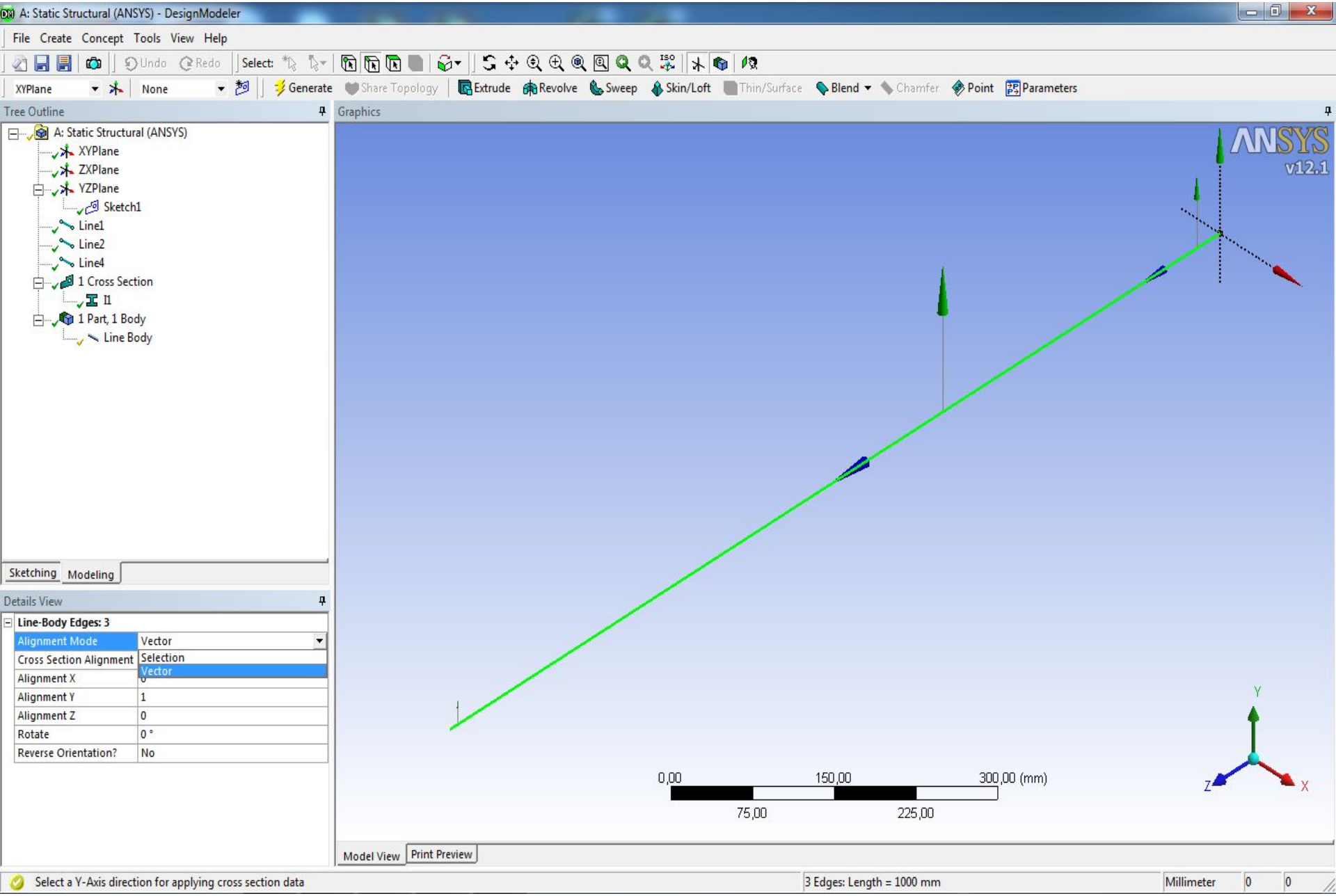
Details of Line1		
Lines From Points	Line1	
Point Segments	Apply	Cancel
Operation	Add Material	

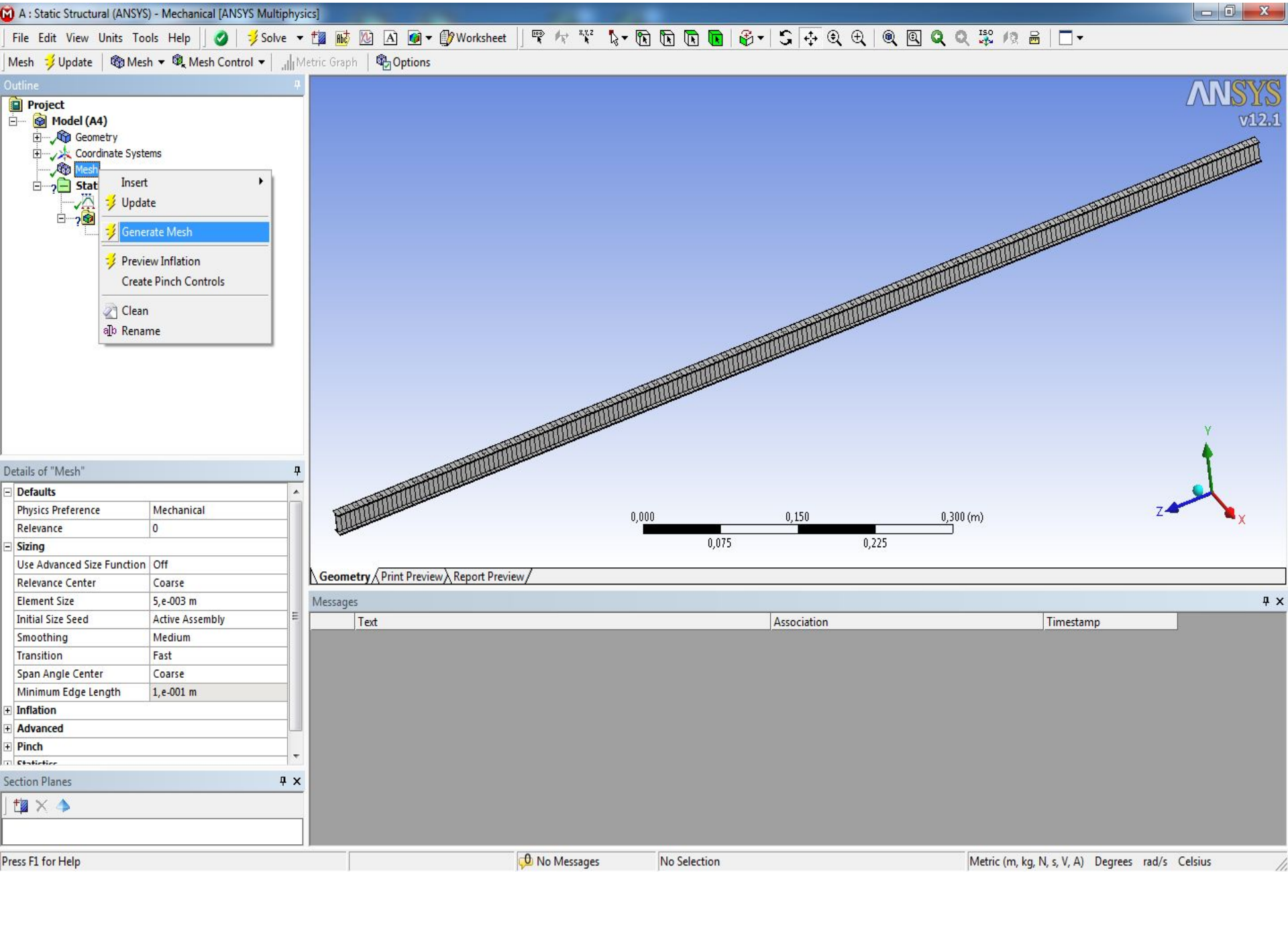
Graphics



Model View Print Preview

Lines From Points Creation -- Select pairs of 2D points, 3D vertices, and Point Feature points for this feature | 1 Point Segment | Millimeter | 0 | 0


A: Static Structural (ANSYS) - DesignModeler
File Create Concept Tools View Help
Undo Redo Select:
XYPlane None Generate Share Topology Extrude Revolve Sweep Skin/Loft Thin/Surface Blend Chamfer Point Parameters
Tree Outline
A: Static Structural (ANSYS)
XYPlane
ZXPlane
YZPlane
Sketch1
Line1
Line2
Line4
1 Cross Section
I1
1 Part, 1 Body
Line Body
Sketching Modeling
Details View
Line-Body Edges: 3
Alignment Mode Vector
Selection
Vector
Cross Section Alignment
Alignment X 0
Alignment Y 1
Alignment Z 0
Rotate 0 °
Reverse Orientation? No
Graphics
ANSYS
v12.1
0,00 150,00 300,00 (mm)
75,00 225,00
Y
Z
X
Model View Print Preview
Select a Y-Axis direction for applying cross section data
3 Edges: Length = 1000 mm
Millimeter 0 0


A : Static Structural (ANSYS) - Mechanical [ANSYS Multiphysics]
File Edit View Units Tools Help
Solve
Worksheet
Mesh Update Mesh Mesh Control Metric Graph Options
Outline
Project
Model (A4)
Geometry
Coordinate Systems
Mesh
Stat
Insert
Update
Generate Mesh
Preview Inflation
Create Pinch Controls
Clean
Rename
ANSYS
v12.1
0,000
0,150
0,300 (m)
0,075
0,225
Y
Z
X
Geometry
Print Preview
Report Preview
Details of "Mesh"
Defaults
Physics Preference Mechanical
Relevance 0
Sizing
Use Advanced Size Function Off
Relevance Center Coarse
Element Size 5,e-003 m
Initial Size Seed Active Assembly
Smoothing Medium
Transition Fast
Span Angle Center Coarse
Minimum Edge Length 1,e-001 m
Inflation
Advanced
Pinch
Section Planes
Messages
Text
Association
Timestamp
Press F1 for Help
No Messages
No Selection
Metric (m, kg, N, s, V, A) Degrees rad/s Celsius

A : Static Structural (ANSYS) - Mechanical [ANSYS Multiphysics]

File Edit View Units Tools Help | Solve | Worksheet

Geometry | Point Mass | Thermal Point Mass

Outline

- Project
  - Model (A4)
    - Geometry
      - Line Body
    - Coordinate Systems
    - Mesh
    - Static Structural (A5)
      - Analysis Settings
      - Solution (A6)
        - Solution Information

Details of "Line Body"

Graphics Properties	
Definition	
Suppressed	No
Coordinate System	Default Coordinate System
Reference Temperature	By Environment
Offset Mode	Refresh on Update
Offset Type	Centroid
Material	
Assignment	Structural Steel
Nonlinear Effects	Yes
Thermal Strain Effects	Yes
Bounding Box	
Properties	
Statistics	

Stainless Steel

Section Planes

ANSYS v12.1

0,000 0,150 0,300 (m)
0,075 0,225

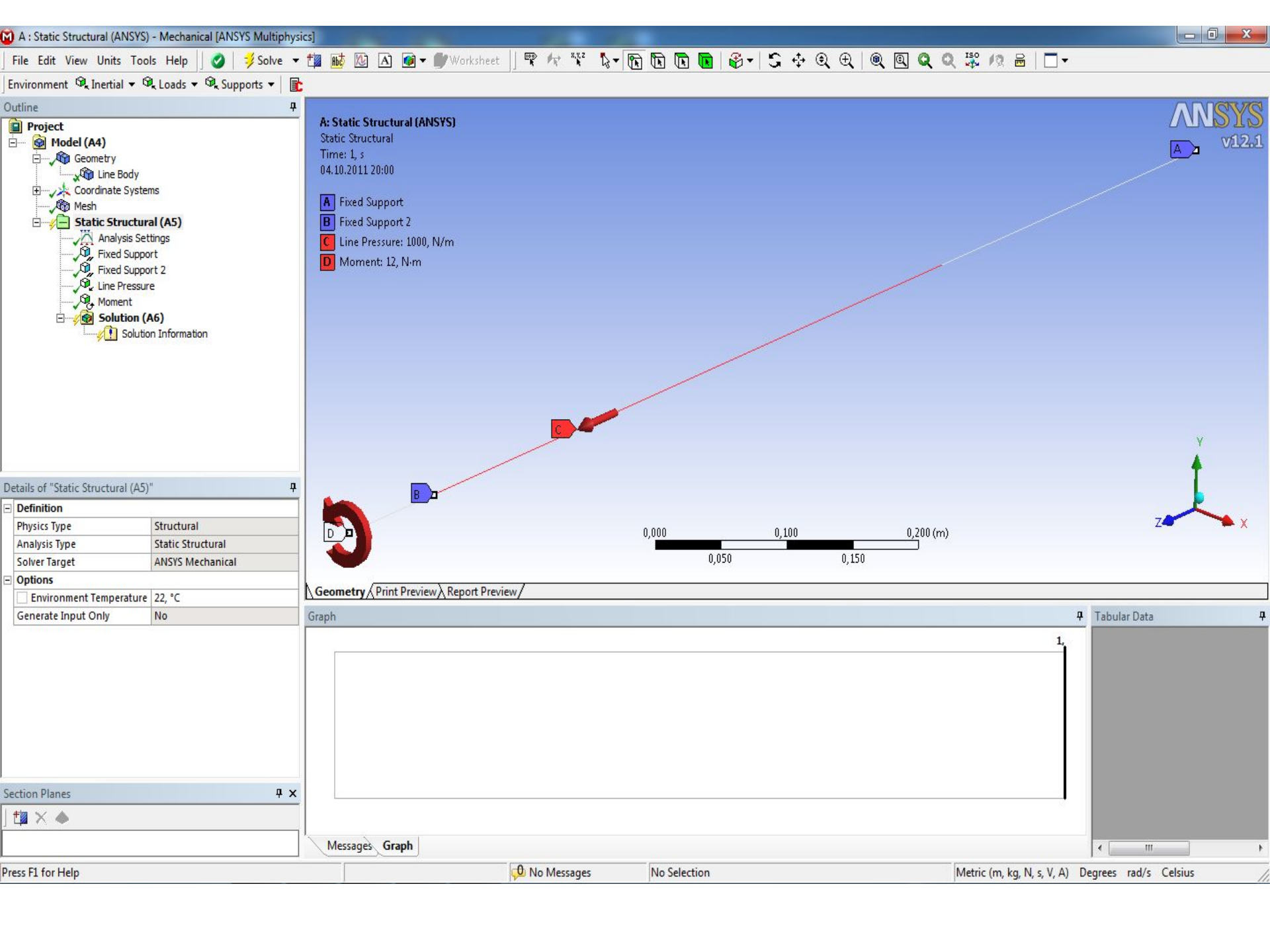
Y Z X

Geometry | Print Preview | Report Preview

Messages

	Text	Association	Timestamp

Press F1 for Help | No Messages | No Selection | Metric (m, kg, N, s, V, A) Degrees rad/s Celsius


A : Static Structural (ANSYS) - Mechanical [ANSYS Multiphysics]
File Edit View Units Tools Help
Solve
Worksheet
Environment
Inertial
Loads
Supports
Outline
Project
Model (A4)
Geometry
Line Body
Coordinate Systems
Mesh
Static Structural (A5)
Analysis Settings
Fixed Support
Fixed Support 2
Line Pressure
Moment
Solution (A6)
Solution Information
Details of "Static Structural (A5)"
Definition
Physics Type
Structural
Analysis Type
Static Structural
Solver Target
ANSYS Mechanical
Options
Environment Temperature
22, °C
Generate Input Only
No
Section Planes
A: Static Structural (ANSYS)
Static Structural
Time: 1, s
04.10.2011 20:00
A Fixed Support
B Fixed Support 2
C Line Pressure: 1000, N/m
D Moment: 12, N·m
ANSYS
v12.1
0,000
0,100
0,200 (m)
0,050
0,150
Y
Z
X
Geometry
Print Preview
Report Preview
Graph
1,
Tabular Data
Messages
Graph
Press F1 for Help
No Messages
No Selection
Metric (m, kg, N, s, V, A)
Degrees
rad/s
Celsius

A : Static Structural (ANSYS) - Mechanical [ANSYS Multiphysics]

File Edit View Units Tools Help | Solve | Worksheet | Probe

Result 4,8e+003 (Auto Scale)

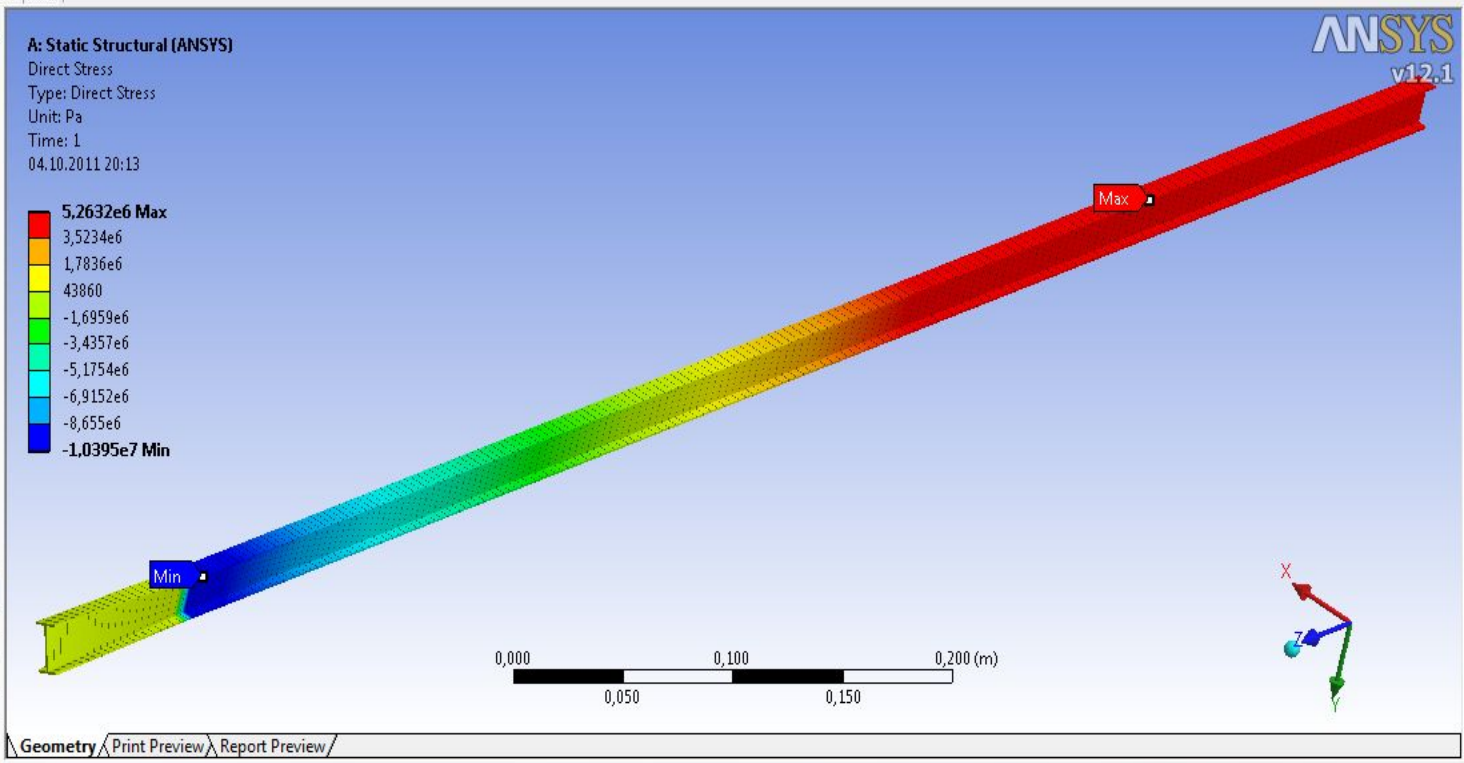
Outline

- Project
  - Model (A4)
    - Geometry
      - Line Body
    - Coordinate Systems
    - Mesh
    - Static Structural (A5)
      - Analysis Settings
      - Fixed Support
      - Line Pressure
      - Moment
      - Fixed Support 2
      - Solution (A6)
        - Solution Information
        - Total Deformation
        - Beam Tool
          - Direct Stress
          - Minimum Combined Stress
          - Maximum Combined Stress

Details of "Direct Stress"

Definition	
Type	Direct Stress
By	Time
Display Time	Last
Calculate Time History	Yes
Identifier	
Integration Point Results	
Display Option	Averaged
Results	
Minimum	-1,0395e+007 Pa
Maximum	5,2632e+006 Pa
Information	

Section Planes



Geometry | Print Preview | Report Preview

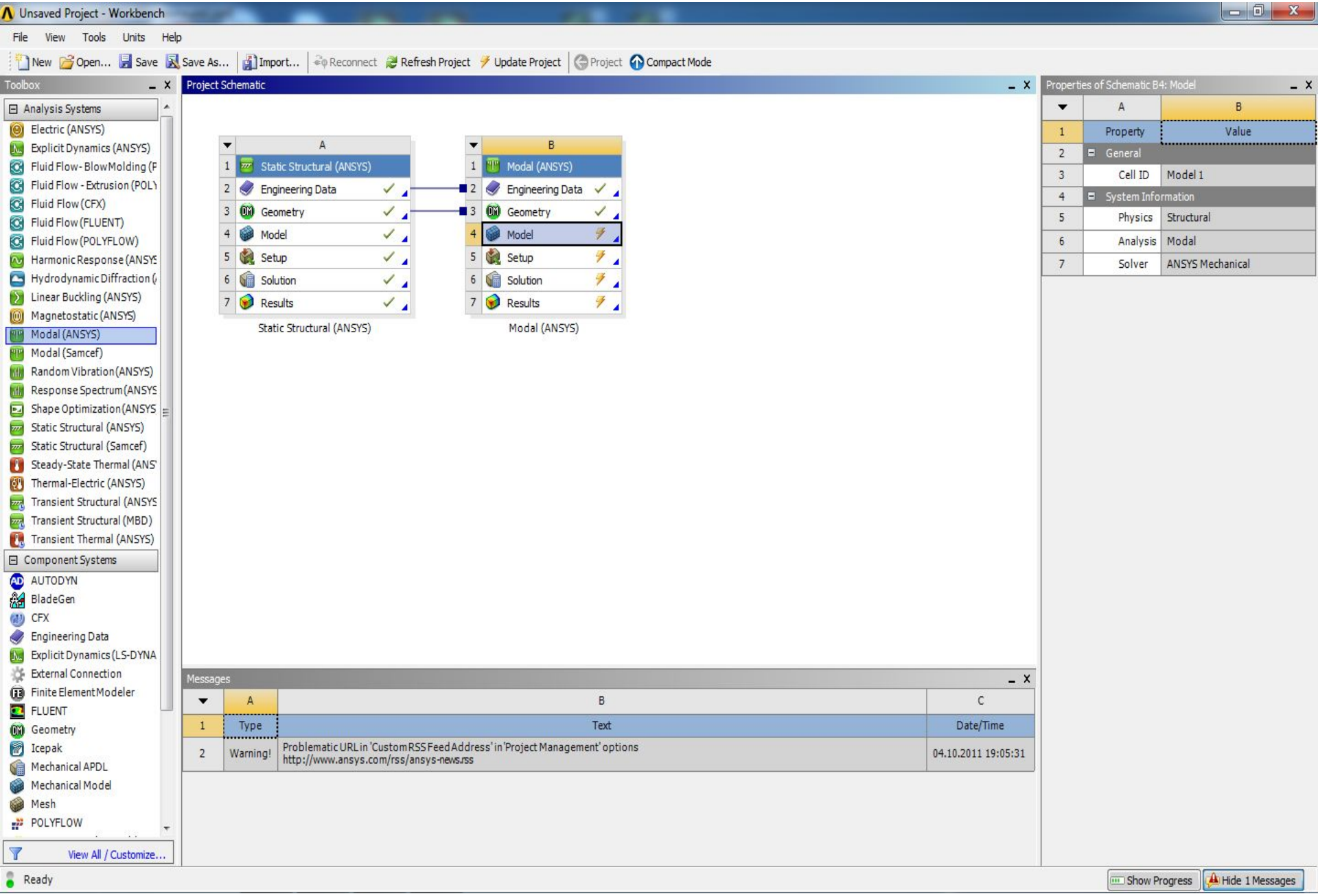
Graph

Animation | 10 Frames | 2 Sec (Auto)

0, 1,

Tabular Data | Messages | Graph

Press F1 for Help | 1 Message | No Selection | Metric (m, kg, N, s, V, A) Degrees rad/s Celsius


Unsaved Project - Workbench
File View Tools Units Help
New Open... Save Save As... Import... Reconnect Refresh Project Update Project Project Compact Mode
Toolbox
Analysis Systems
Electric (ANSYS)
Explicit Dynamics (ANSYS)
Fluid Flow- BlowMolding (F
Fluid Flow - Extrusion (POLY
Fluid Flow (CFX)
Fluid Flow (FLUENT)
Fluid Flow (POLYFLOW)
Harmonic Response (ANSYS
Hydrodynamic Diffraction (
Linear Buckling (ANSYS)
Magnetostatic (ANSYS)
Modal (ANSYS)
Modal (Samcef)
Random Vibration (ANSYS)
Response Spectrum (ANSYS
Shape Optimization (ANSYS
Static Structural (ANSYS)
Static Structural (Samcef)
Steady-State Thermal (ANS
Thermal-Electric (ANSYS)
Transient Structural (ANSYS
Transient Structural (MBD)
Transient Thermal (ANSYS)
Component Systems
AUTODYN
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Engineering Data
Explicit Dynamics (LS-DYNA
External Connection
Finite Element Modeler
FLUENT
Geometry
Icepak
Mechanical APDL
Mechanical Model
Mesh
POLYFLOW
View All / Customize...
Project Schematic
A
1 Static Structural (ANSYS)
2 Engineering Data
3 Geometry
4 Model
5 Setup
6 Solution
7 Results
Static Structural (ANSYS)
B
1 Modal (ANSYS)
2 Engineering Data
3 Geometry
4 Model
5 Setup
6 Solution
7 Results
Modal (ANSYS)
Messages
A B C
1 Type Text Date/Time
2 Warning! Problematic URL in 'Custom RSS Feed Address' in 'Project Management' options
http://www.ansys.com/rss/ansys-news.rss
04.10.2011 19:05:31
Properties of Schematic B4: Model
A B
1 Property Value
2 General
3 Cell ID Model 1
4 System Information
5 Physics Structural
6 Analysis Modal
7 Solver ANSYS Mechanical
Ready
Show Progress
Hide 1 Messages

B : Modal (ANSYS) - Mechanical [ANSYS Multiphysics]

File Edit View Units Tools Help | Solve | Worksheet

Result 1,6e-002 (Auto Scale) | Probe

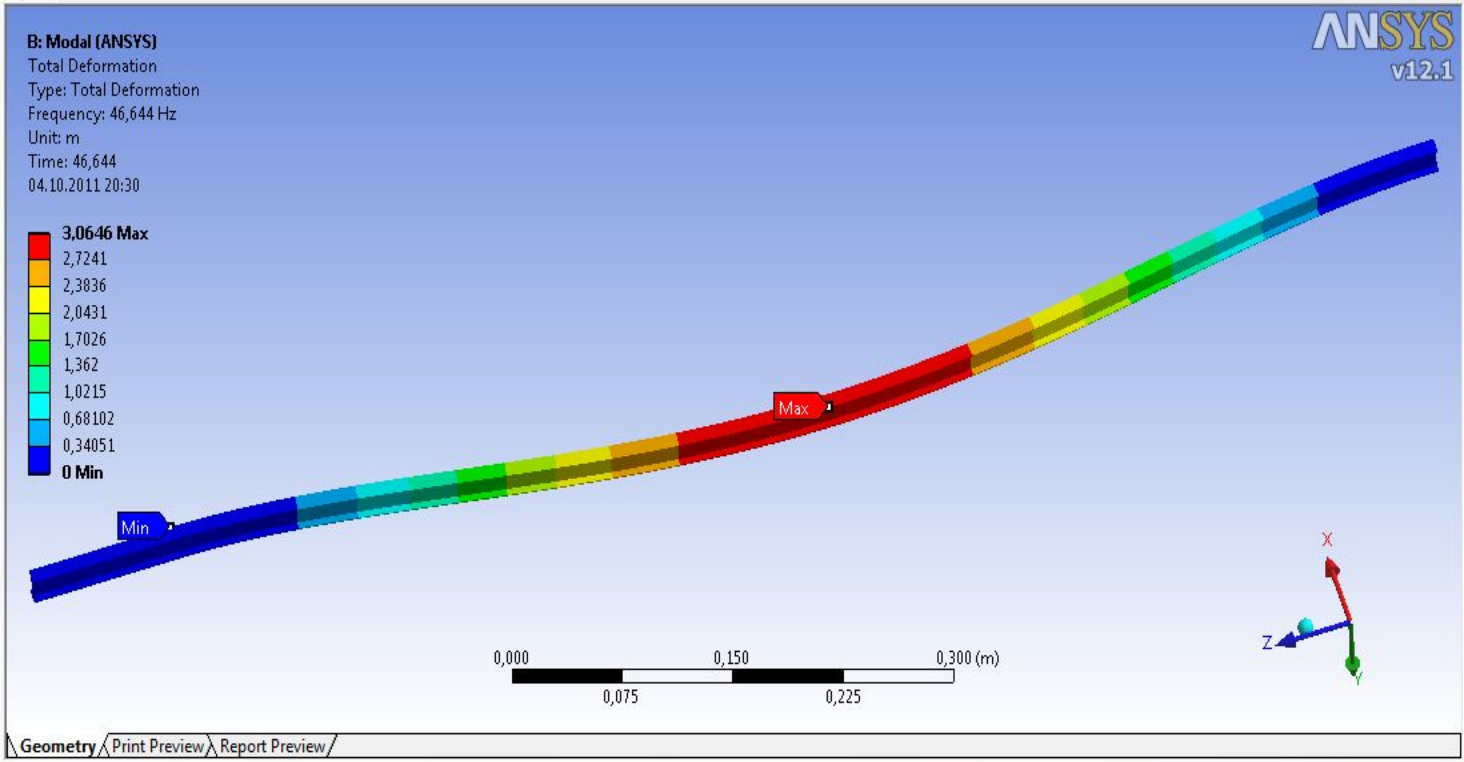
Outline

- Project
  - Model (B4)
    - Geometry
    - Coordinate Systems
    - Mesh
    - Modal (B5)
      - Pre-Stress (None)
      - Analysis Settings
      - Fixed Support
      - Fixed Support 2
      - Solution (B6)
        - Solution Information
        - Total Deformation

Details of "Total Deformation"

Scope	
Scoping Method	Geometry Selection
Geometry	All Bodies
Definition	
Type	Total Deformation
Mode	1,
Identifier	
Results	
Minimum	0, m
Maximum	3,0646 m
Information	

Section Planes



Geometry | Print Preview | Report Preview

Tabular Data

	Mode	Frequency [Hz]
1	1,	46,644
2	2,	128,01
3	3,	128,45
4	4,	170,61
5	5,	251,5
6	6,	256,01

Messages | Tabular Data | Graph

Press F1 for Help | No Messages | No Selection | Metric (m, kg, N, s, V, A) Degrees rad/s Celsius