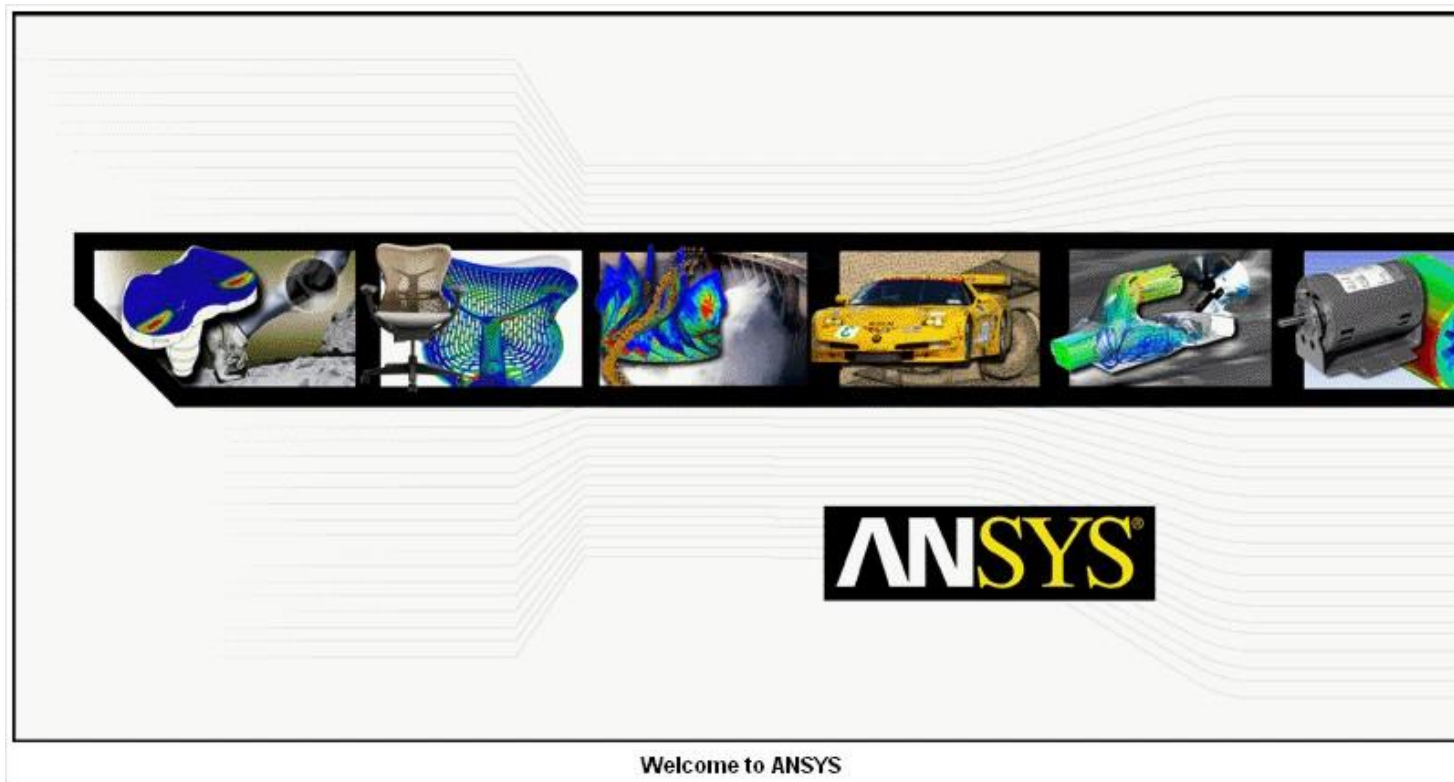


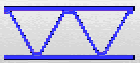
Rīgas Tehniskā universitāte Materiālu un Konstrukciju institūts

Uzdevums: Ieskaites uzdevuma aprēķina paraugs, izmantojot galīgo elementu aprēķina programmu ANSYS.

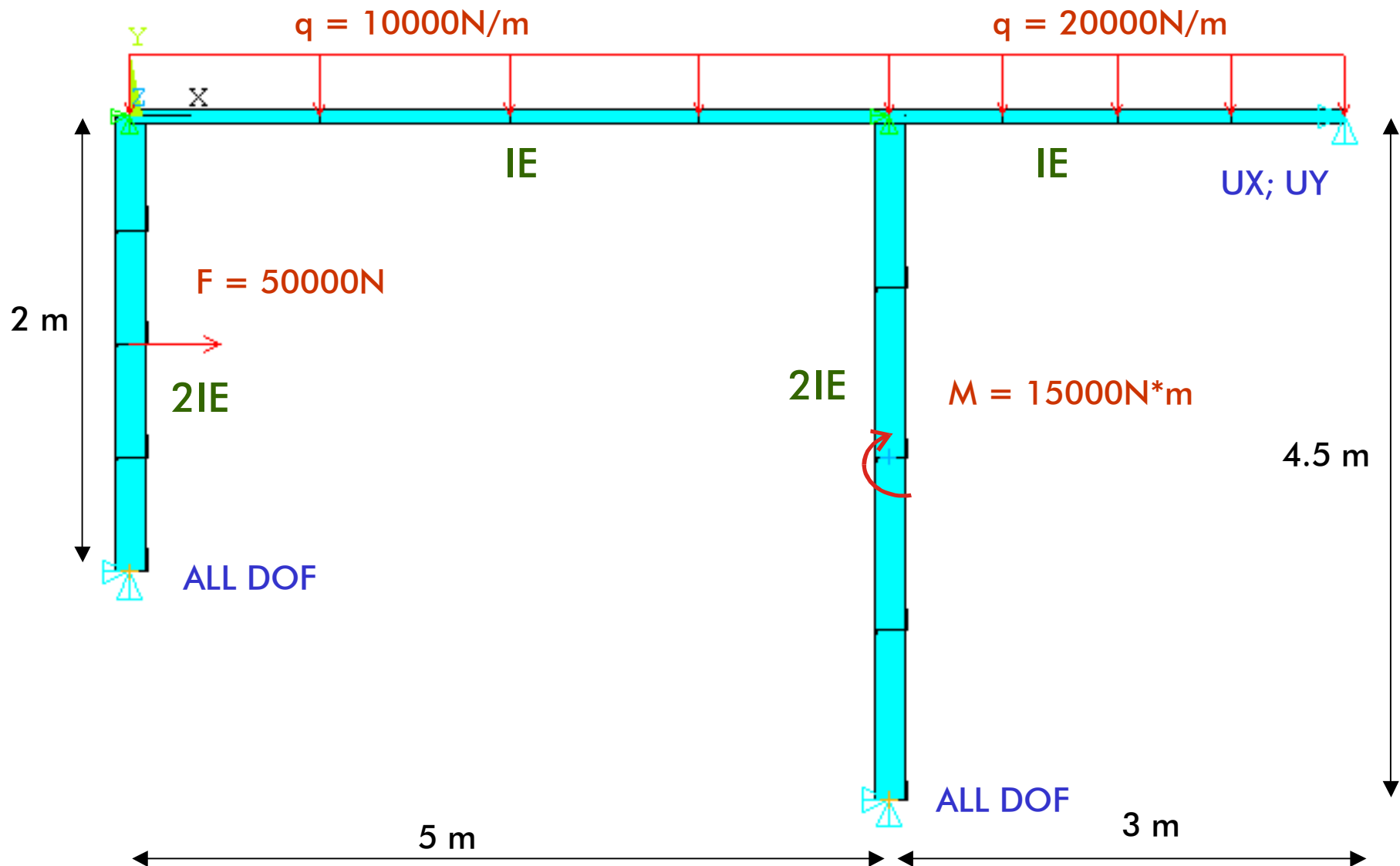
Programma: ANSYS 9

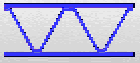
Autors: K. Kalniņš





Uzdevuma nostādne: Aprēķina shēma, robežu nosacījumi, slodžu kombinācijas.



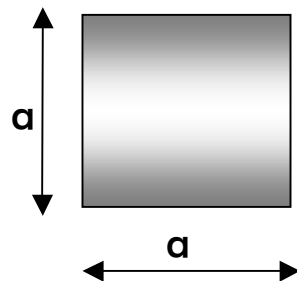


Uzdevuma nostādne

Galīgā elementa izvēle: BEAM -3

Šķērsriezuma profila īpašību izvēle:

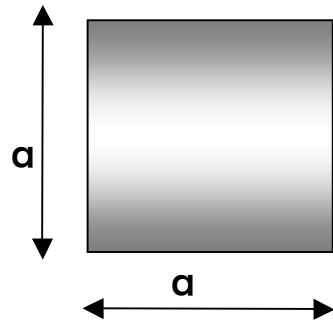
Real Constant Set 1:



$$A = a^2$$
$$I = (a^4)/12$$

a

Laukums [m ²]	0.01m ²
Inerces moments [m ⁴]	0.0000083m ⁴
Augstums	0.1 m



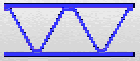
Real Constant Set 2:

Laukums [m ²]	0.01411m ²
Inerces moments [m ⁴]	0.0000166m ⁴
Augstums	0.1188 m

Materiāla īpašību izvēle:

Tērauds:

Elastības modulis	2.1e11 N/m ²
Puasona koeficients	0.3



Uzdevuma nostādne

Šķērsriezuma profila īpašību izvēle:

Real Constants for BEAM3	
Element Type Reference No.	1
Real Constant Set No.	1
Cross-sectional area AREA	0.01
Area moment of inertia IZZ	8.33e-006
Total beam height HEIGHT	0.1

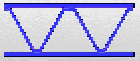
Real Constant Set 1:

Laukums [m²] 0.01m²
Inerces moments [m⁴] 0.0000083m⁴
Augstums 0.1 m

Real Constants for BEAM3	
Element Type Reference No.	1
Real Constant Set No.	2
Cross-sectional area AREA	0.015
Area moment of inertia IZZ	1.6e-005
Total beam height HEIGHT	0.2

Real Constant Set 2:


Laukums [m²] 0.01411m²
Inerces moments [m⁴] 0.0000166m⁴
Augstums 0.1188 m



Koordinātu mezglu punktu definēšana:

1 POINTS
POIN NUM

ANSYS
MAY 16 2005
16:02:50



8 8

X, Y, Z

1, 0, 0, 0
2, 0, 0, 0
3, 0, -2, 0
4, 5, 0, 0
5, 5, 0, 0
6, 5, 0, 0
7, 5, -4.5, 0
8, 8, 0, 0

3

7

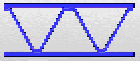
Create Keypoints in Active Coordinate System

[K] Create Keypoints in Active Coordinate System

NPT Keypoint number

X,Y,Z Location in active CS

OK Apply Cancel Help



Līniju definēšana:

1
LINES
TYPE NUM

ANSYS
MAY 16 2005
16:12:35

Multiple_Entities

There are 2 KeyPoints at this location.
Picked KeyPoint is 2
Continue picking or select OK, PREV or NEXT

OK Prev Next

1, 1 - 3
2, 2 - 4
3, 5 - 6
4, 7 - 8

Create Straight Line

Pick Unpick

Single Box

Polygon Circle

Loop

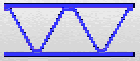
Count = 1
Maximum = 2
Minimum = 2
KeyP No. = 2

List of Items
 Min, Max, Inc

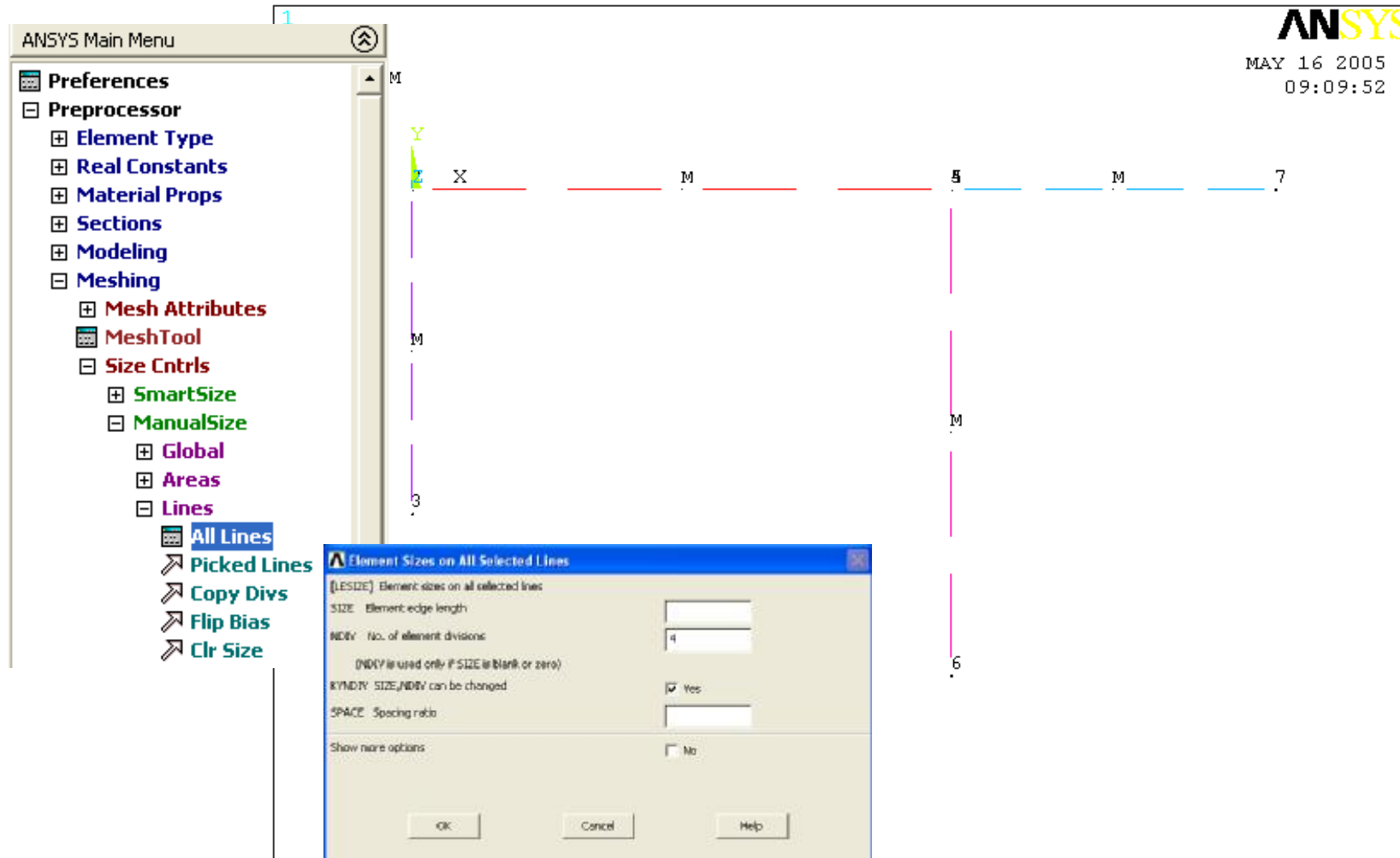
OK Apply

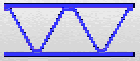
Reset Cancel

Pick All Help



Galīgo elementu proporciju izvēle:





Uzdevuma nostādne

Cita šķērsriezuma profila definēšana kolonnām un līniju dalījums GEM:

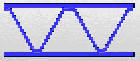
The image shows two overlapping dialog boxes in the ANSYS software interface. The 'Line Attributes' dialog box is the primary focus, with the following settings:

- MAT Material number: 1
- REAL Real constant set number: 2
- TYPE Element type number: 2 (selected in the dropdown menu)
- SECT Element section: None defined
- Pick Orientation Keypoint(s): No

The 'Mesh Lines' dialog box is also visible, with the following settings:

- Pick: Pick, Unpick
- Single: Single, Box
- Polygon: Polygon, Circle
- Loop: Loop
- Count = 0
- Maximum = 4
- Minimum = 1
- Line No. =
- List of Items: List of Items, Min, Max, Inc

Red arrows point from the 'Line Attributes' dialog to the 'Mesh Lines' dialog, indicating the relationship between the two settings.



Uzdevuma nostādne

Konstrukciju nostiprinājumu definēšana:

The image shows the ANSYS Main Menu on the left, with the following structure expanded:

- ANSYS Main Menu
 - Preferences
 - Preprocessor
 - Element Type
 - Real Constants
 - Material Props
 - Sections
 - Modeling
 - Meshing
 - Checking Ctrl
 - Numbering Ctrl
 - Archive Model
 - Coupling / Ceqn
 - FLOTRAN Set Up
 - FSI Set Up
 - MultiField Set Up
 - Loads
 - Analysis Type
 - Fast Sol'n Optn
 - Define Loads
 - Settings
 - Apply
 - Structural
 - Displacement
 - On Lines
 - On Areas
 - On Keypoints
 - On Nodes
 - On Node Comp
 - Symmetry B.C.
 - Antisymm B.C.

ALL DOF

UX; UY

ALL DOF

Apply U,ROT on KPs

[OK] Apply Displacements (U,ROT) on Keypoints

Lab2 - DOFs to be constrained

ALL DOF
UX
UY
ROTZ

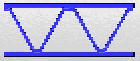
Apply as: Constant value

If Constant value then:

VALUE: Displacement value

KEKPN: Expand disp to nodes? No

OK Apply Cancel Help



Uzdevuma nostādne

Locīklu – mezglu kopējo pārvietojumu definēšana:

ANSYS Main Menu

- Preferences
- Preprocessor
 - Element Type
 - Real Constants
 - Material Props
 - Sections
 - Modeling
 - Meshing
 - CheckingCtrls
 - NumberingCtrls
 - Archive Model
 - Coupling / Ceqn
 - Couple DOFs
 - Cupl DOFs w/Mstr
 - Cop w/Same Nodes

Define Coupled DOFs

Pick Unpick

Single Box

Polygon Circle

Loop

Count = 0
Maximum = 22
Minimum = 1
Node No. =

List of Items
 Min, Max, Inc

OK Apply
Reset Cancel
Pick All Help

1, UX
2, UY

3, UX
4, UY

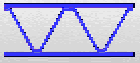
Define Coupled DOFs

[CP] Define Set of Coupled DOFs

NSET Set reference number

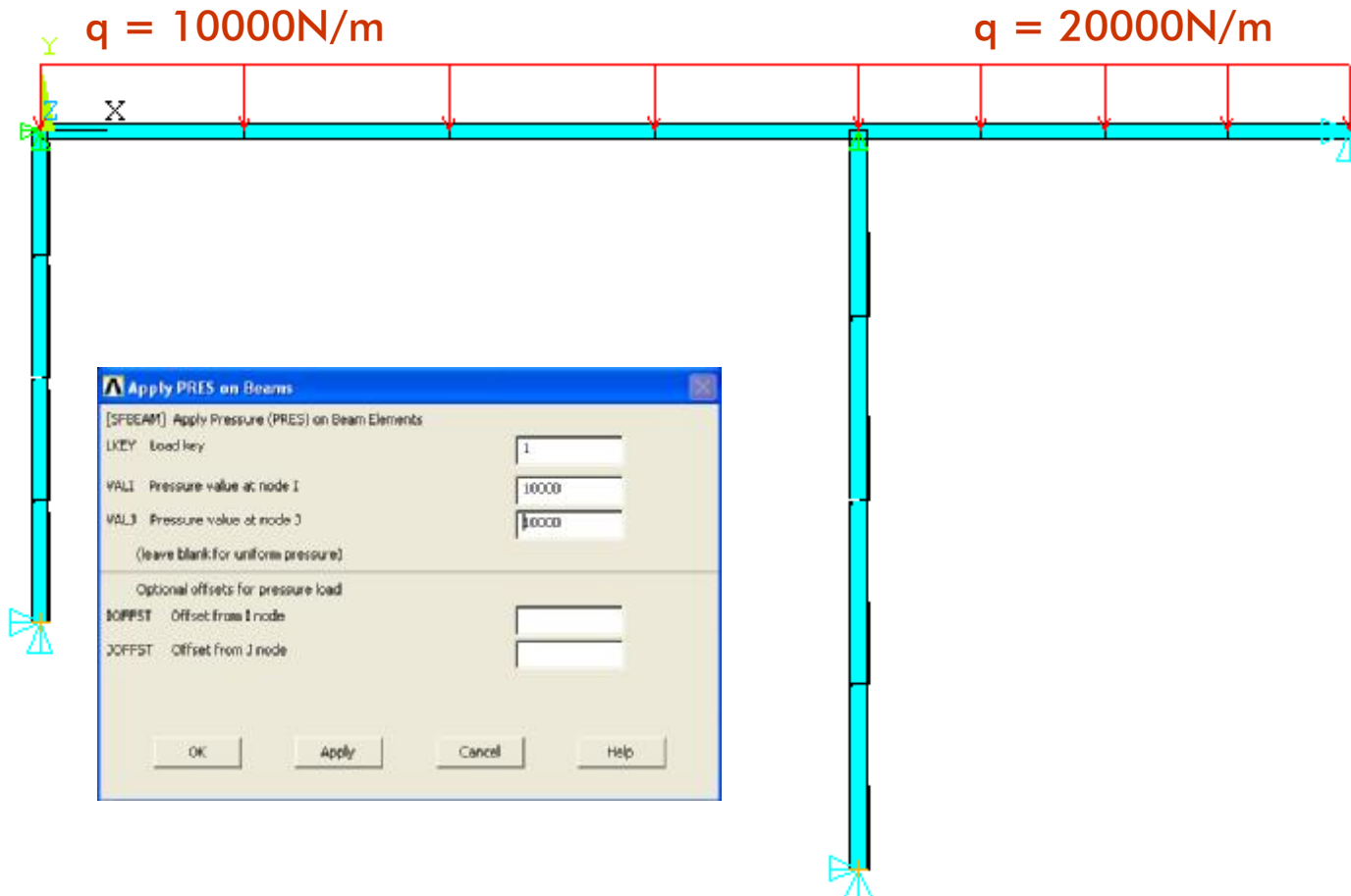
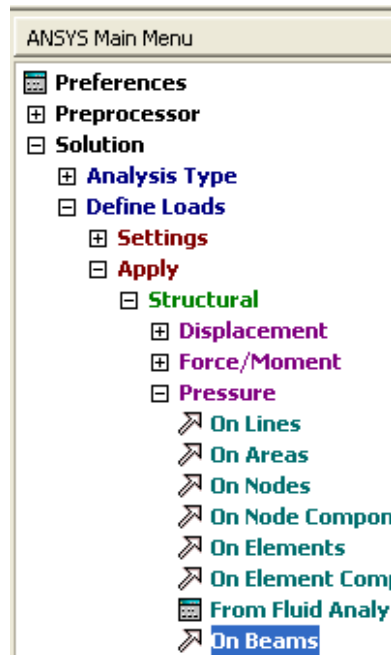
Lab: Degree-of-freedom label

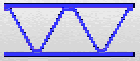
OK Apply Cancel Help



Uzdevuma nostādne

Vienmērīgi izkliedētas slodzes definēšana:



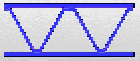


Koncentrētas slodzes definēšana:

The screenshot displays the ANSYS Main Menu on the left, with the 'Define Loads' > 'Apply' > 'On Nodes' path highlighted. The main window shows a 2D frame structure with a horizontal beam and two vertical columns. A red arrow indicates a force applied to the left column. The 'Apply F/M on Nodes' dialog box is open, showing the following settings:

- Lab: Direction of force/moment: FX
- Apply as: Constant value
- If Constant value then: VALUE Force/moment value: 2000

Buttons: OK, Apply, Cancel, Help

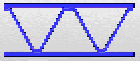


Momenta slodzes definēšana:

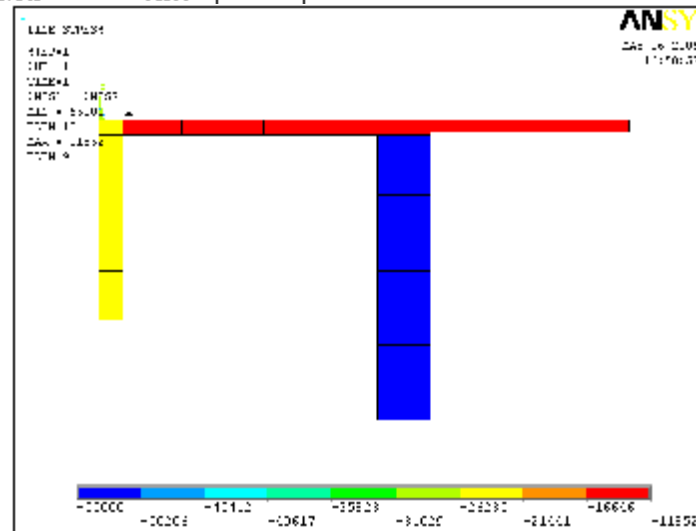
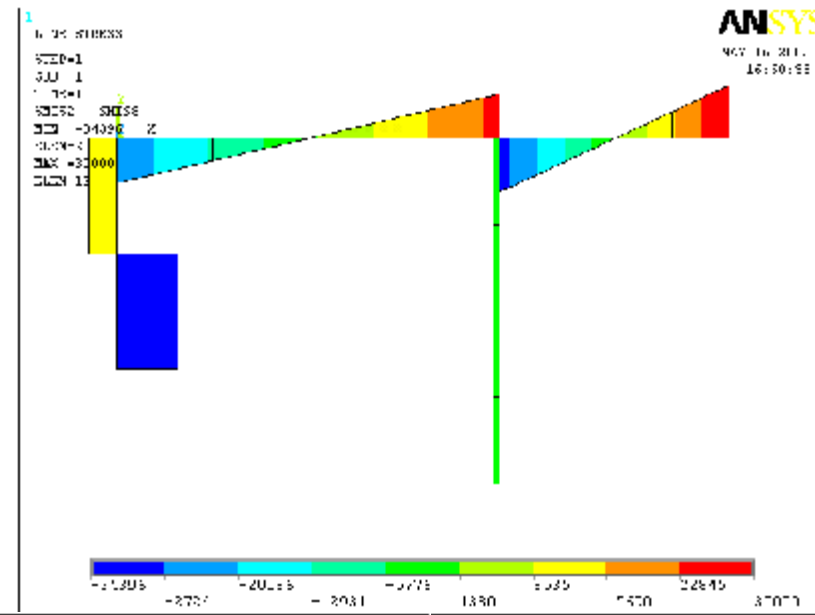
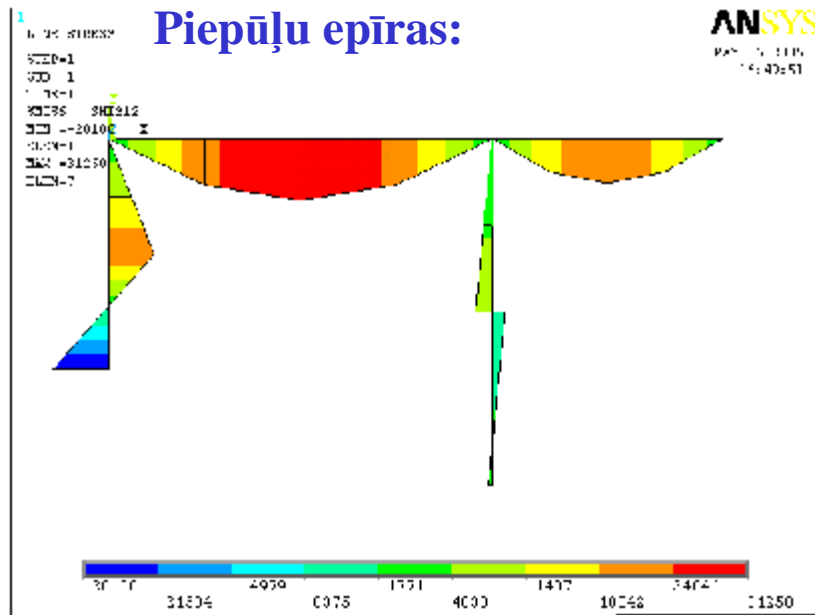
The screenshot displays the ANSYS Main Menu on the left, with the 'Define Loads' > 'Apply' > 'Structural' > 'Force/Moment' > 'On Nodes' path highlighted. The main window shows a 2D frame structure with a horizontal beam and two vertical columns. A red curved arrow indicates a moment being applied to the right vertical column. The 'Apply F/M on Nodes' dialog box is open, showing the following settings:

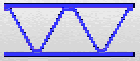
- Lab: Direction of force/moment: MZ
- Apply as: Constant value
- If Constant value then: VALUE Force/moment value: 15000

Buttons: OK, Apply, Cancel, Help



Uzdevuma nostādne





Uzdevuma nostādne

Spriegumu, deformāciju grafiki:

