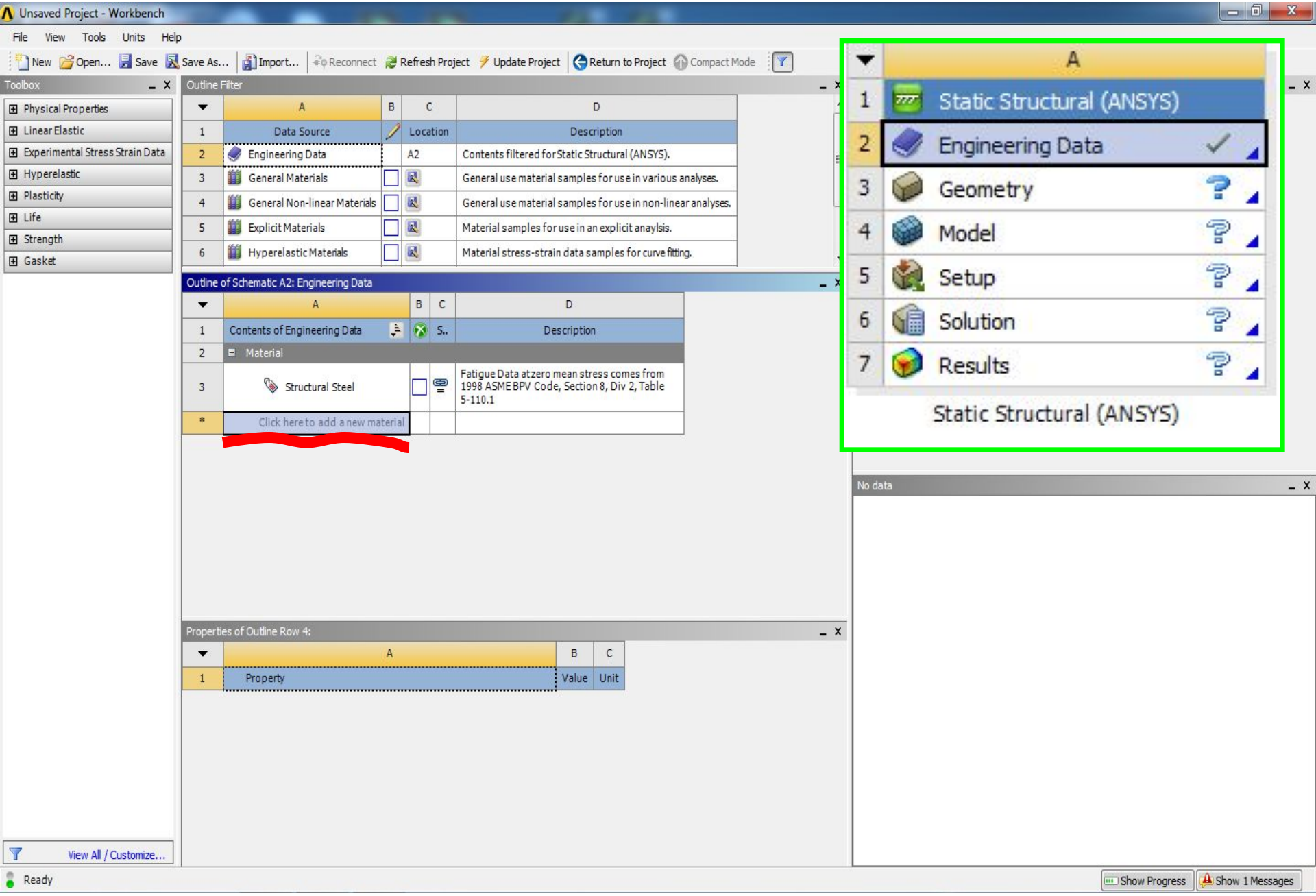
Моделирование состояния биметаллических конструкций

Порядок выполнения работы:

Моделирование биметаллических конструкций при статической нагрузке (Static Structural)

- Создание биметаллической конструкции согласно заданию.
- Задание материалов.
- Генерация сети конечных элементов.
- Задание граничных условий.
- Проведение расчета.
- Интерпретация результатов.

Определение частот и форм собственных колебаний (Modal)



Шаг 1 Здание свойств нового материала для пластины

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
  - Density
  - Isotropic Secant Coefficient of
  - Orthotropic Secant Coefficient
  - Isotropic Instantaneous Coeff
  - Orthotropic Instantaneous Coe
  - Constant Damping Coefficient
  - Damping Factor (β)
- Linear Elastic
  - Isotropic Elasticity
  - Orthotropic Elasticity
  - Anisotropic Elasticity
- 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	Structural Steel			Fatigue Data atzero mean stress comes from 1998 ASME BPV Code, Section 8, Div 2, Table 5-110.1
4				
*	Click			

Properties of Outline

	Property	D
1		
2	De	
3	Isc	
4	Young	
5	Young	
6	Poiss	
7	Poiss	
8	Bulk Modulus: Scale	1

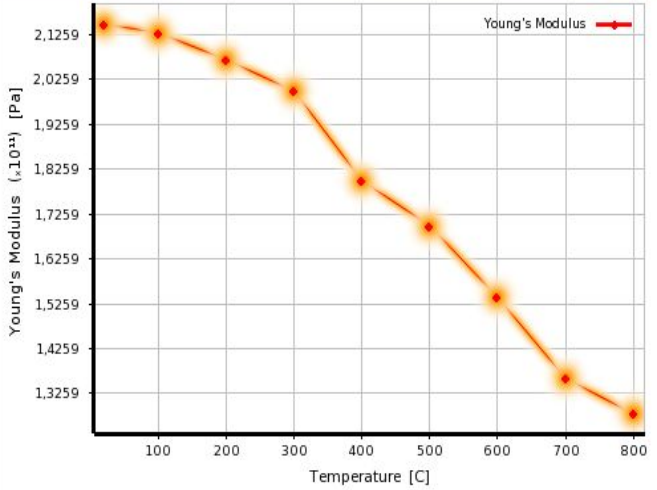
Температура испытания	Модуль нормальной упругости	Модуль упругости при сдвиге кручением	Коэффициент Пуассона
t, °C	E, Па	G, Па	μ
20	2,15E+11	8,40E+10	0,2798
100	2,13E+11	8,30E+10	0,2831
200	2,07E+11	8,00E+10	0,2938
300	2E+11	7,70E+10	0,2987
400	1,8E+11	7,00E+10	0,2857
500	1,7E+11	6,50E+10	0,3077
600	1,54E+11	5,80E+10	0,3276
700	1,36E+11	5,10E+10	0,3333
800	1,28E+11	4,80E+10	0,3333

$$E = 2(1+\mu)G$$

Table of Properties Row 5: Isotropic Elasticity

	A	B	C	D
1	Temperature (C)	Young's Modulus (Pa)	Poisson's Ratio	Bulk Modulus (Pa)
2	20	2,15E+11	0,2798	1,6273E+11
3	100	2,13E+11	0,2831	1,6367E+11
4	200	2,07E+11	0,2938	1,6731E+11
5	300	2E+11	0,2987	1,6559E+11
6	400	1,8E+11	0,2857	1,3999E+11
7	500	1,7E+11	0,3077	1,4734E+11
8	600	1,54E+11	0,3276	1,4888E+11
9	700	1,36E+11	0,3333	1,3597E+11
10	800	1,28E+11	0,3333	1,2797E+11
*				

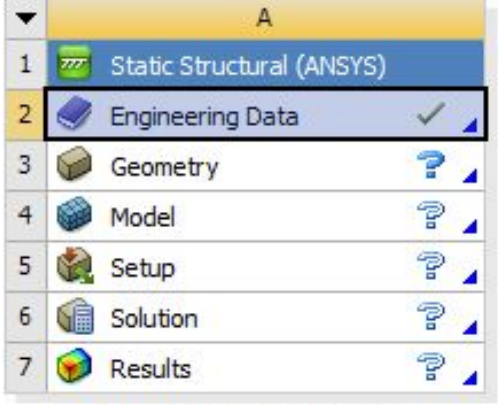
Chart of Properties Row 5: Isotropic Elasticity



Ready

Show Progress Show 1 Messages

Шаг 2 Здание зависимости прочностных свойств от температуры



Static Structural (ANSYS)

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 General Materials

	A	B	C	D	E
1	Contents of General Materials	Add		S..	Description
2	Material				
3	Air				General properties for air.
4	Aluminum Alloy				General aluminum alloy. Fatigue properties come from MIL-HDBK-5H, page 3-277.
5	Concrete				
6	Copper Alloy				
7	Gray Cast Iron				
8	Magnesium Alloy				
9	Polyethylene				
10	Silicon Anisotropic				
11	Stainless Steel				
					Fatigue Data atzero mean stress comes from

Properties of Outline Row 3: Air

	A	B	C
1	Property	Value	Unit

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.

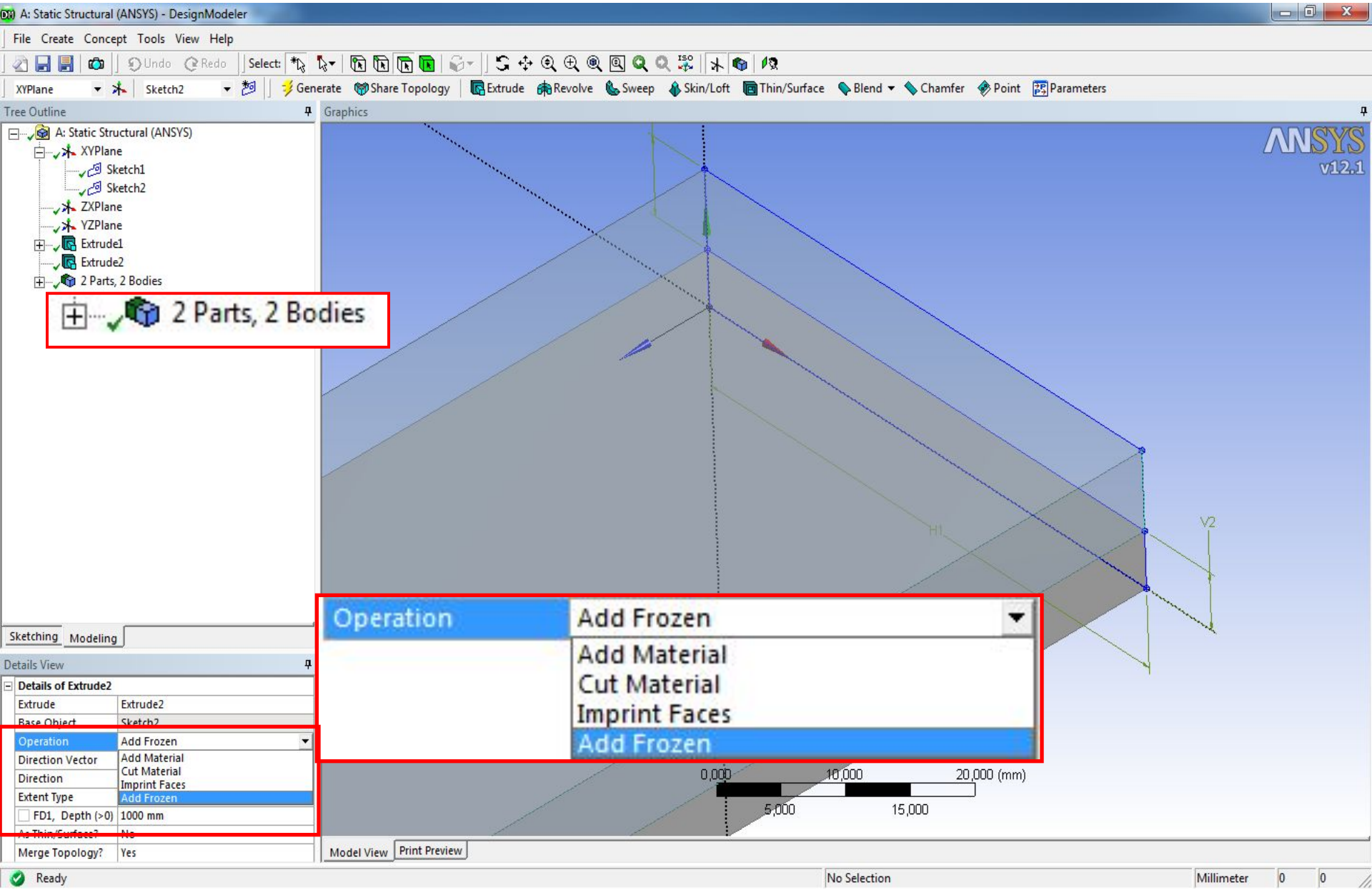
Outline of Schematic A2: Engineering Data

	A	B	C	D
1	Contents of Engineering Data		S..	Description
2	Material			
3	Copper Alloy			
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			

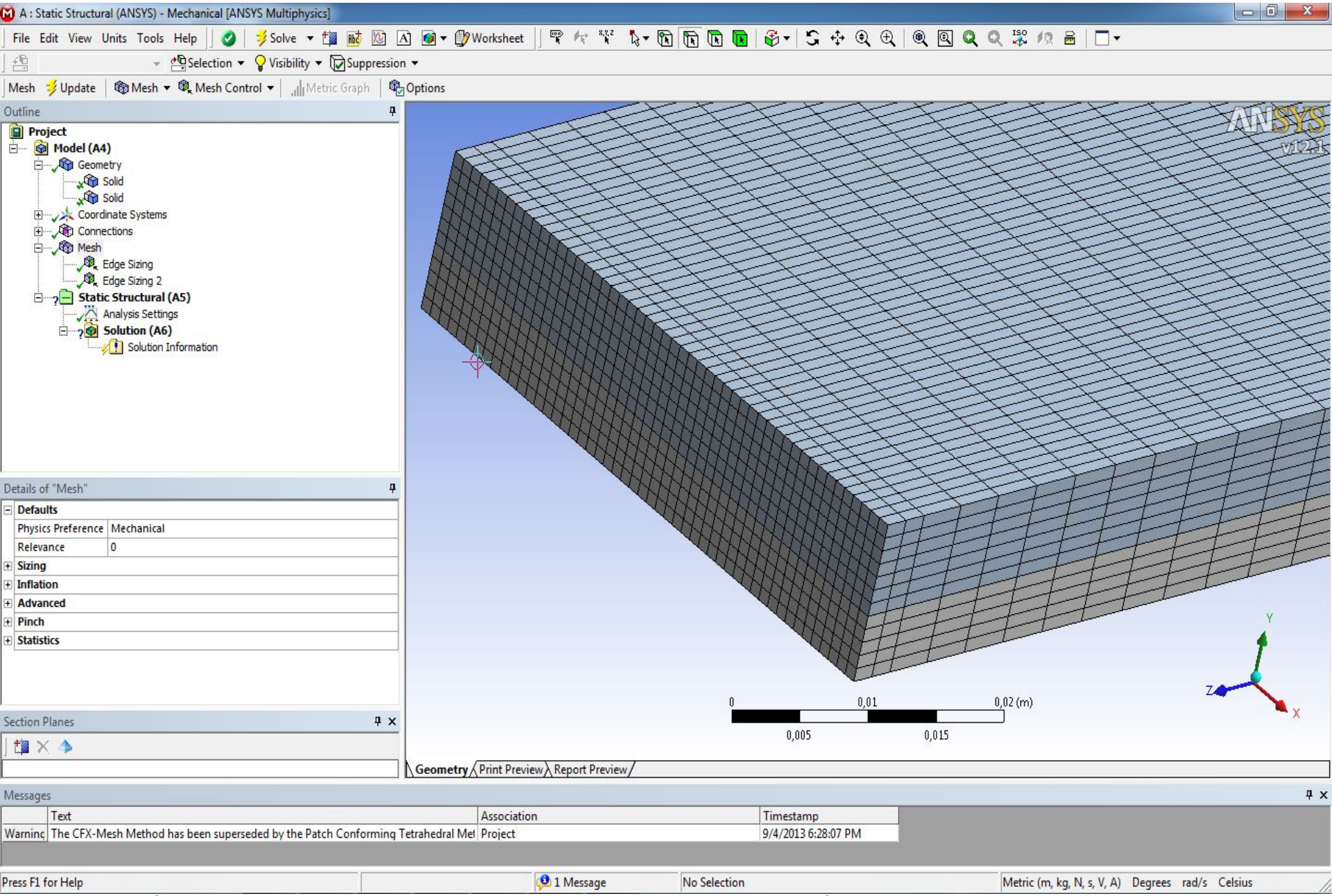
Properties of Outline Row 3: Copper Alloy

	A	B	C	D
1	Property	Value	Unit	
2	Density	8300	kg m^-3	
3	Isotropic Secant Coefficient of Thermal Expansion			
4	Coefficient of Thermal Expansion	1,8E-05	C^-1	
5	Reference Temperature	22	C	
6	Isotropic Elasticity			
7	Derive from	Young's Modulus and Poisson's Ratio		
8	Young's Modulus	1,1E+11	Pa	

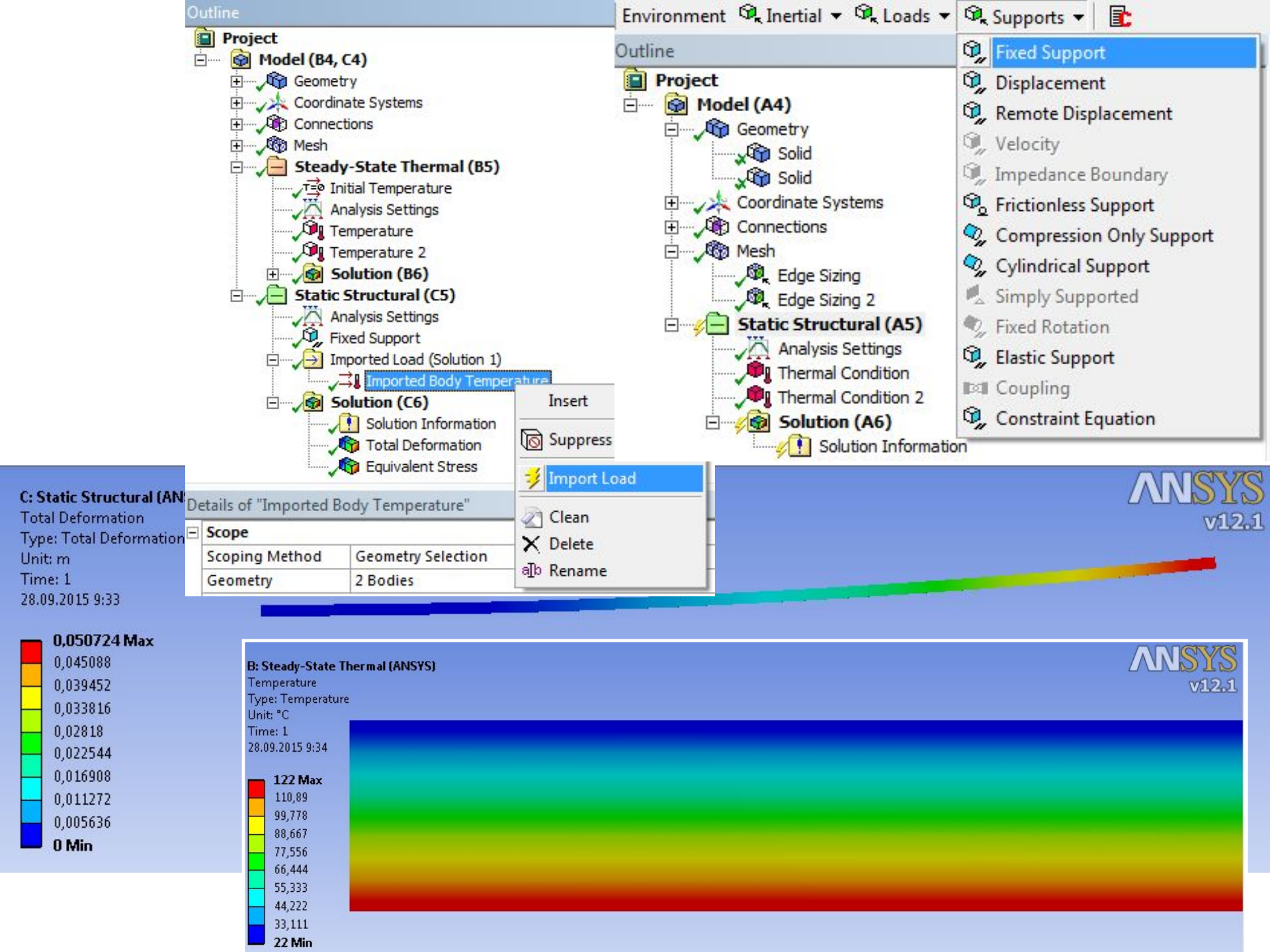
Шаг 3 Здание свойств нового материала для пластины



Шаг 4 Моделирование геометрии двух биметаллических пластин



Шаг 5 Создание неравномерной расчетной сетки двух биметаллических пластин


Outline
Project
Model (B4, C4)
Geometry
Coordinate Systems
Connections
Mesh
Steady-State Thermal (B5)
Initial Temperature
Analysis Settings
Temperature
Temperature 2
Solution (B6)
Static Structural (C5)
Analysis Settings
Fixed Support
Imported Load (Solution 1)
Imported Body Temperature
Solution (C6)
Solution Information
Total Deformation
Equivalent Stress
Insert
Suppress
Import Load
Clean
Delete
Rename
Details of "Imported Body Temperature"
Scope
Scoping Method
Geometry Selection
Geometry
2 Bodies
Environment
Inertial
Loads
Supports
Outline
Project
Model (A4)
Geometry
Solid
Solid
Coordinate Systems
Connections
Mesh
Edge Sizing
Edge Sizing 2
Static Structural (A5)
Analysis Settings
Thermal Condition
Thermal Condition 2
Solution (A6)
Solution Information
Fixed Support
Displacement
Remote Displacement
Velocity
Impedance Boundary
Frictionless Support
Compression Only Support
Cylindrical Support
Simply Supported
Fixed Rotation
Elastic Support
Coupling
Constraint Equation
C: Static Structural (AN
Total Deformation
Type: Total Deformation
Unit: m
Time: 1
28.09.2015 9:33
0,050724 Max
0,045088
0,039452
0,033816
0,02818
0,022544
0,016908
0,011272
0,005636
0 Min
ANSYS
v12.1
B: Steady-State Thermal (ANSYS)
Temperature
Type: Temperature
Unit: °C
Time: 1
28.09.2015 9:34
122 Max
110,89
99,778
88,667
77,556
66,444
55,333
44,222
33,111
22 Min
ANSYS
v12.1

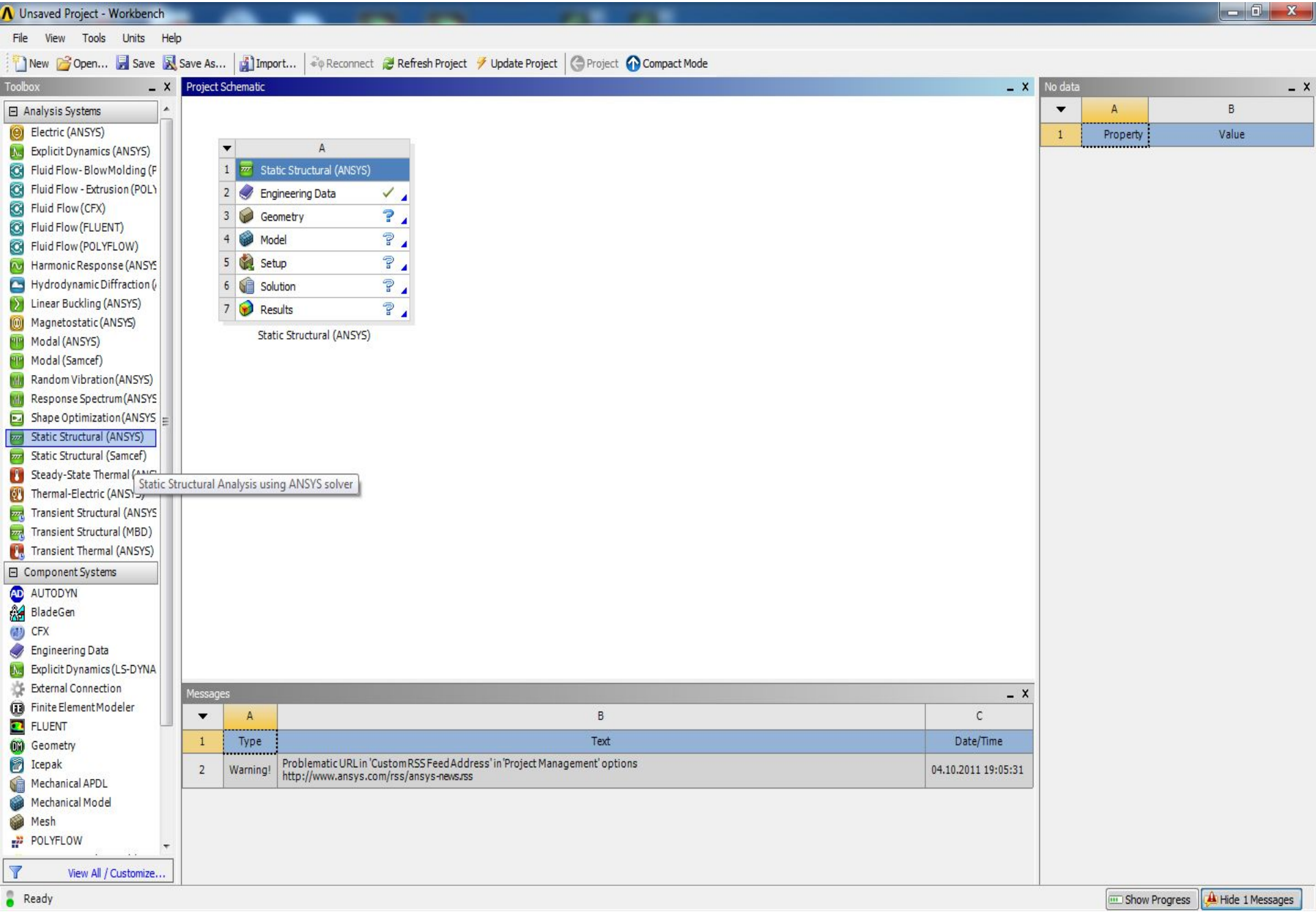
Применение программного комплекса ANSYS Workbanch для расчета задач стержневых систем

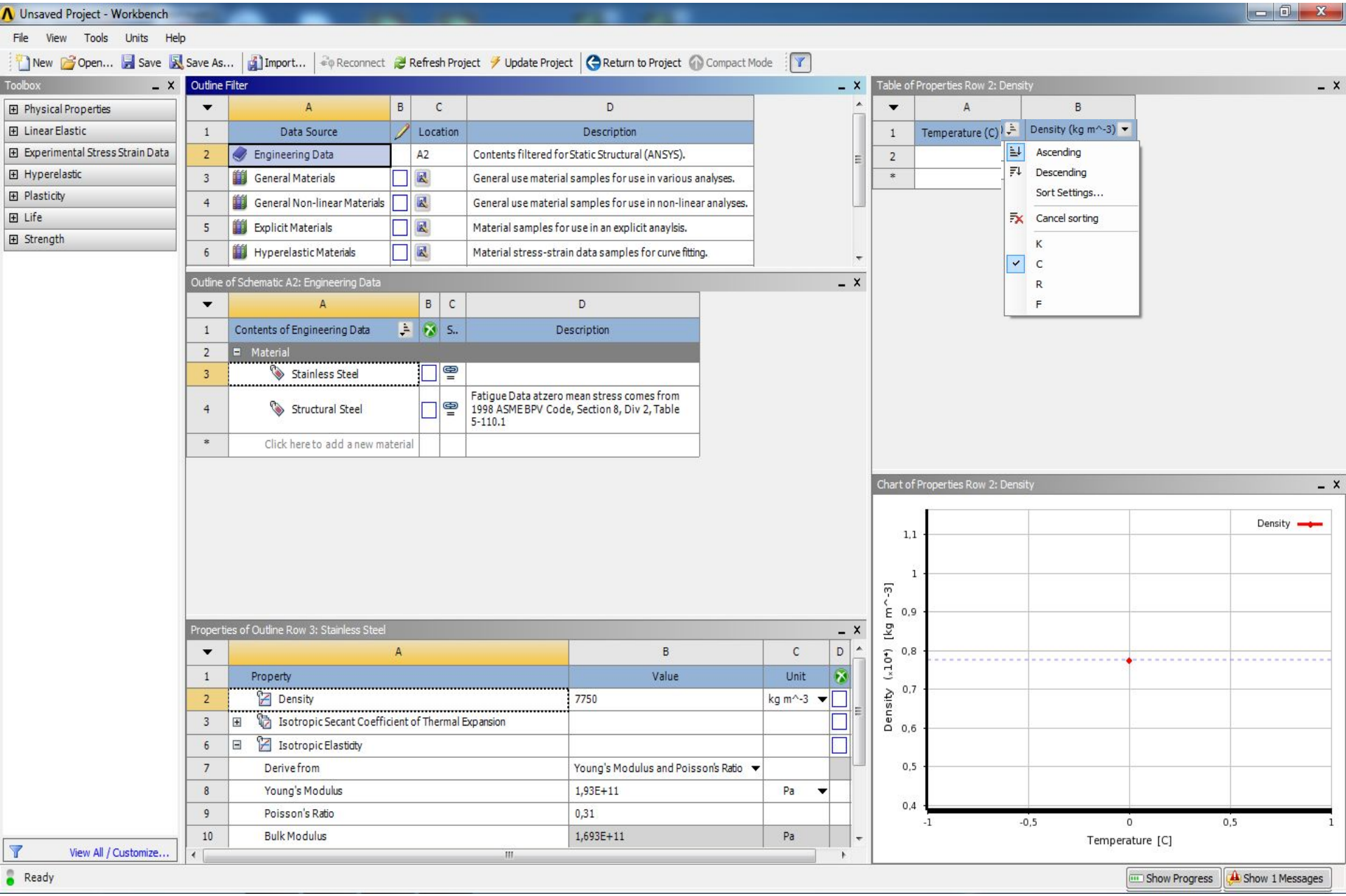
Порядок выполнения работы:

Моделирование неразрезной балки при статической нагрузке (Static Structural)

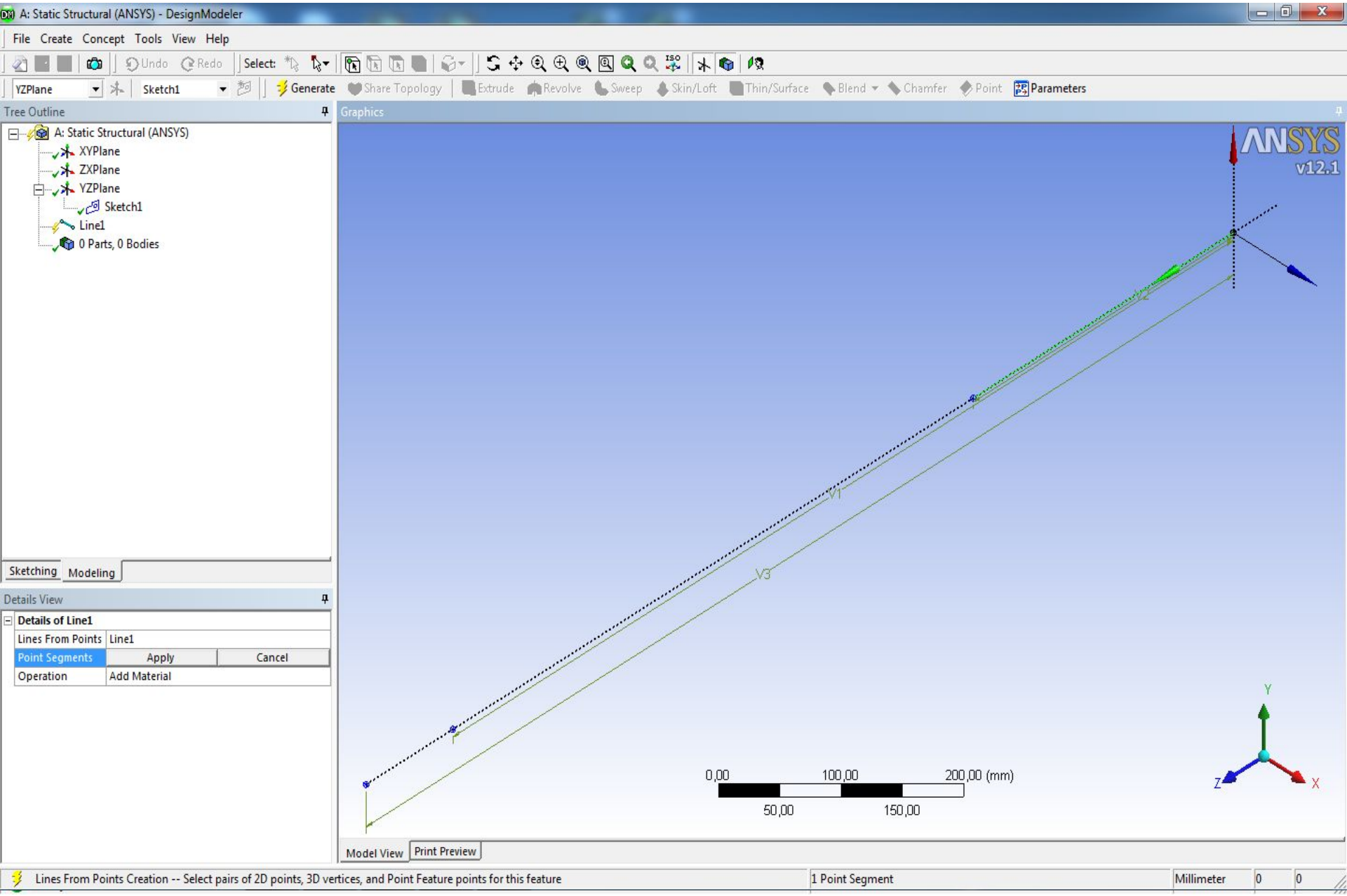
- Создание схемы балки согласно заданию.
- Задание материалов.
- Генерация сети балочных элементов.
- Задание граничных условий.
- Проведение расчета.
- Интерпретация результатов.

Определение частот и форм собственных колебаний (Modal)

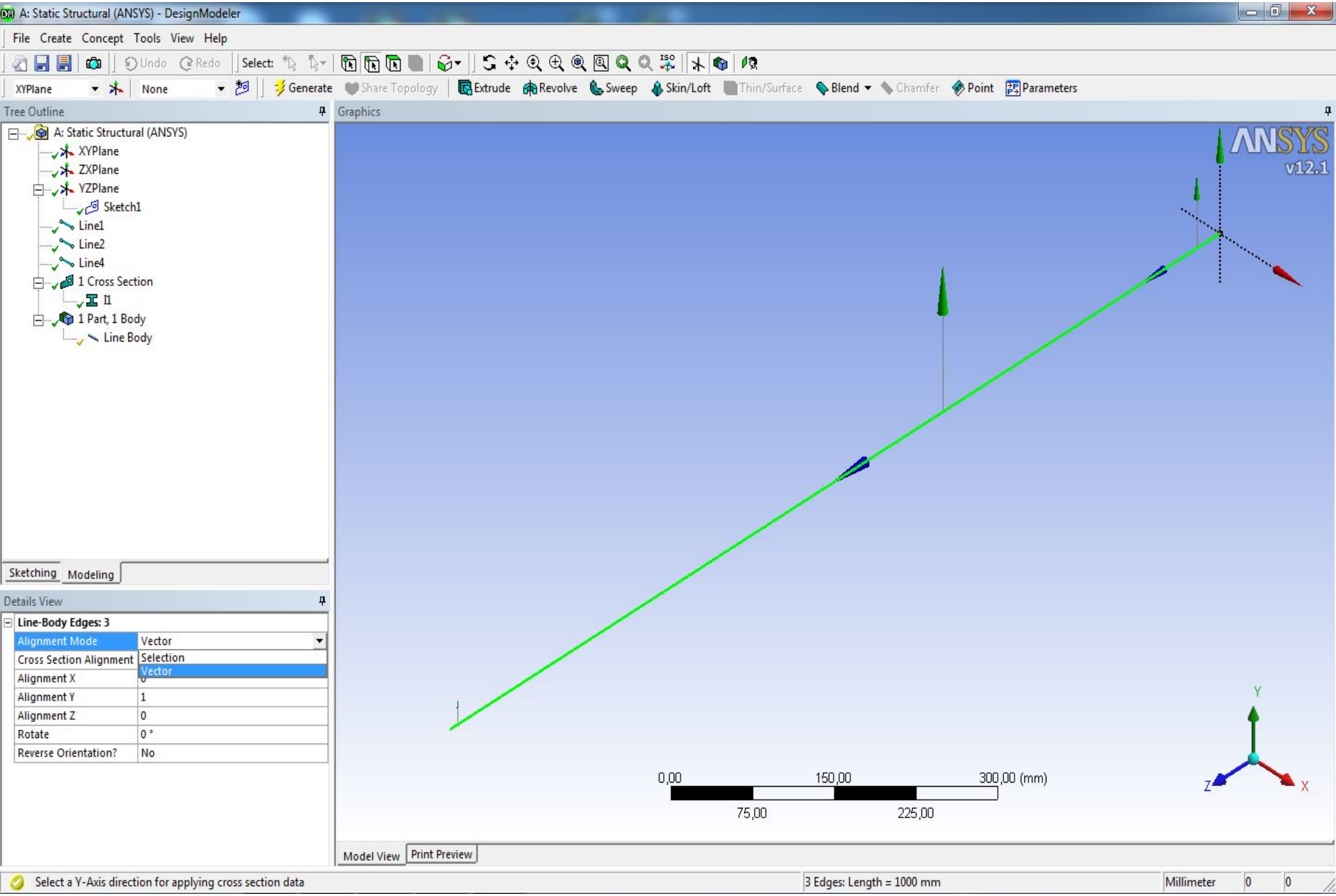

Unsaved Project - Workbench
File View Tools Units Help
New Open... Save Save As... Import... Reconnect Refresh Project Update Project Project Compact Mode
Toolbox
Analysis Systems
Electric (ANSYS)
Explicit Dynamics (ANSYS)
Fluid Flow- BlowMolding (F
Fluid Flow - Extrusion (POLY
Fluid Flow (CFX)
Fluid 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...
Static Structural Analysis using ANSYS solver
Project Schematic
A
1 Static Structural (ANSYS)
2 Engineering Data
3 Geometry
4 Model
5 Setup
6 Solution
7 Results
Static Structural (ANSYS)
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



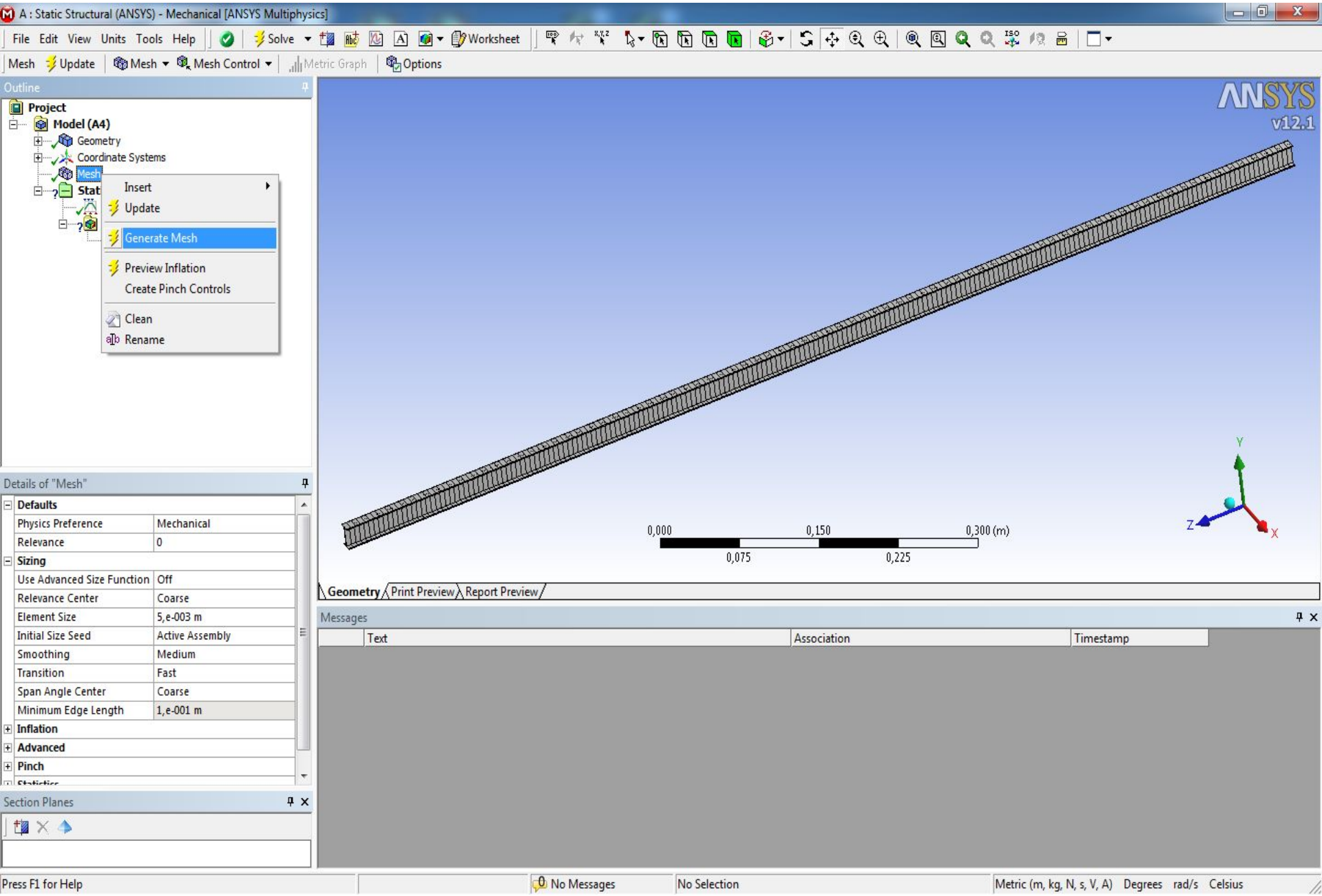
Шаг 1 Здание свойств материала балки



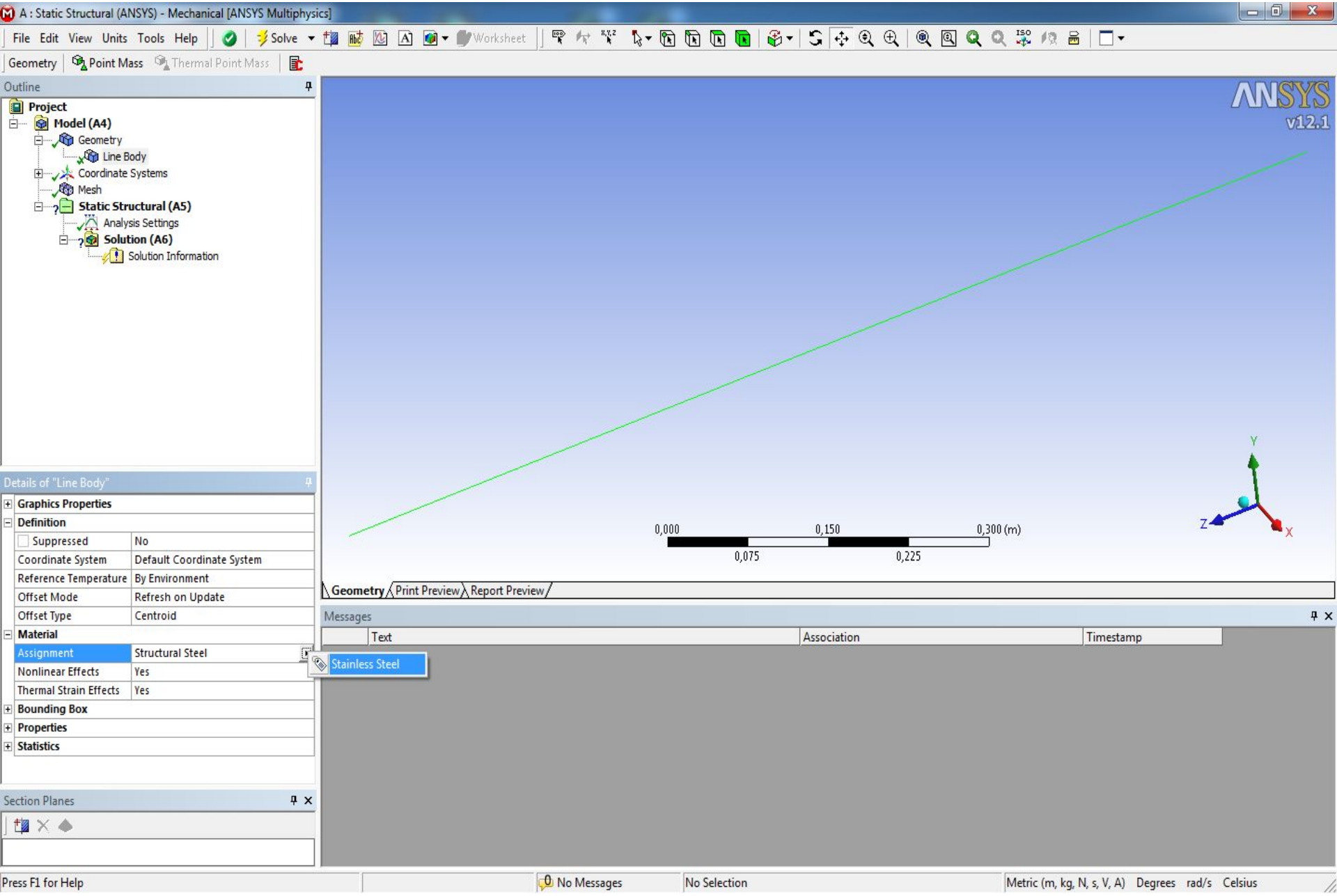
Шаг 2 Создание конструкционных точек и направляющих линий



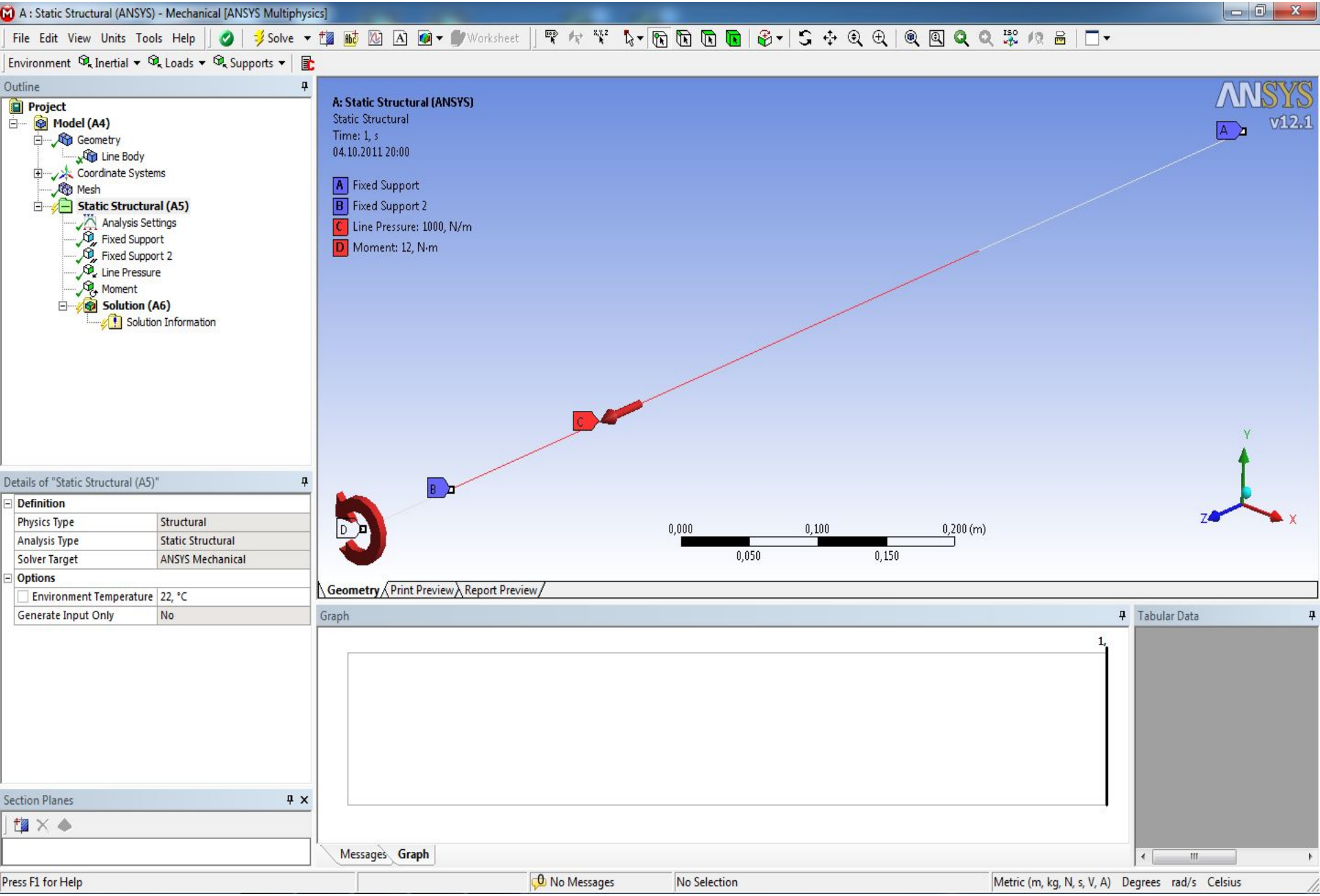
Шаг 3 Здание поперечного сечения балки



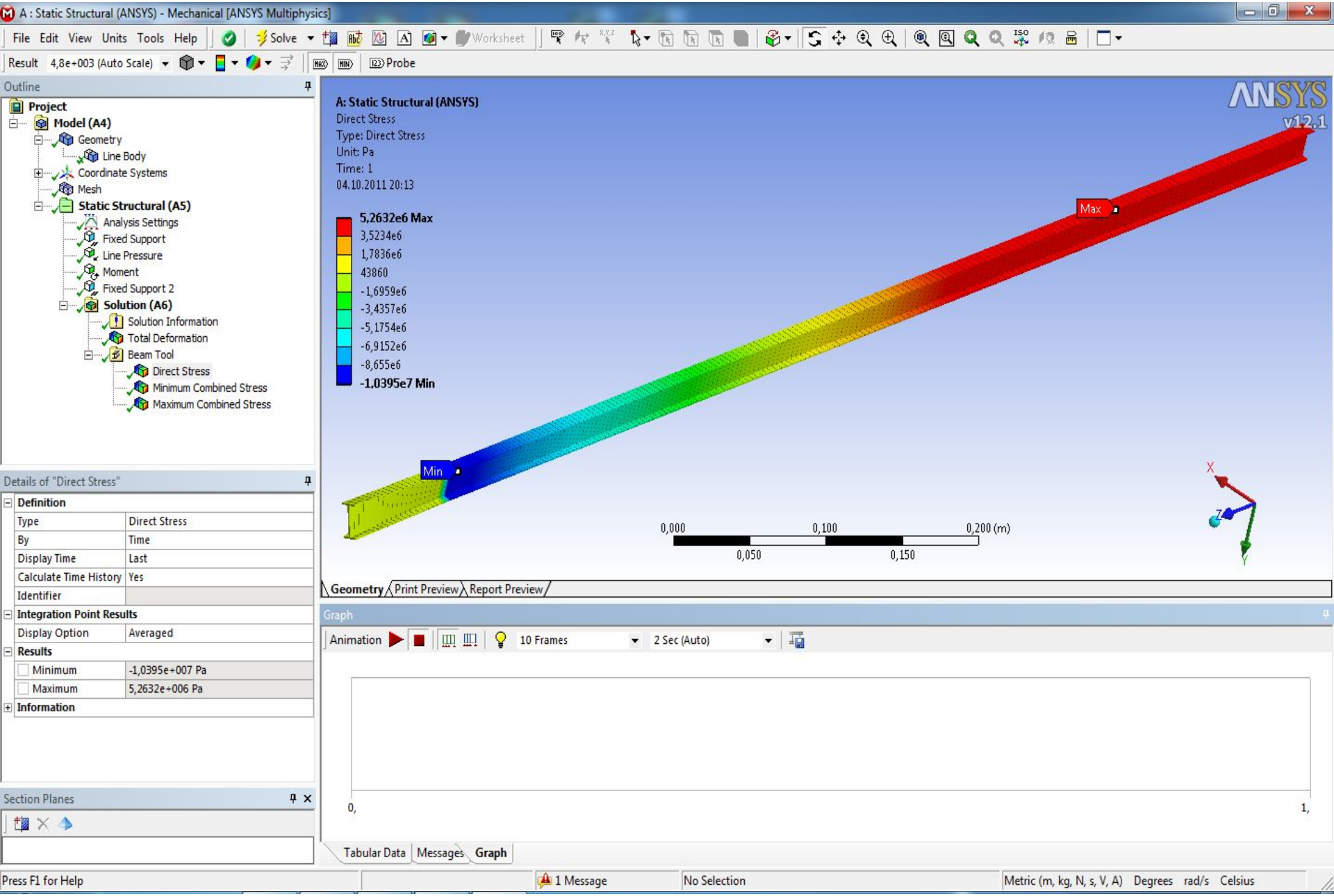
Шаг 4 Построение сети конечных элементов



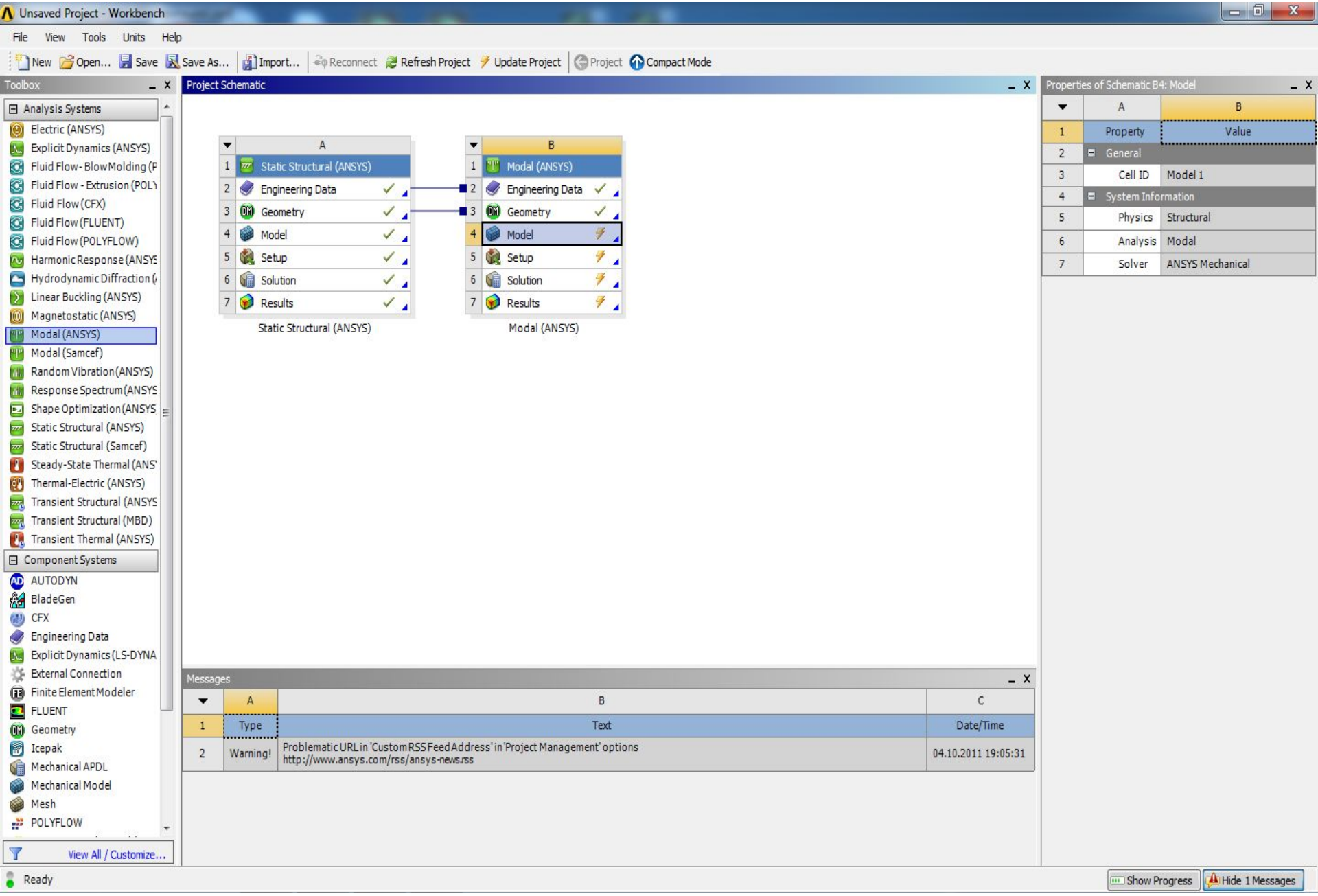
Шаг 5 Задание граничных условий



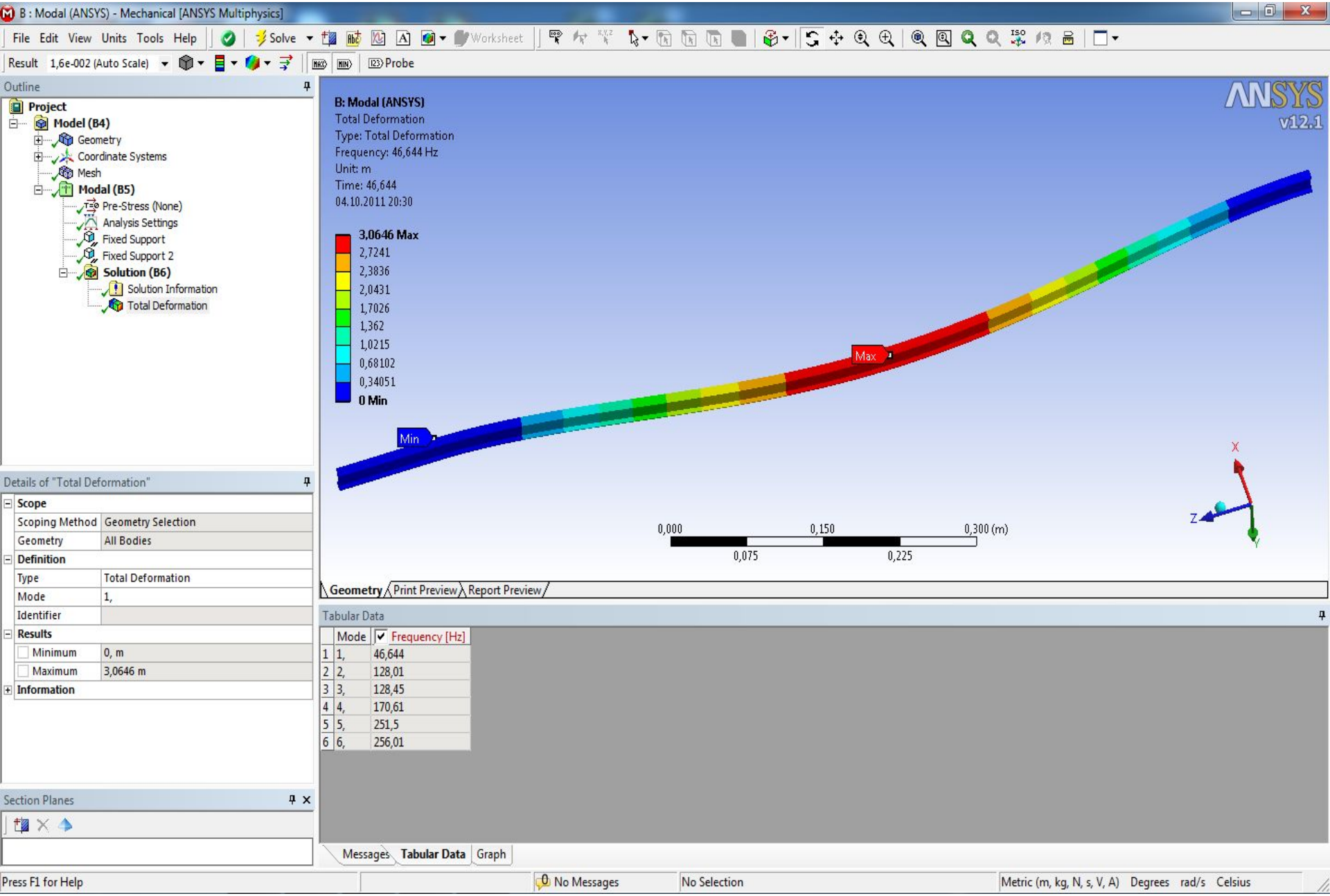
Шаг 6 Задание граничных условий (продолжение)



Шаг 6 Результат решения статической задачи прочности



Шаг 7 Направление данных в модальный анализ



Шаг 8 Результат модального анализа