OpenSees Navigator & Hybrid Simulation

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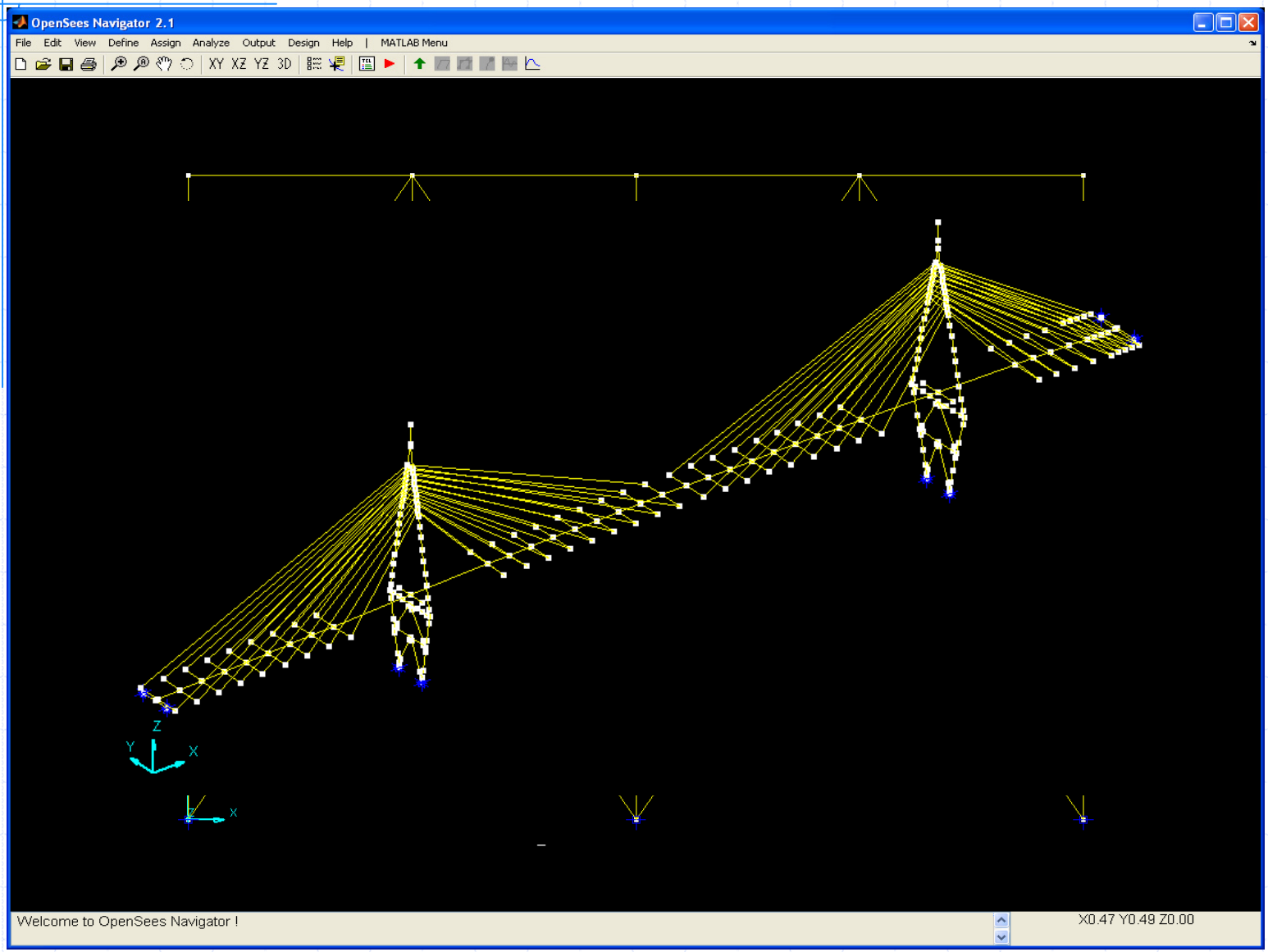
Introduction

- MATLAB based Graphical User Interface
- Pre- and post-processing for OpenSees
- Integration of Hybrid Simulation into the graphical user interface
- Response Spectra generation
- Integrated AISC data base
- Design toolboxes: NSP, AISC design checks, PBEE, …
- Self-executable version available

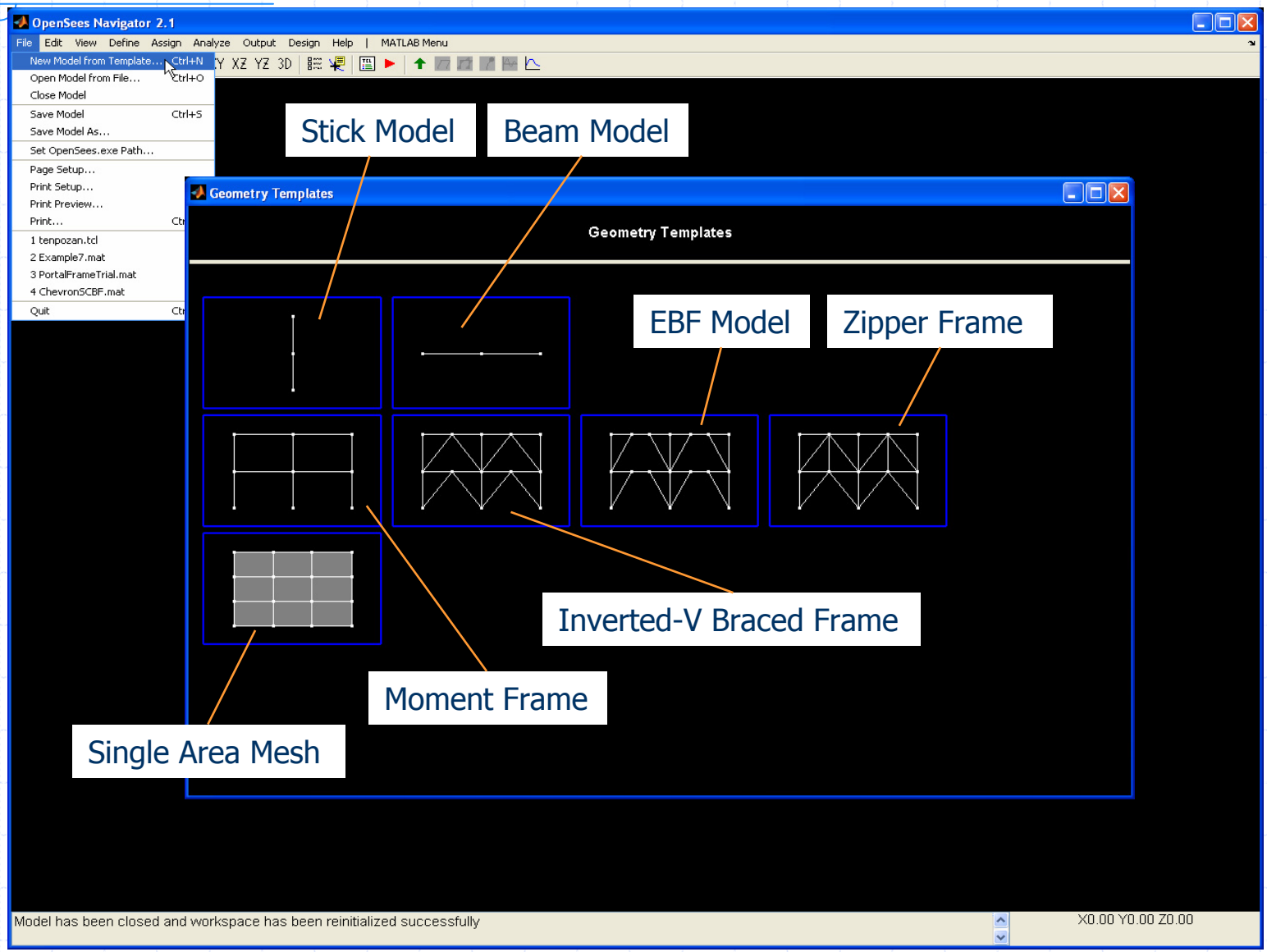
Motivation

- Graphical input is more flexible than TCL text input
- Most researchers use MATLAB to do the post-processing, and MATLAB/Simulink is the typical framework for implementing hybrid analyses
- OpenSees Navigator will create the OpenSees (hybrid) model and graphically display results before, during or after a test
- Flexible to use and requires no programming skills

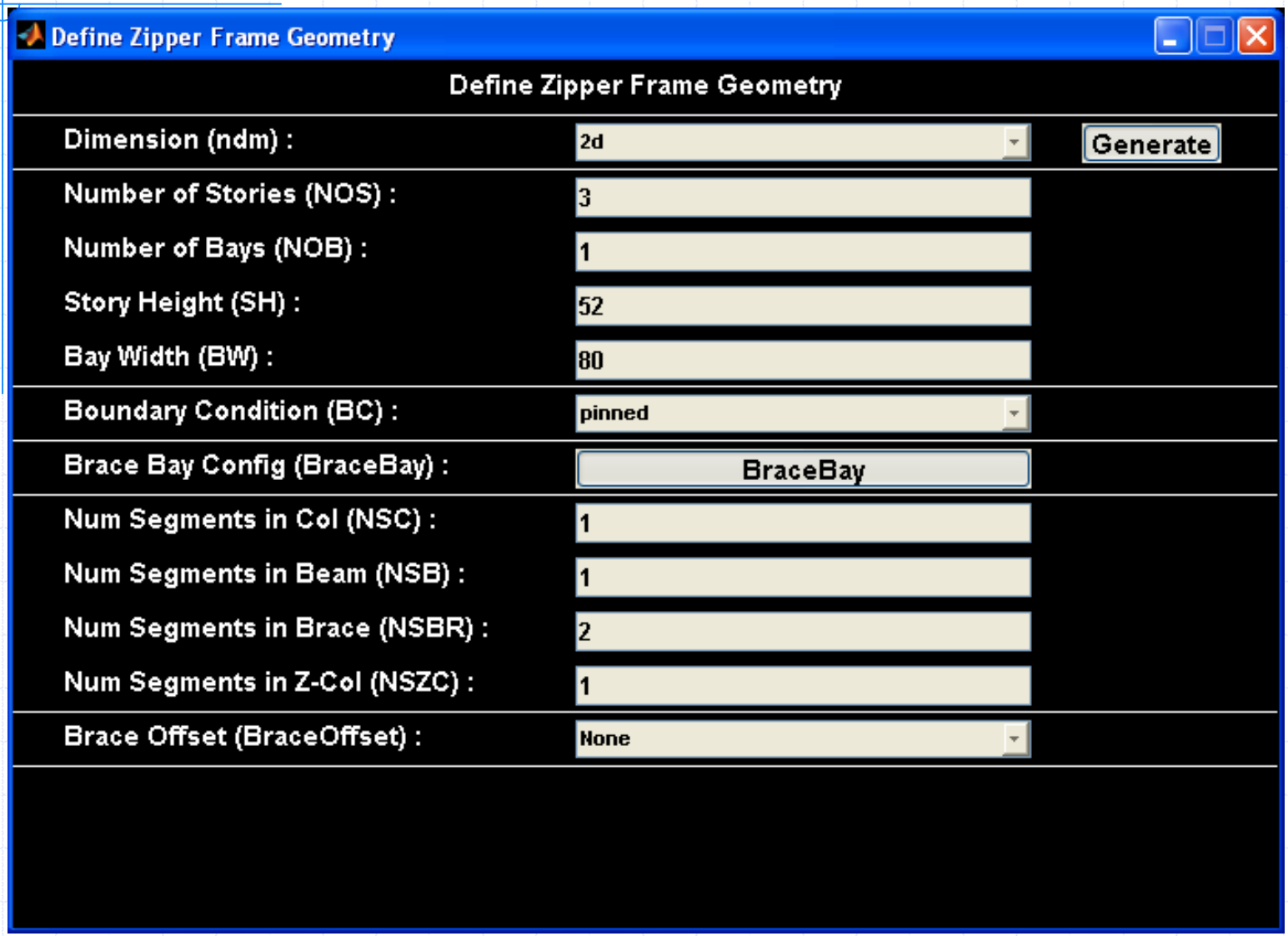
OpenSees Navigator



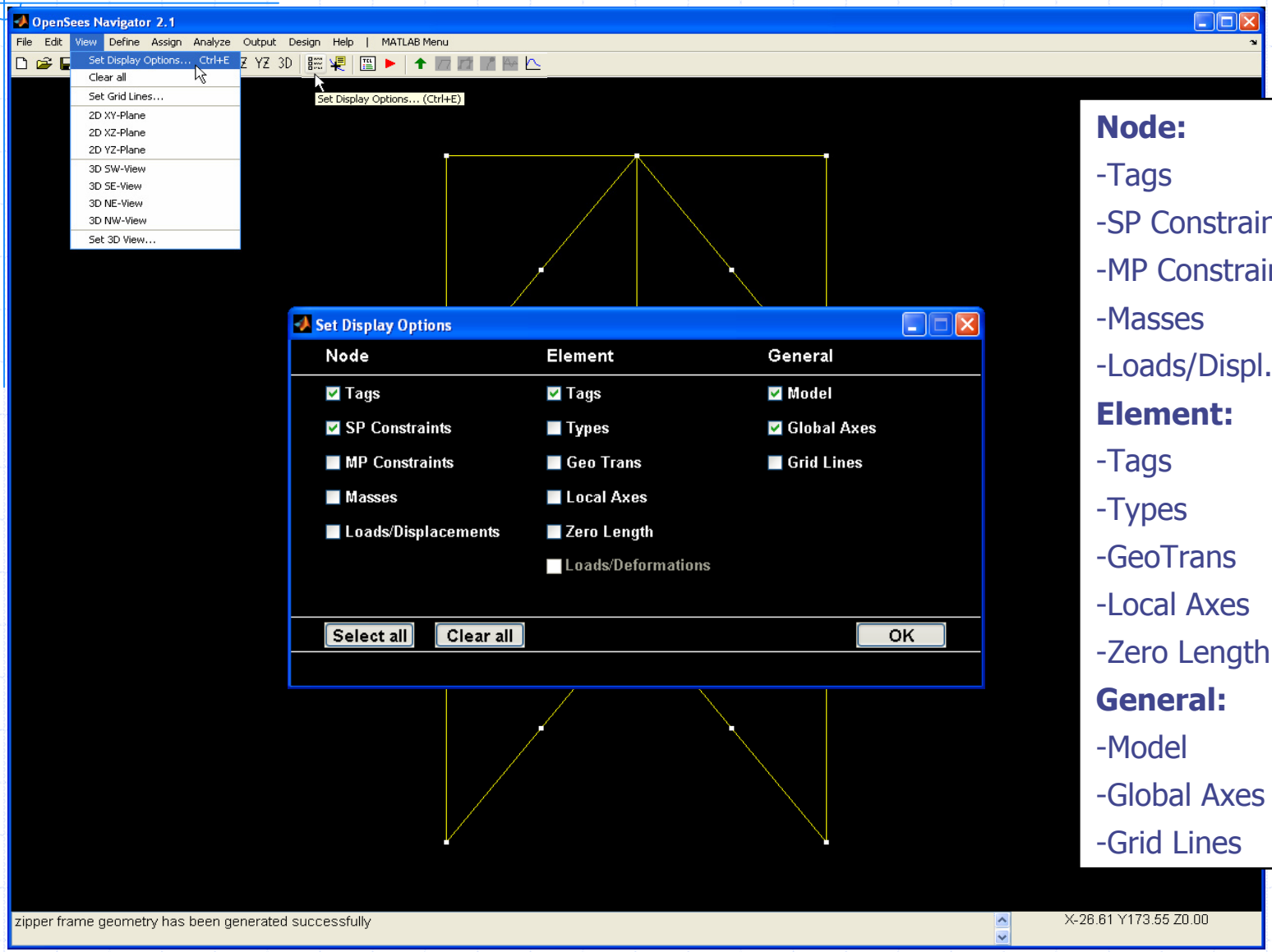
Define Geometry



Define Geometry: Zipper Frame



View Geometry: Set Display Options



Node:

-Tags

-SP Constraints

-MP Constraints

-Masses

-Loads/Displ.

Element:

-Tags

-Types

-GeoTrans

-Local Axes

-Zero Length

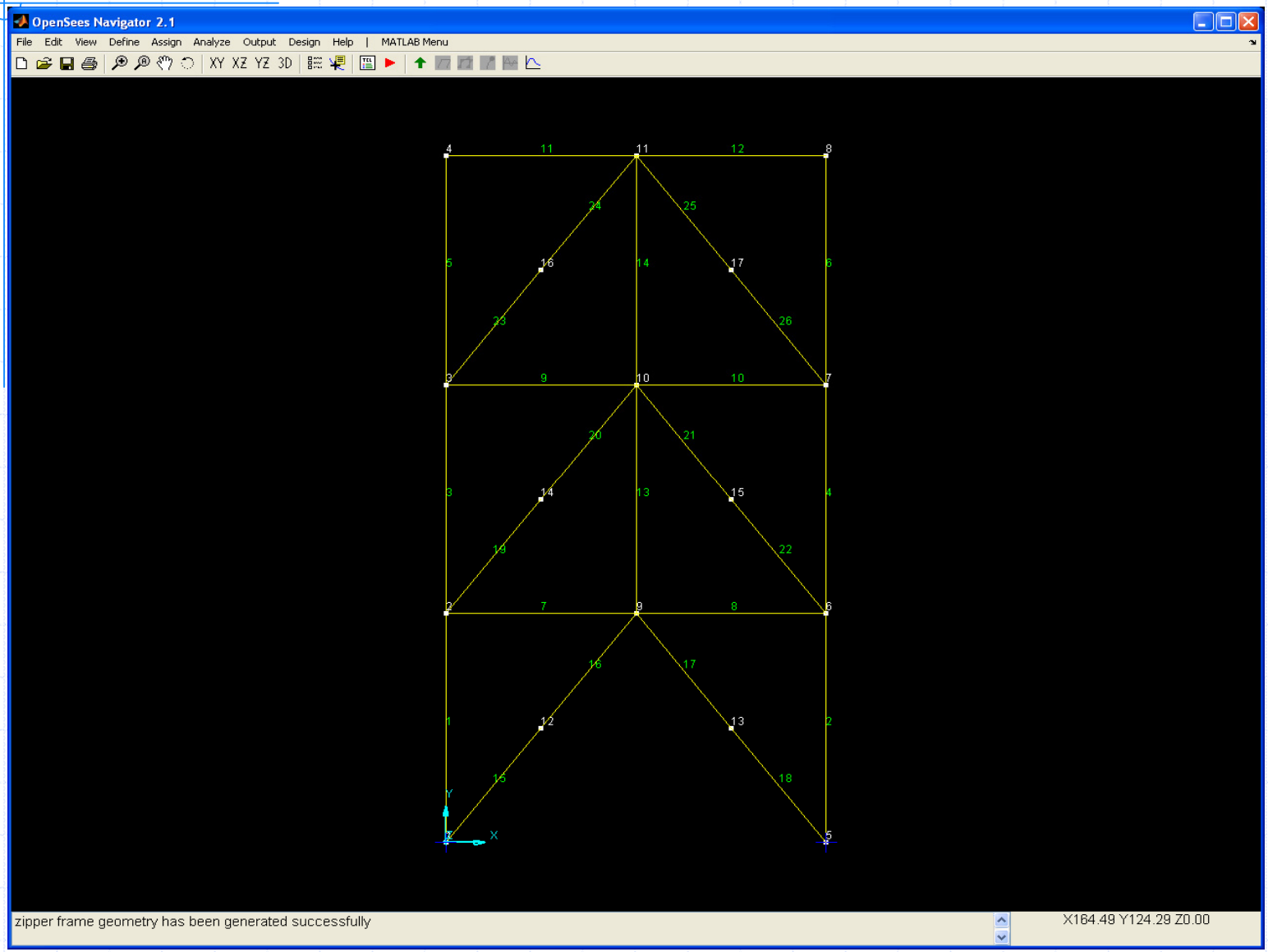
General:

-Model

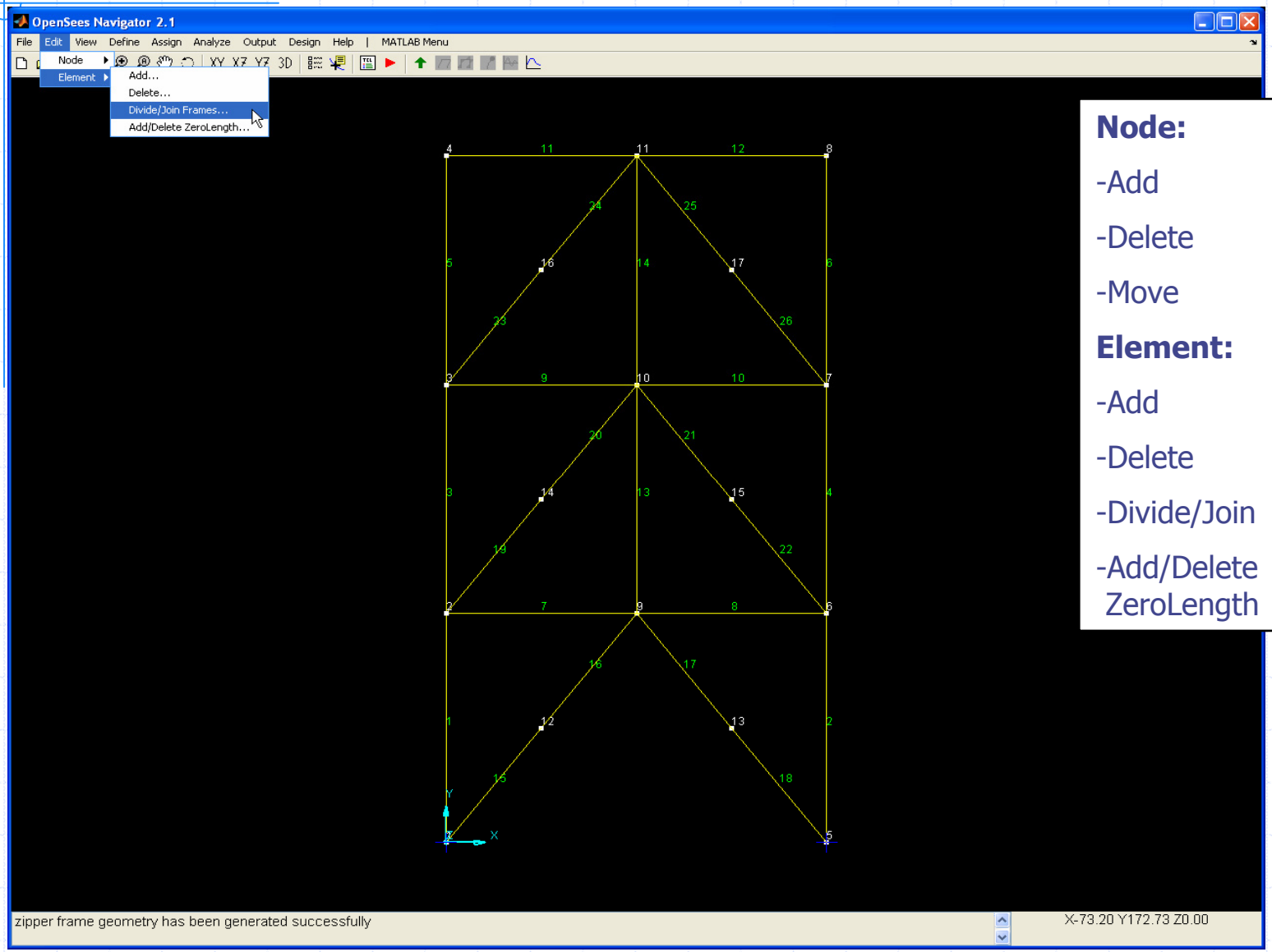
-Global Axes

-Grid Lines

View Geometry: Display



Edit Geometry



Node:

-Add

-Delete

-Move

Element:

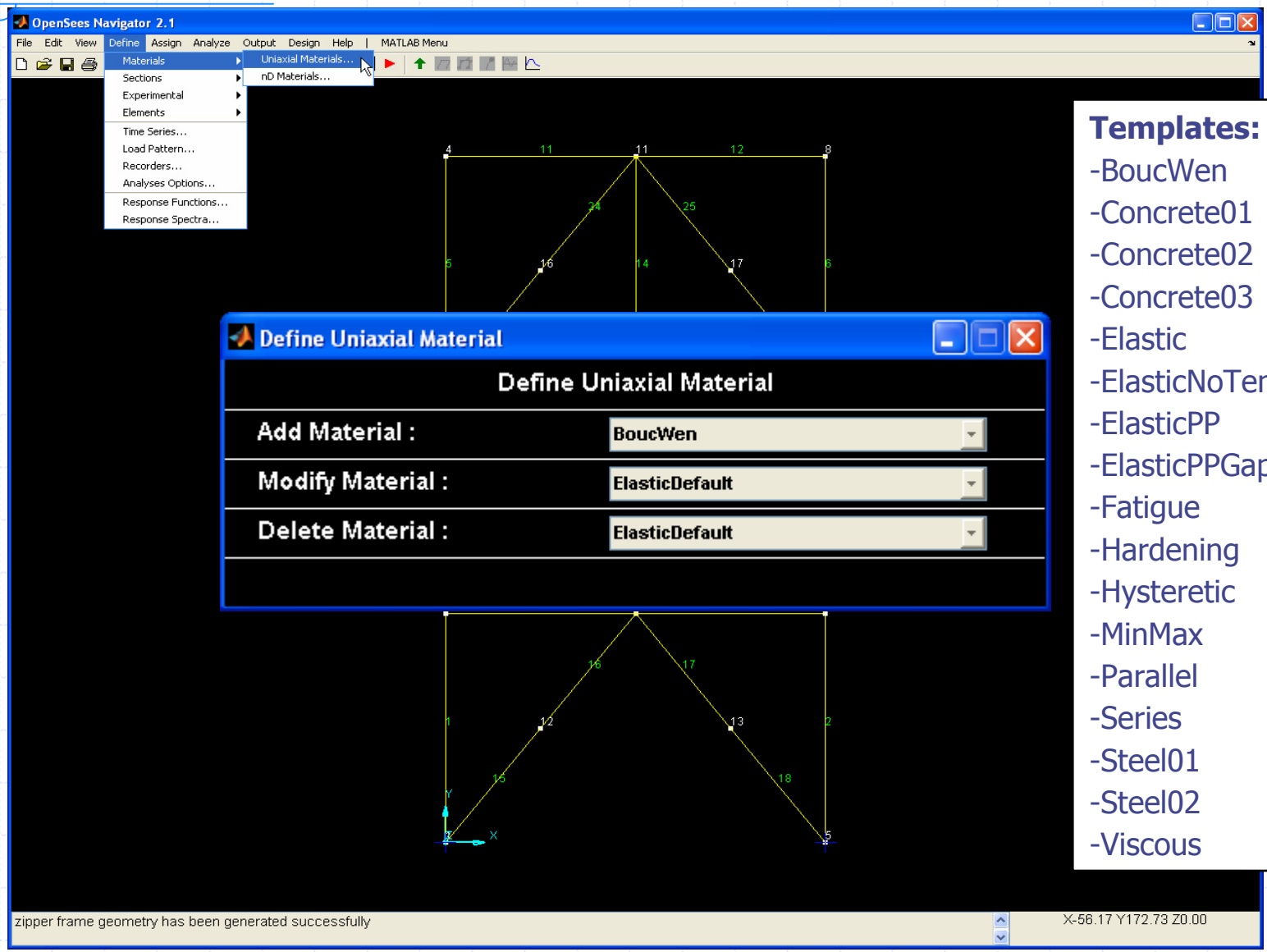
-Add

-Delete

-Divide/Join

-Add/Delete ZeroLength

Define Material: Uniaxial Materials

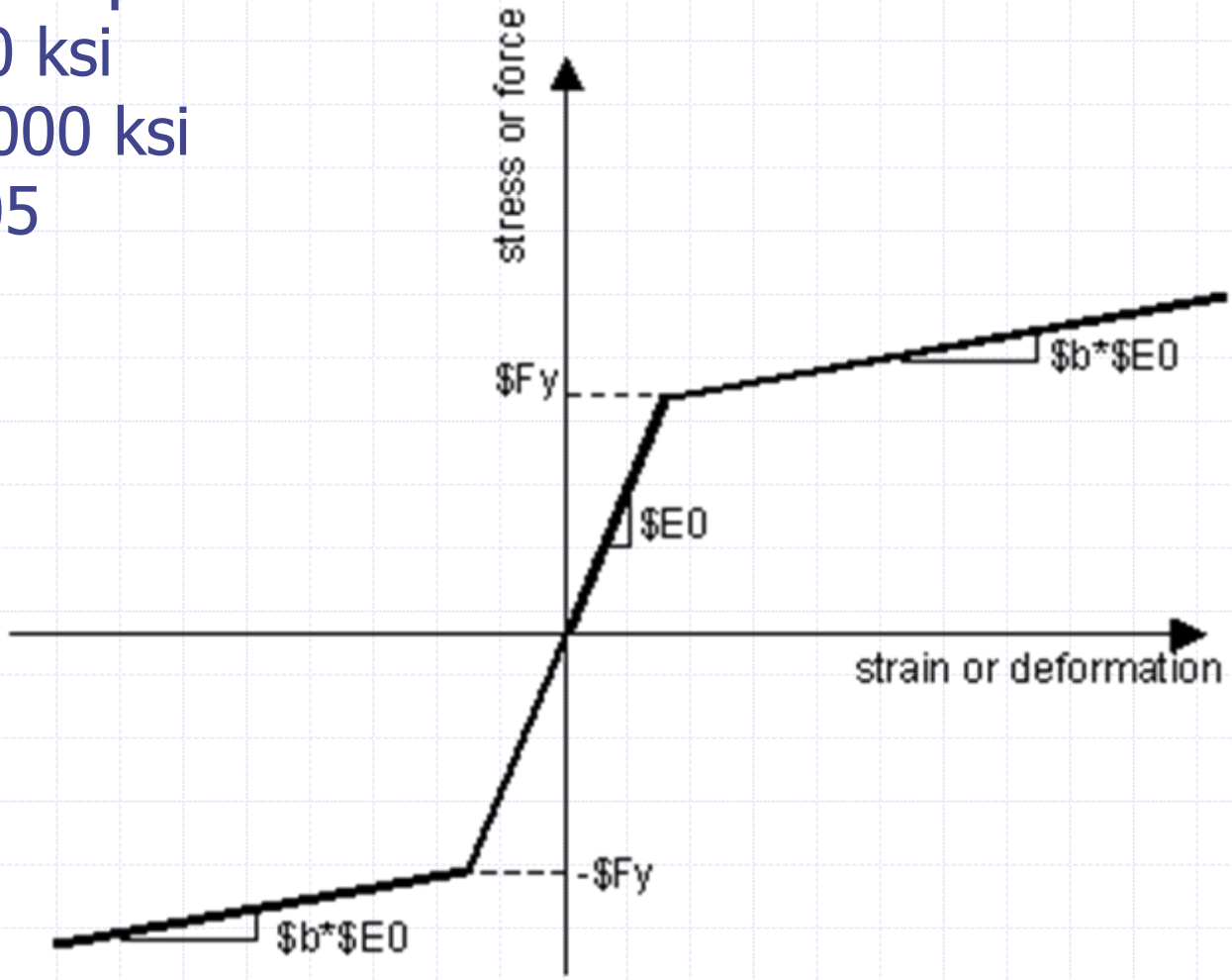


Templates:

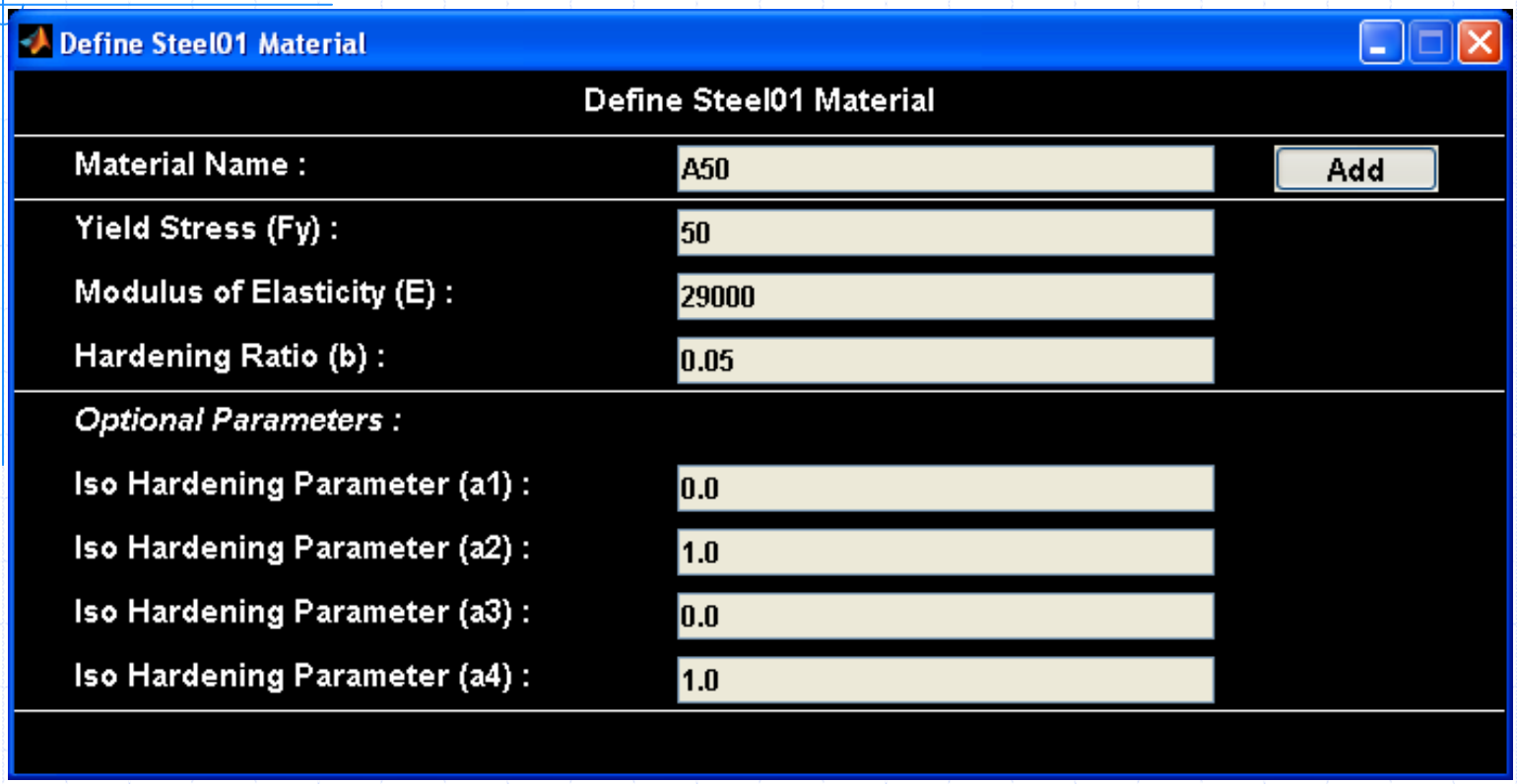
- -BoucWen
- -Concrete01
- -Concrete02
- -Concrete03
- -Elastic
- -ElasticNoTension
- -ElasticPP
- -ElasticPPGap
- -Fatigue
- -Hardening
- -Hysteretic
- -MinMax
- -Parallel
- -Series
- -Steel01
- -Steel02
- -Viscous

Define Steel01 Material: A50

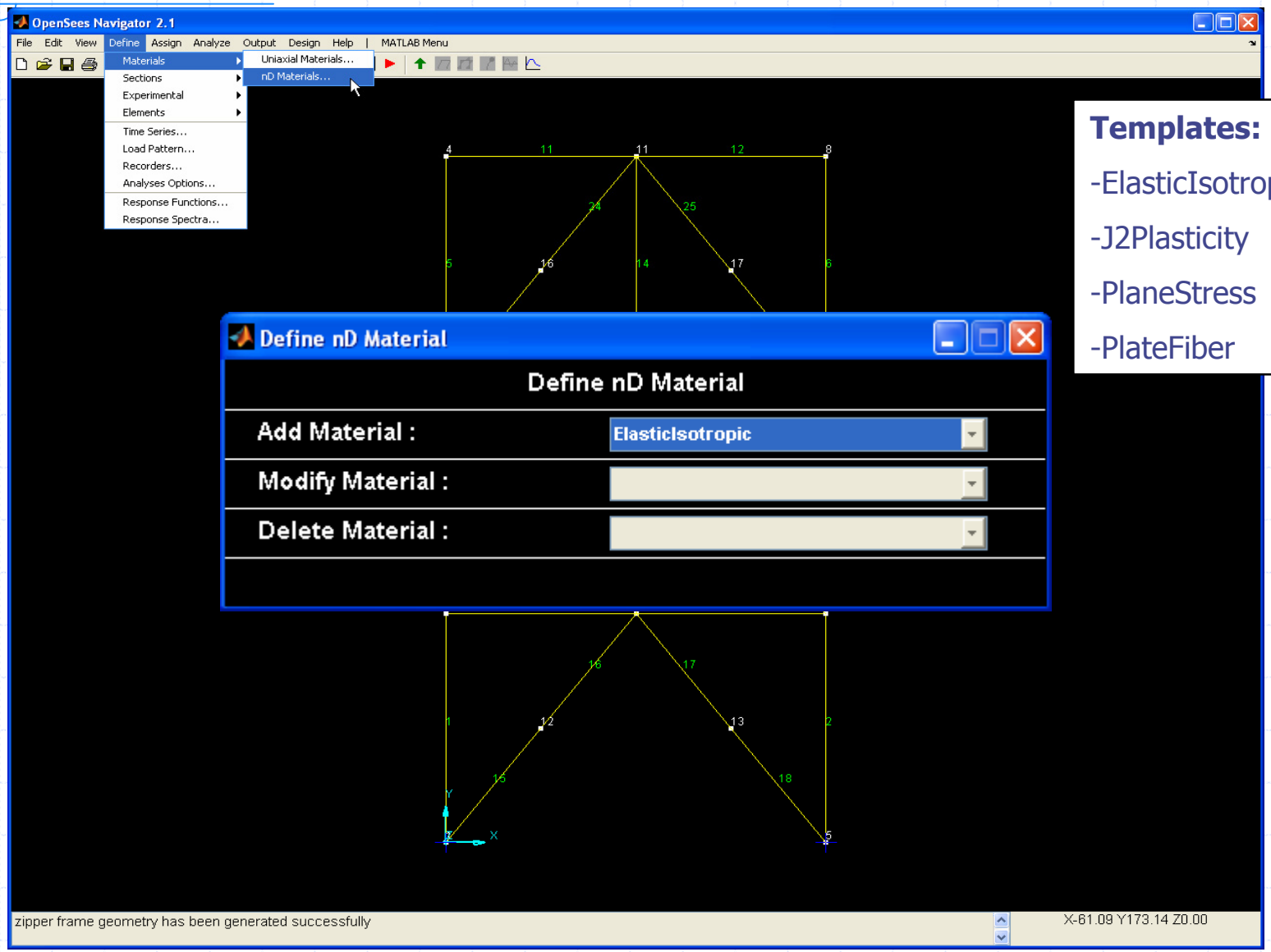
- Material Properties
  - Fy = 50 ksi
  - E = 29000 ksi
  - b = 0.05



Define Steel01 Material: A50



Define Material: nD Materials



Templates:

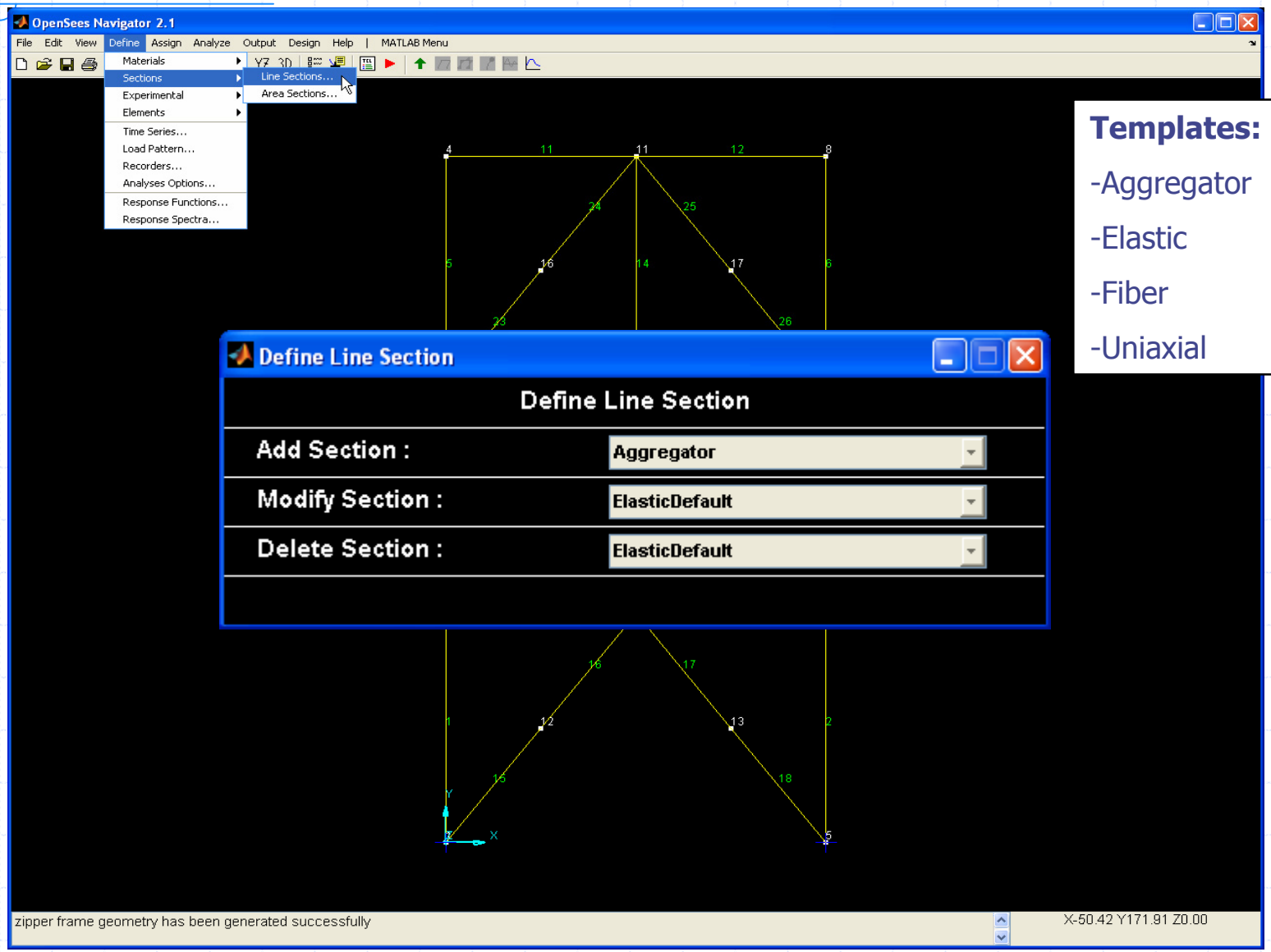
-ElasticIsotropic

-J2Plasticity

-PlaneStress

-PlateFiber

Define Section: Line Sections



Templates:

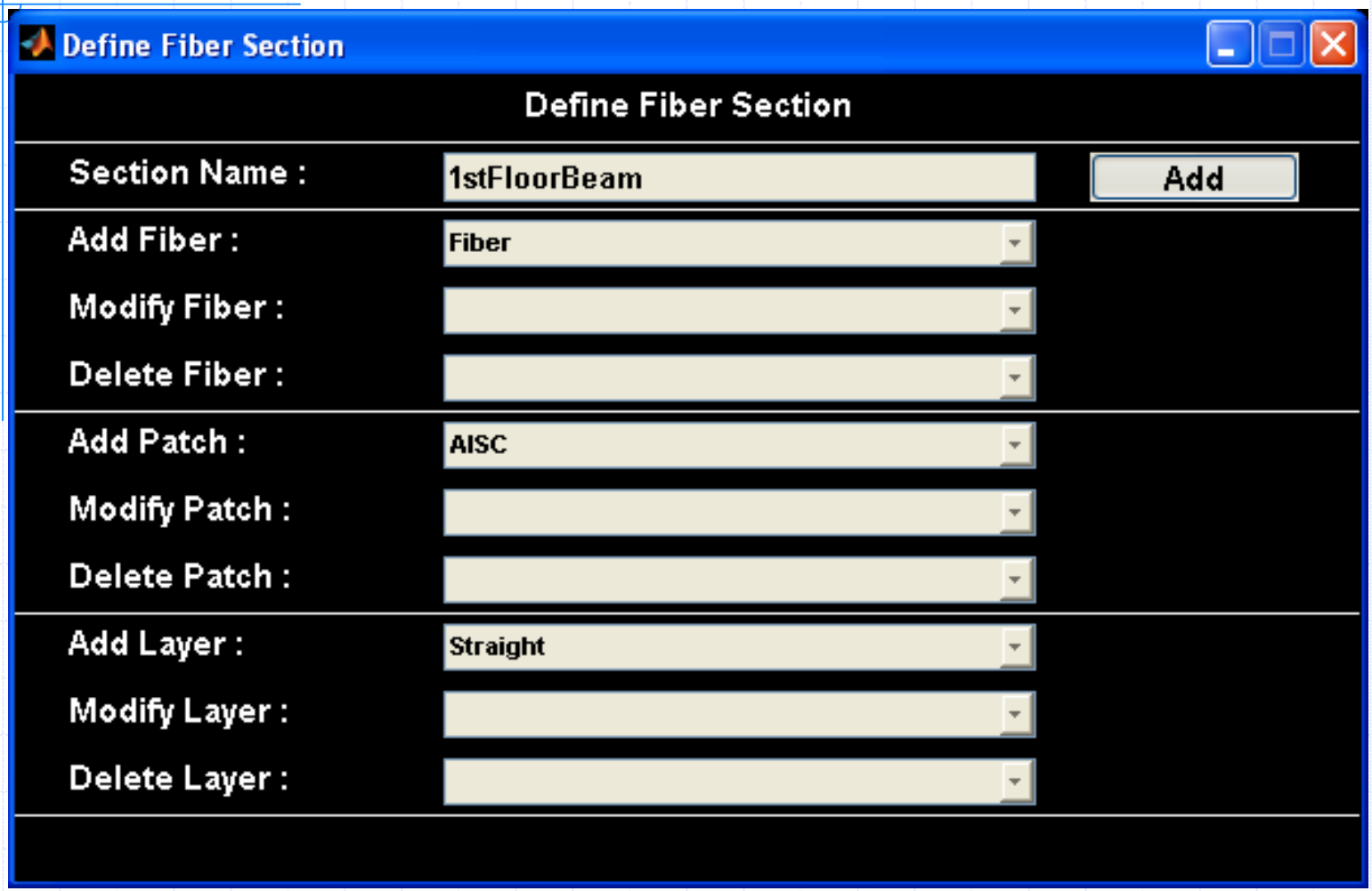
-Aggregator

-Elastic

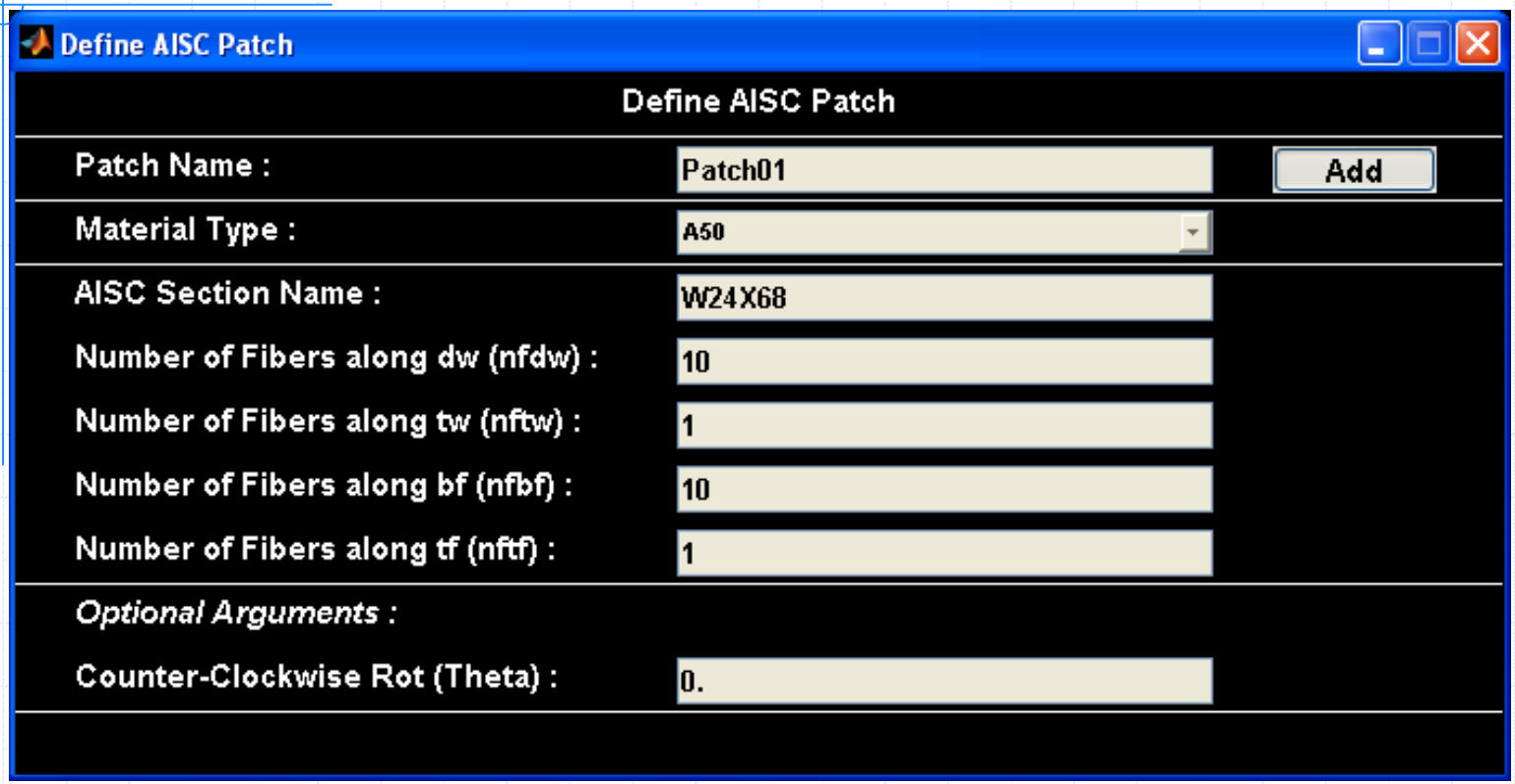
-Fiber

-Uniaxial

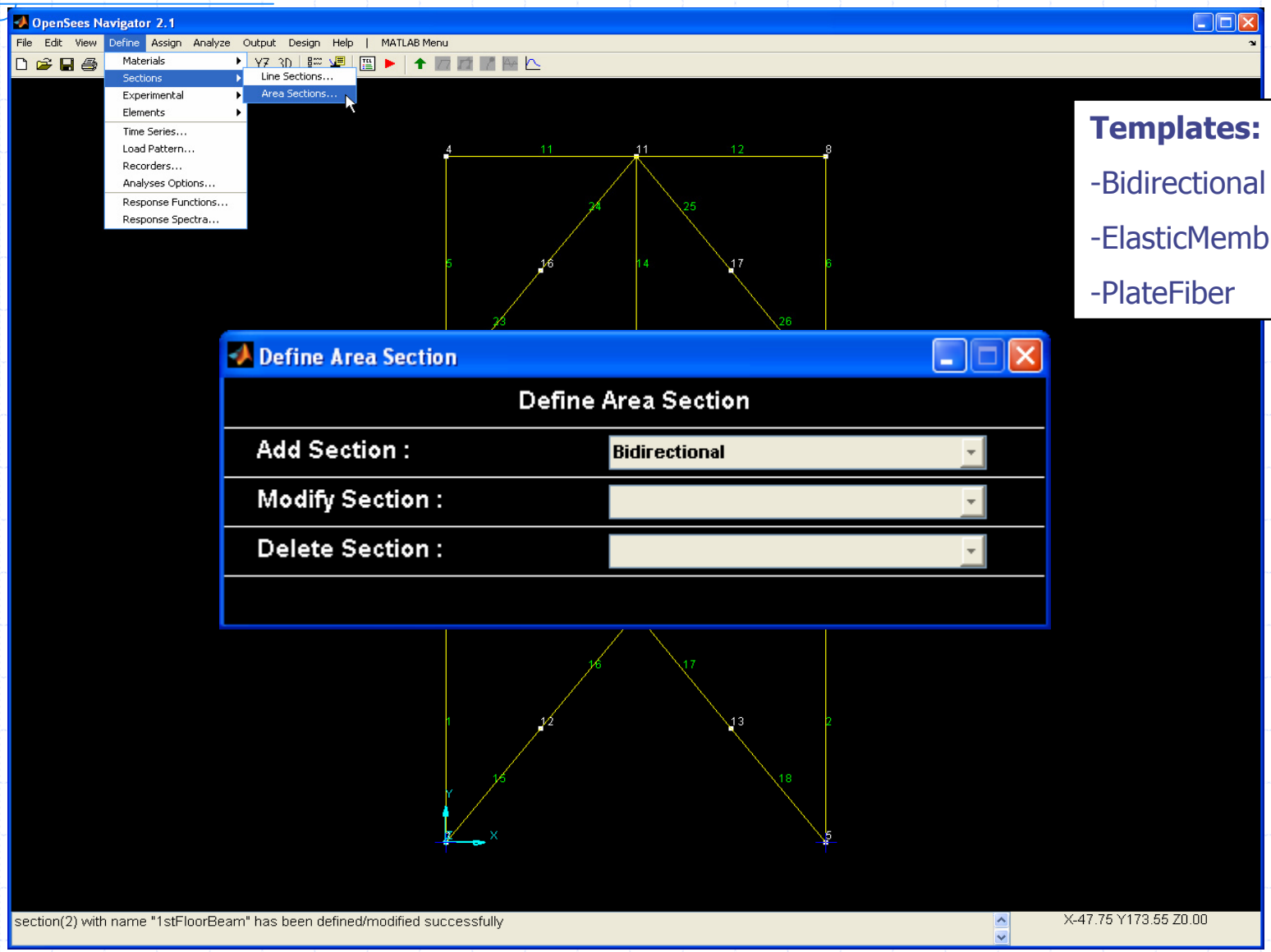
Define Fiber Section: 1stFloorBeam



Define Fiber Section: AISC Patch



Define Section: Area Section



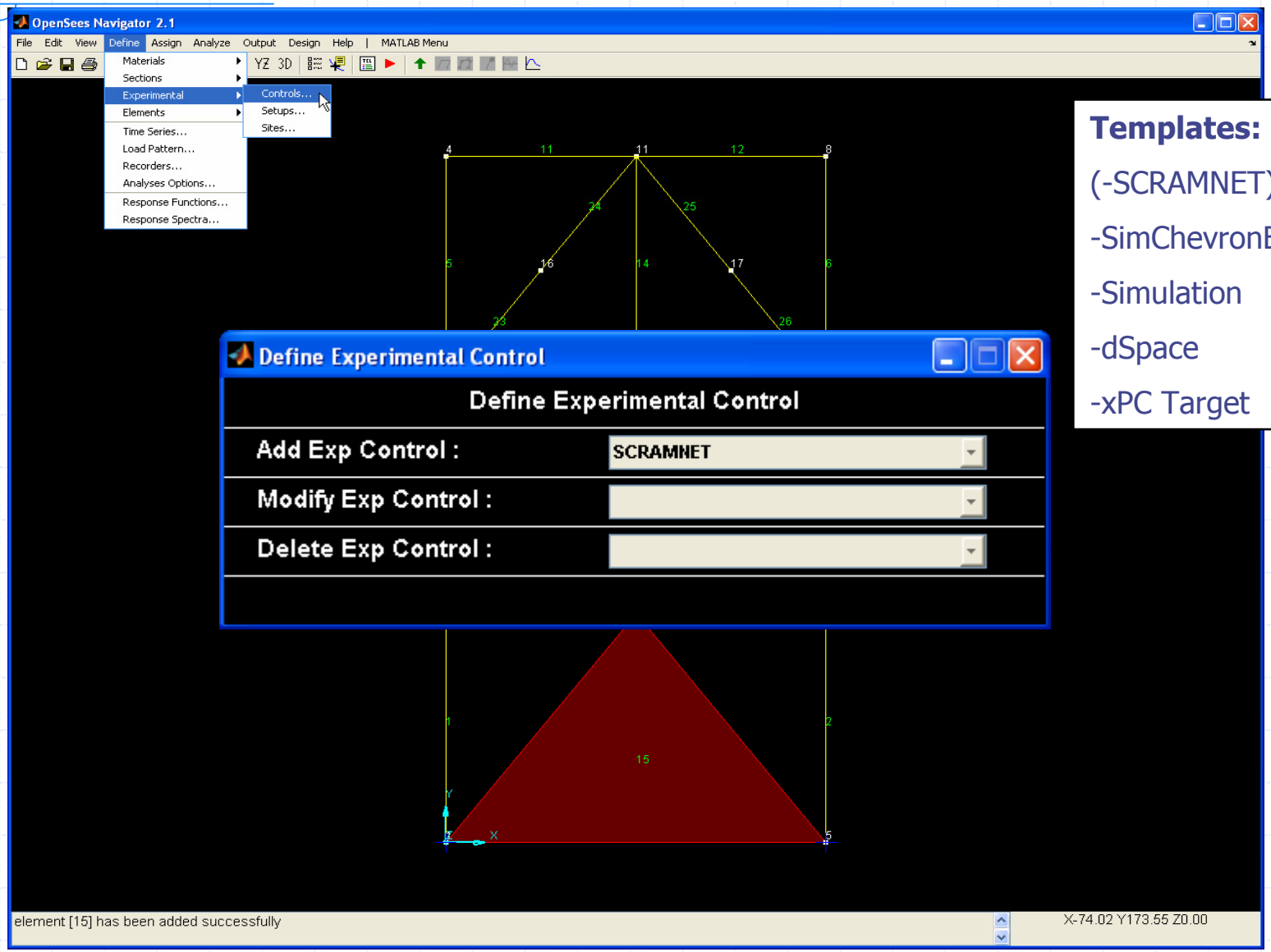
Templates:

-Bidirectional

-ElasticMembranePlate

-PlateFiber

Define Experimental Control



Templates:

(-SCRAMNET)

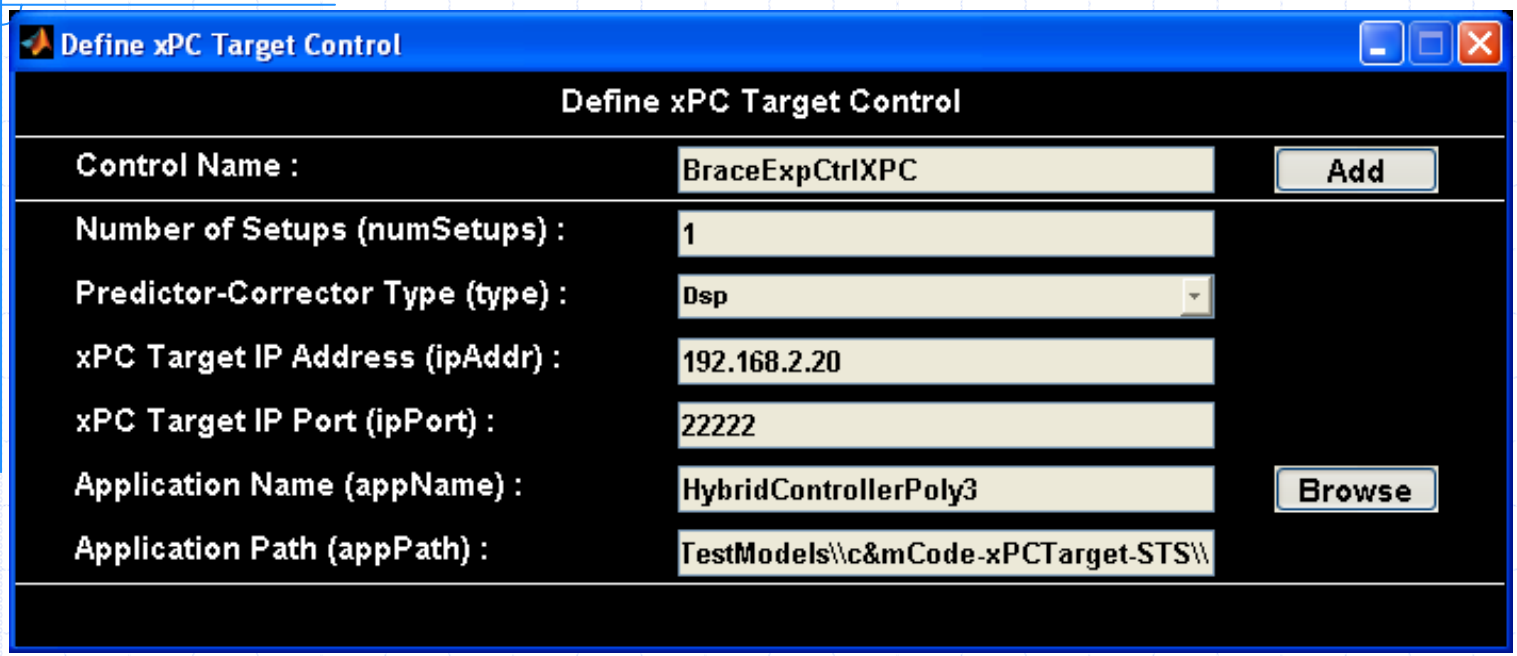
-SimChevronBrace

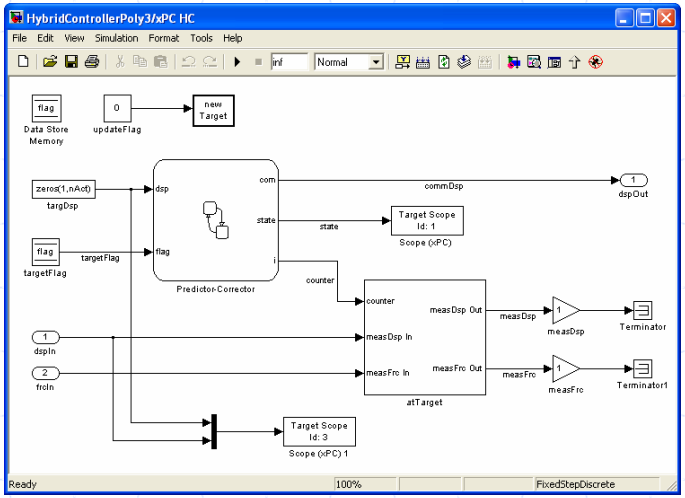
-Simulation

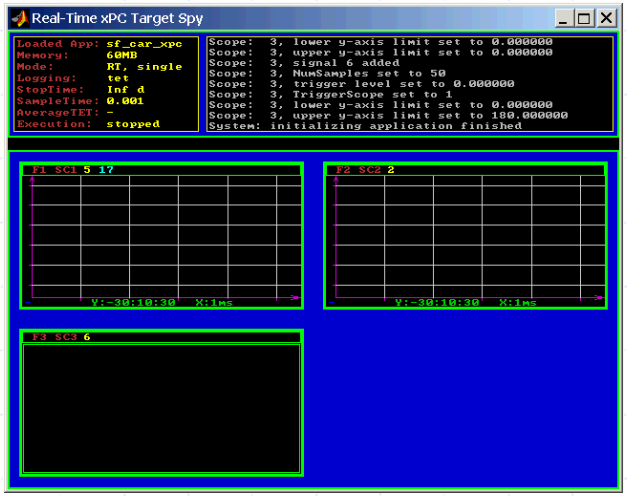
-dSpace

-xPC Target

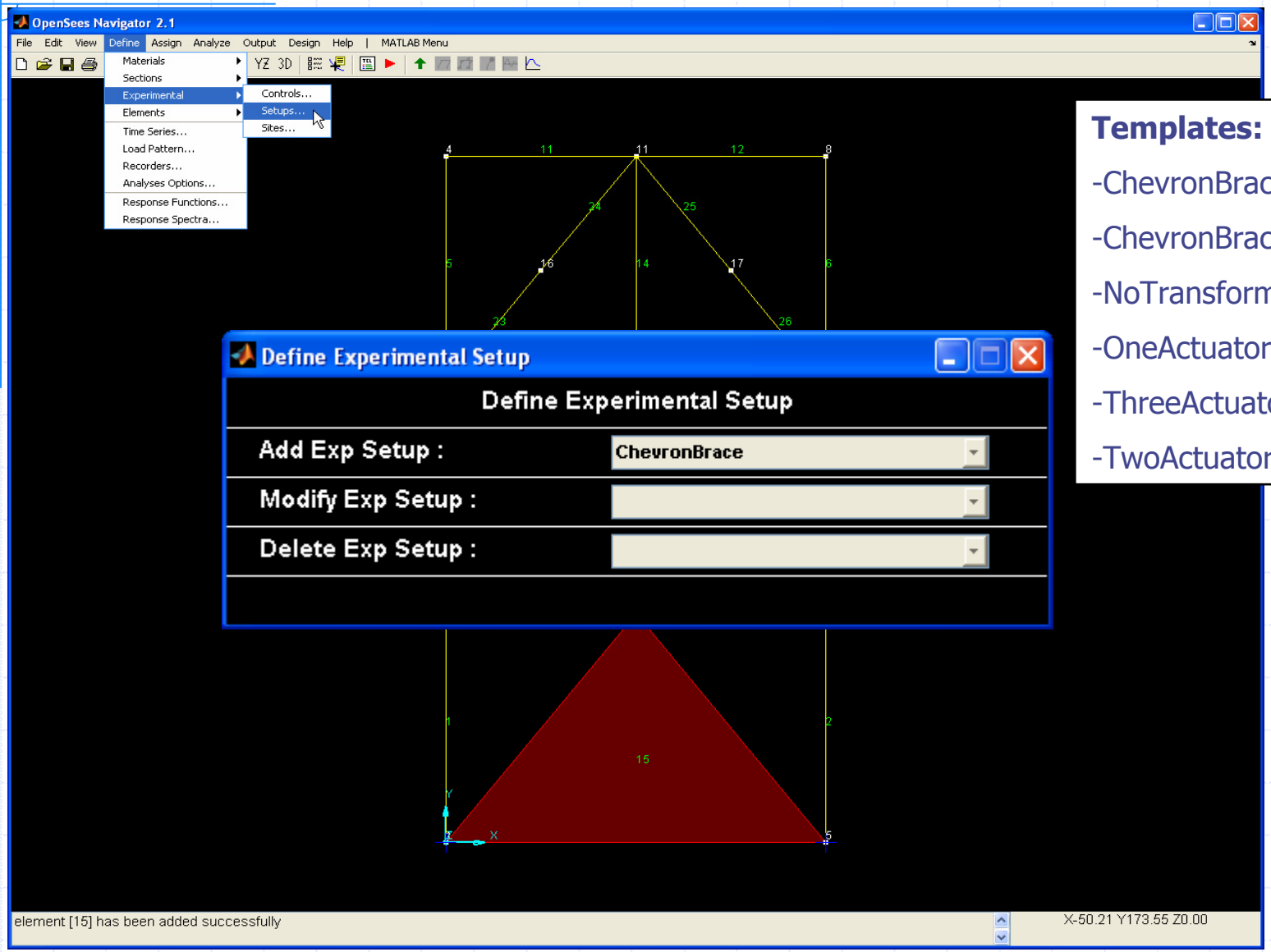
Define ExpControl: xPC Target







Define Experimental Setup



Templates:

-ChevronBrace

-ChevronBraceJntOff

-NoTransformation

-OneActuator

-ThreeActuators

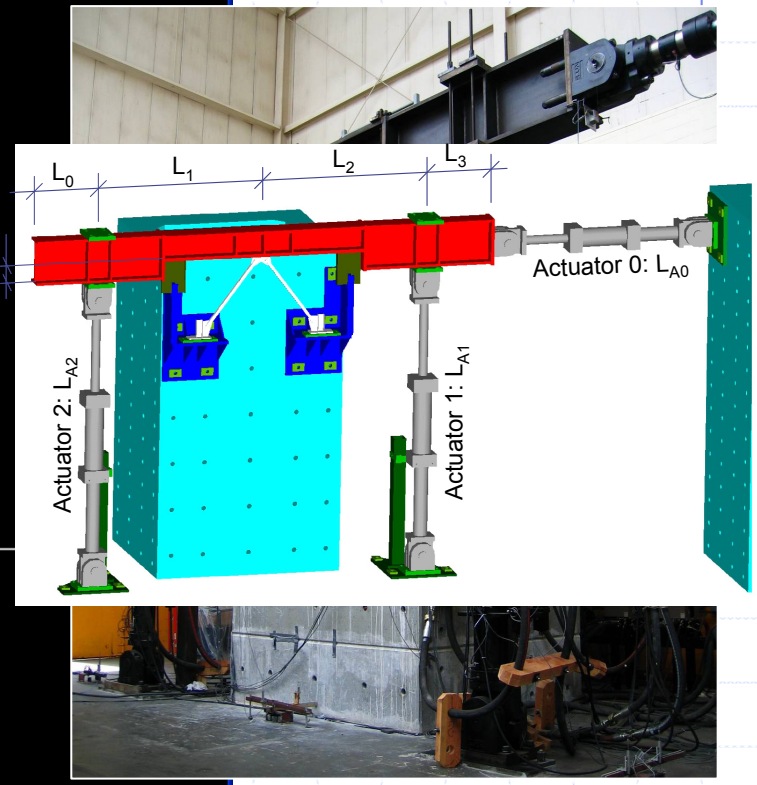
-TwoActuators

Define ExpSetup: ChevronBrace

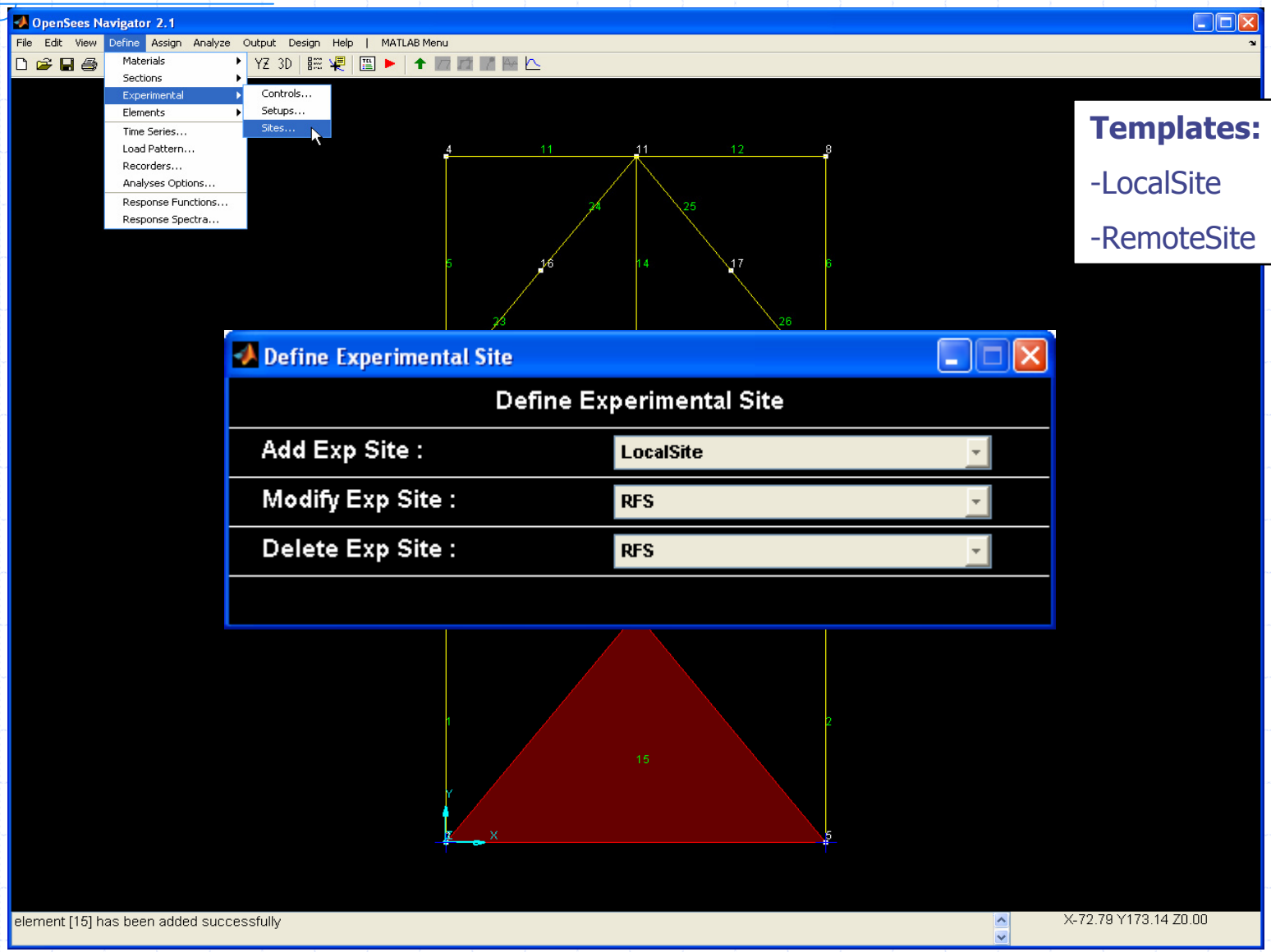
Define ChevronBraceJntOff Setup

Define ChevronBraceJntOff Setup

Setup Name :	BraceExpSetupJntOff	Add
Experimental Control Type :	BraceExpCtrlXPC	
Geometry Type (nlGeomFlag) :	nonlinear, horizontal right	
Actuator Length 1 (La1) :	124.5	
Actuator Length 2 (La2) :	176.625	
Actuator Length 3 (La3) :	176.625	
Rigid Link Length 1 (L1) :	53	
Rigid Link Length 2 (L2) :	108	
Rigid Link Length 3 (L3) :	108	
Rigid Link Length 4 (L4) :	53	
Rigid Link Length 5 (L5) :	24.625	
Rigid Link Length 6 (L6) :	24.625	
Optional Parameters :		
Dsp Control Factor (dspCtrlFact) :	[1 1 1]	
Vel Control Factor (velCtrlFact) :	[1 1 1]	
Acc Control Factor (accCtrlFact) :	[1 1 1]	
Dsp Daq Factor (dspDaqFact) :	[1 1 1 1 1 1]	
Force Daq Factor (frcDaqFact) :	[1 1 1 1 -1 1]	



Define Experimental Site

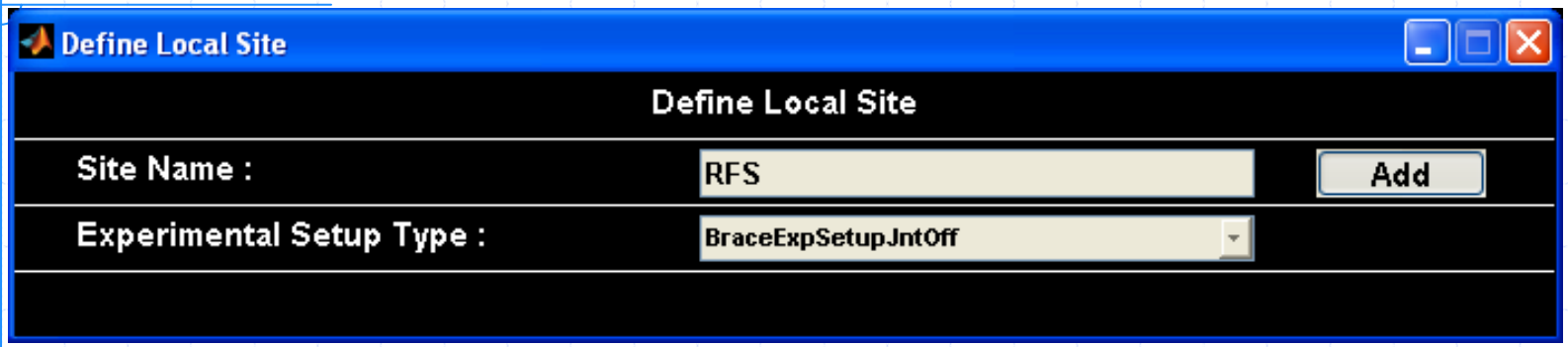


Templates:

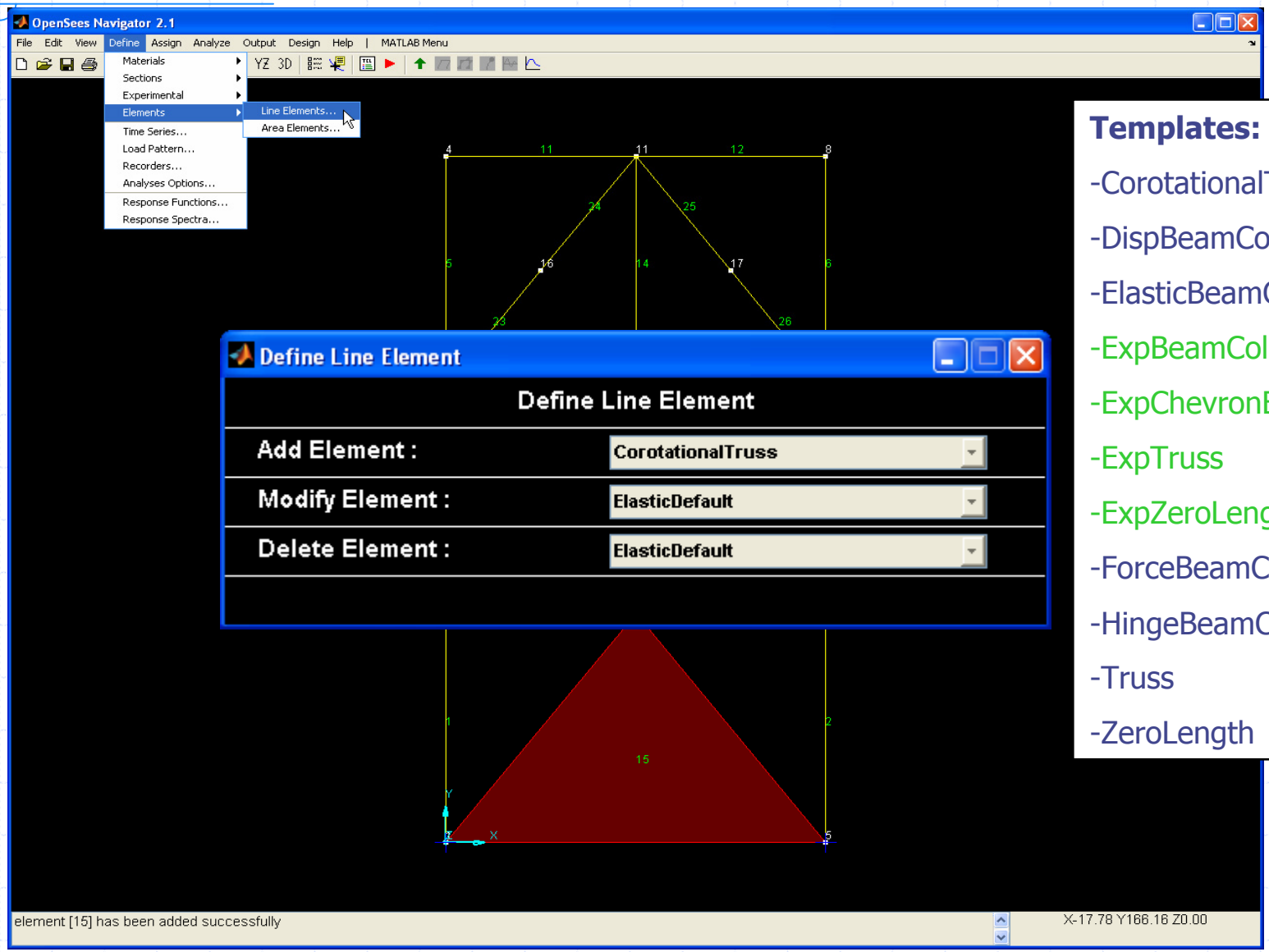
-LocalSite

-RemoteSite

Define ExpSite: RFS



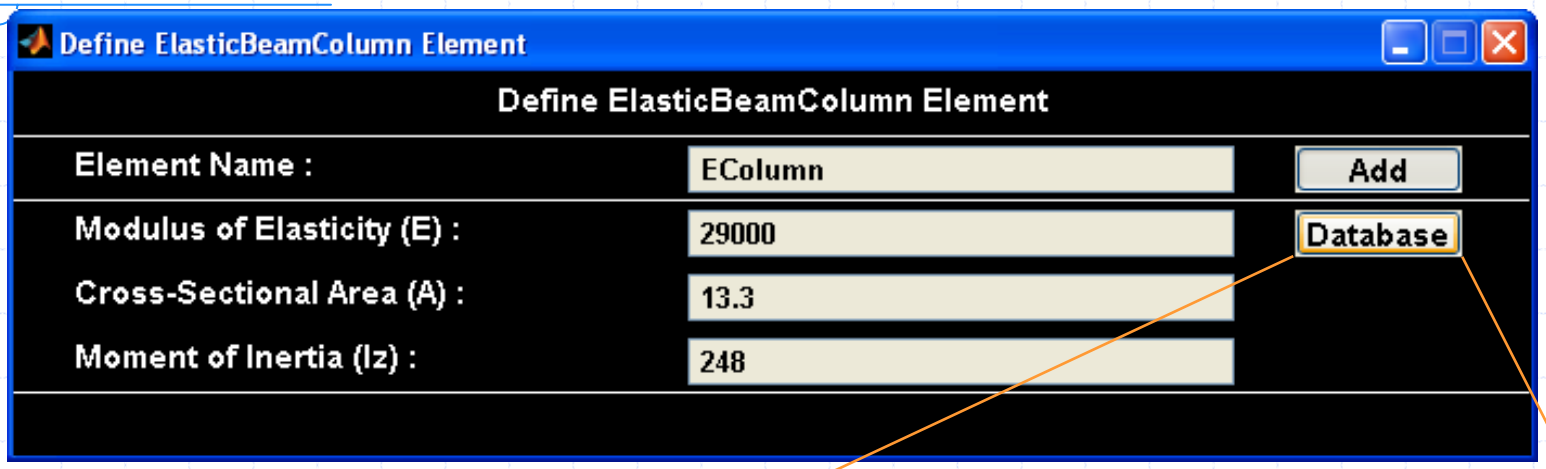
Define Element: Line Element

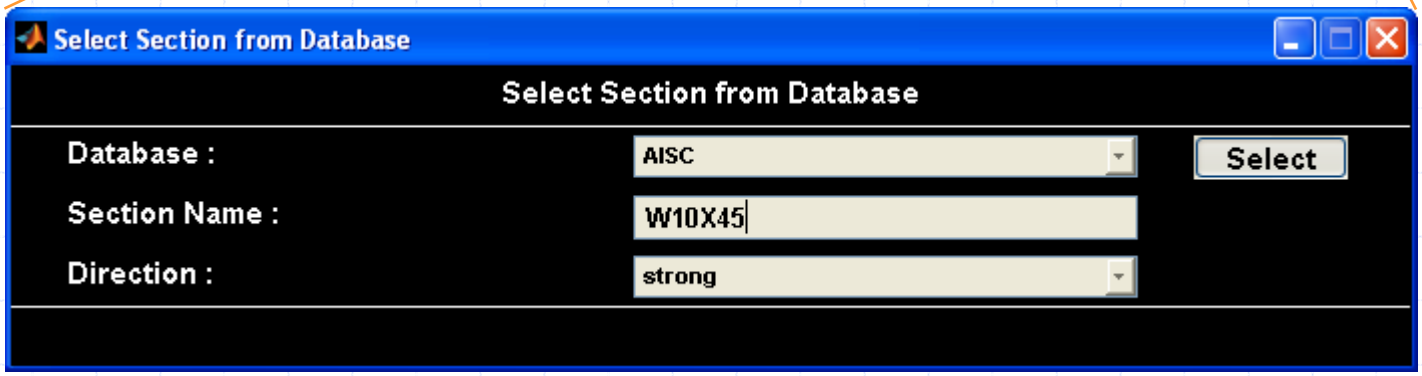


Templates:

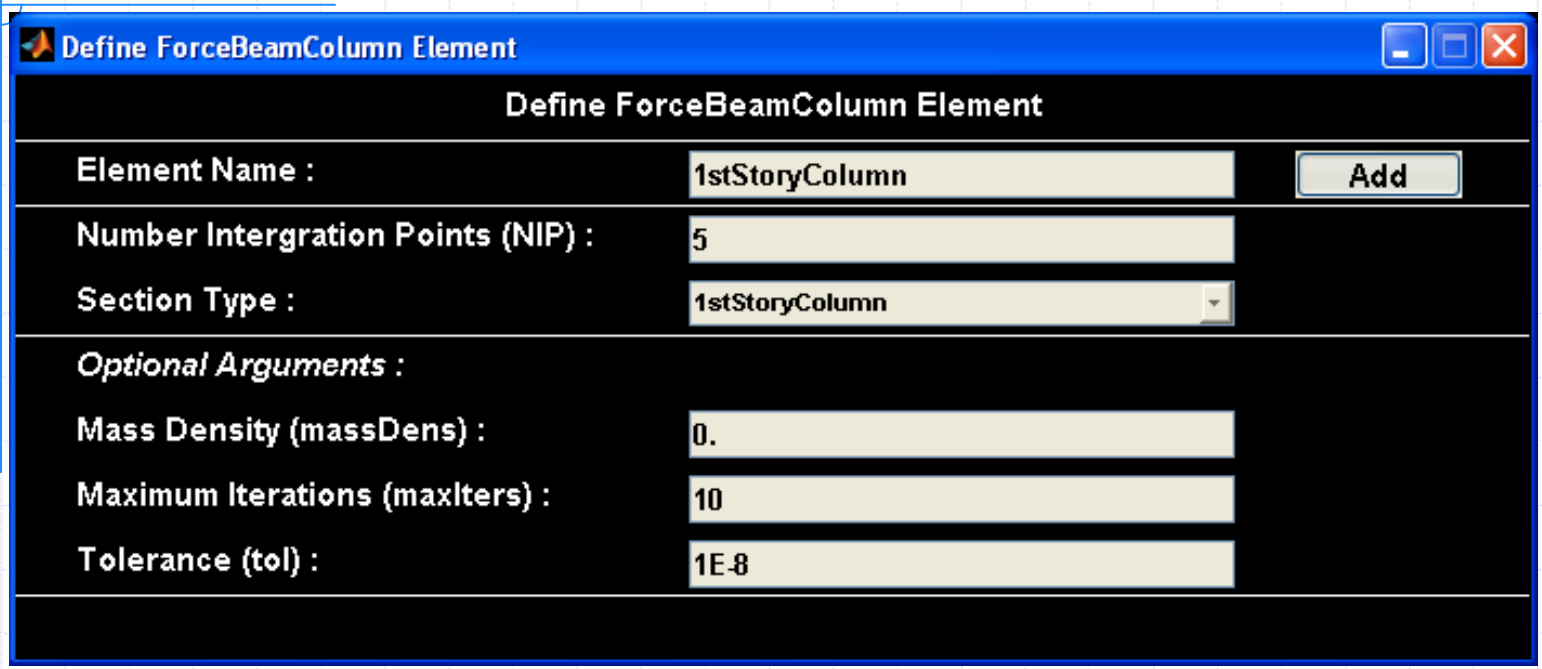
- -CorotationalTruss
- -DispBeamColumn
- -ElasticBeamColumn
- -ExpBeamColumn
- -ExpChevronBrace
- -ExpTruss
- -ExpZeroLength
- -ForceBeamColumn
- -HingeBeamColumn
- -Truss
- -ZeroLength

Define ElasticBeamColumn Element

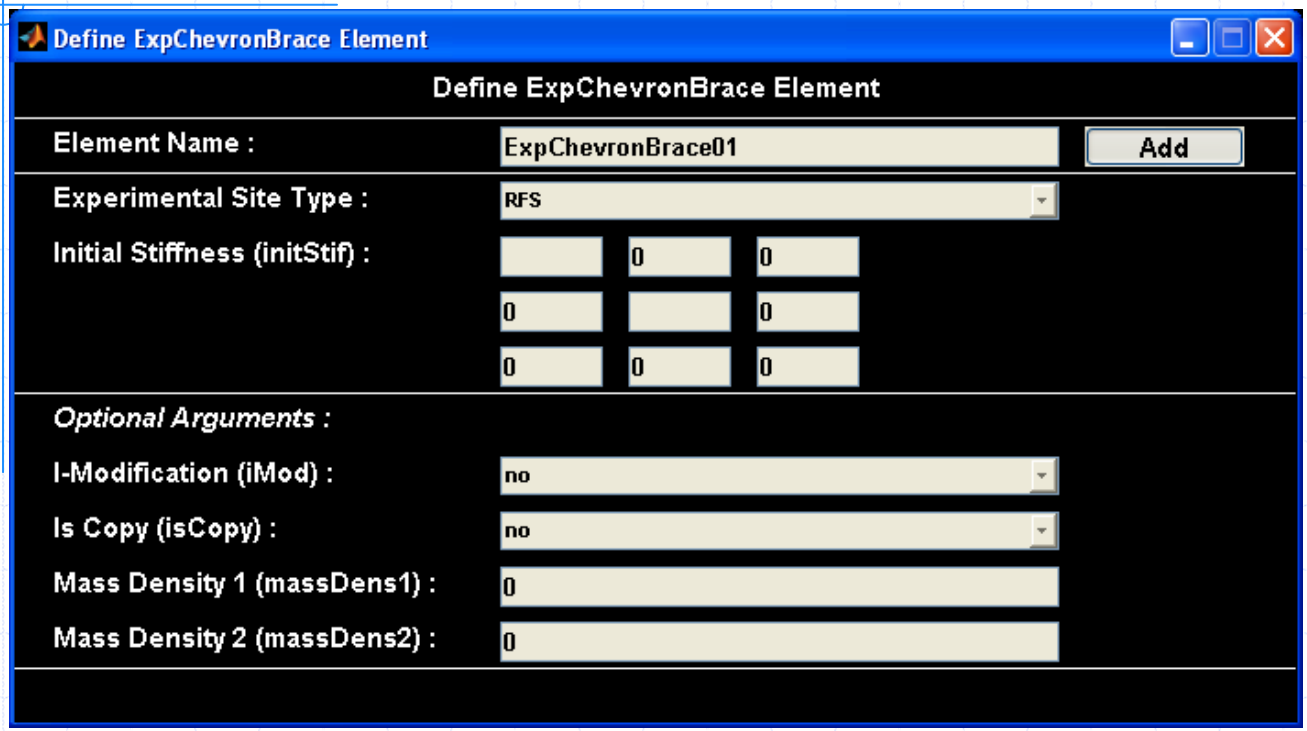


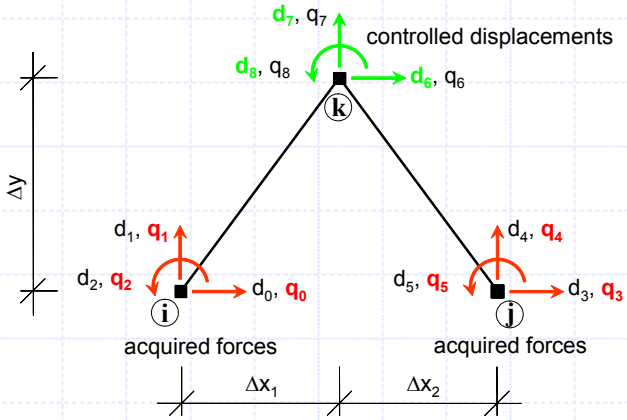


Define ForceBeamColumn Element

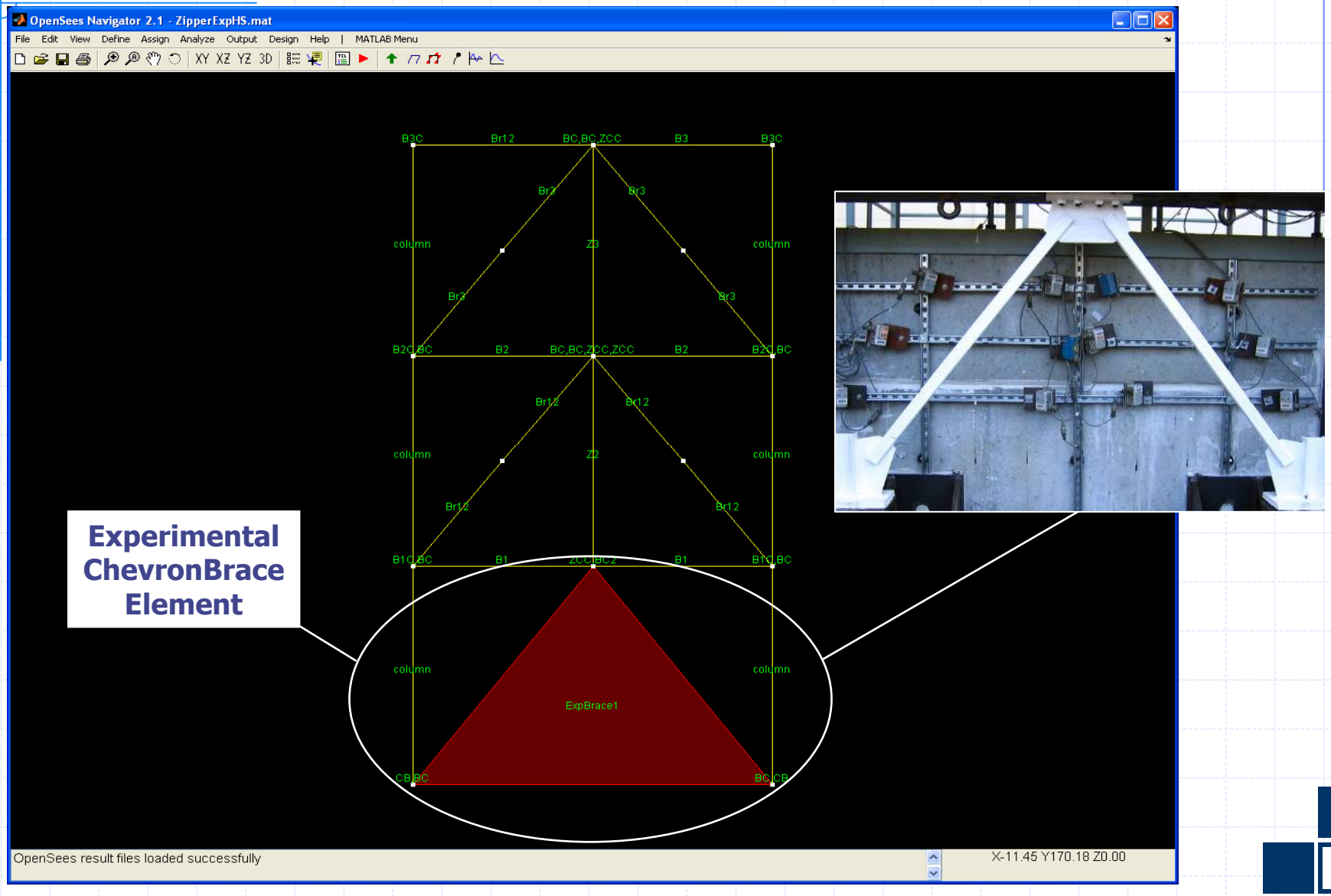


Define ExpElement: ChevronBrace

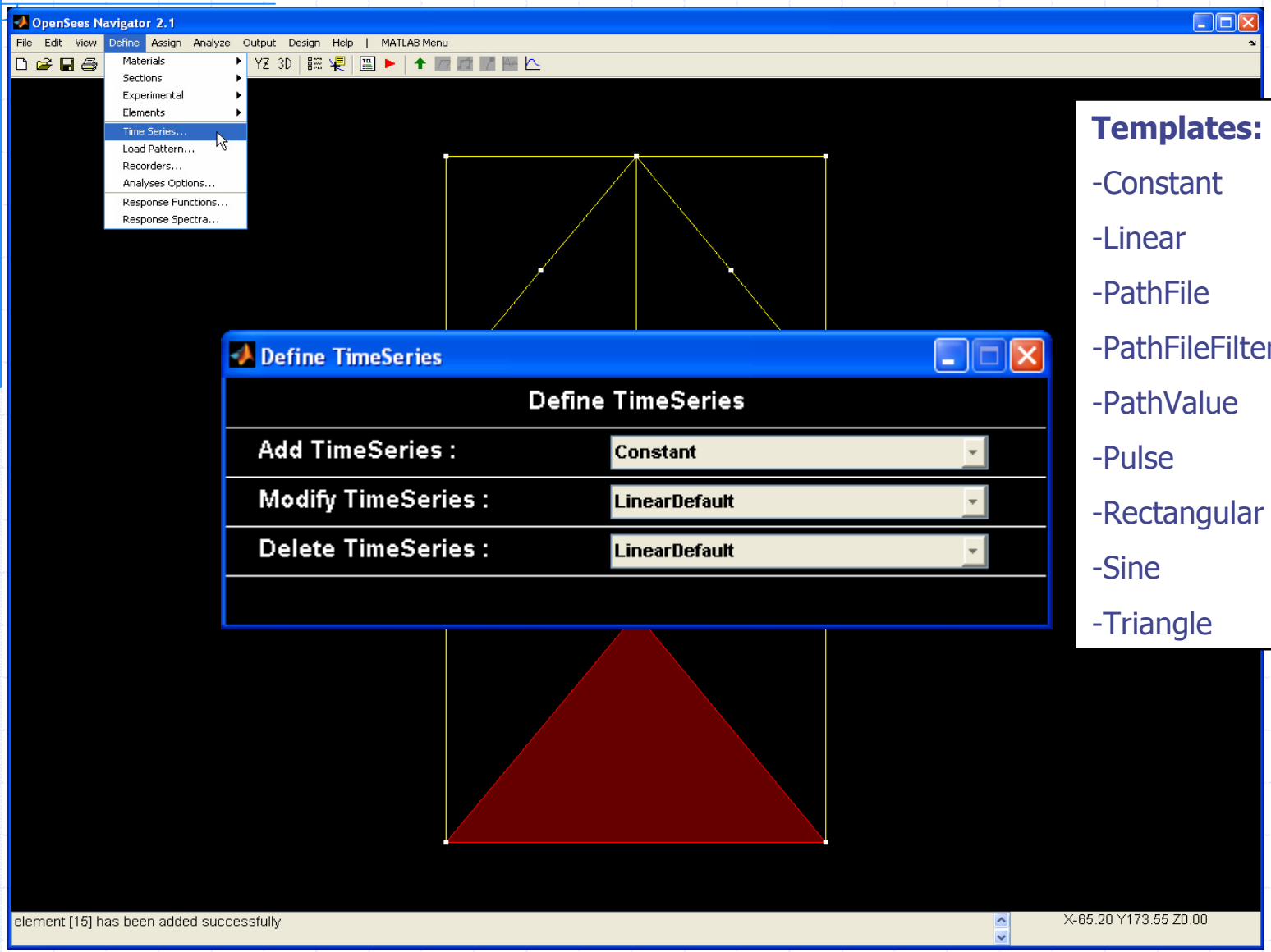




Define ExpElement: ChevronBrace



Define TimeSeries



Templates:

-Constant

-Linear

-PathFile

-PathFileFiltered

-PathValue

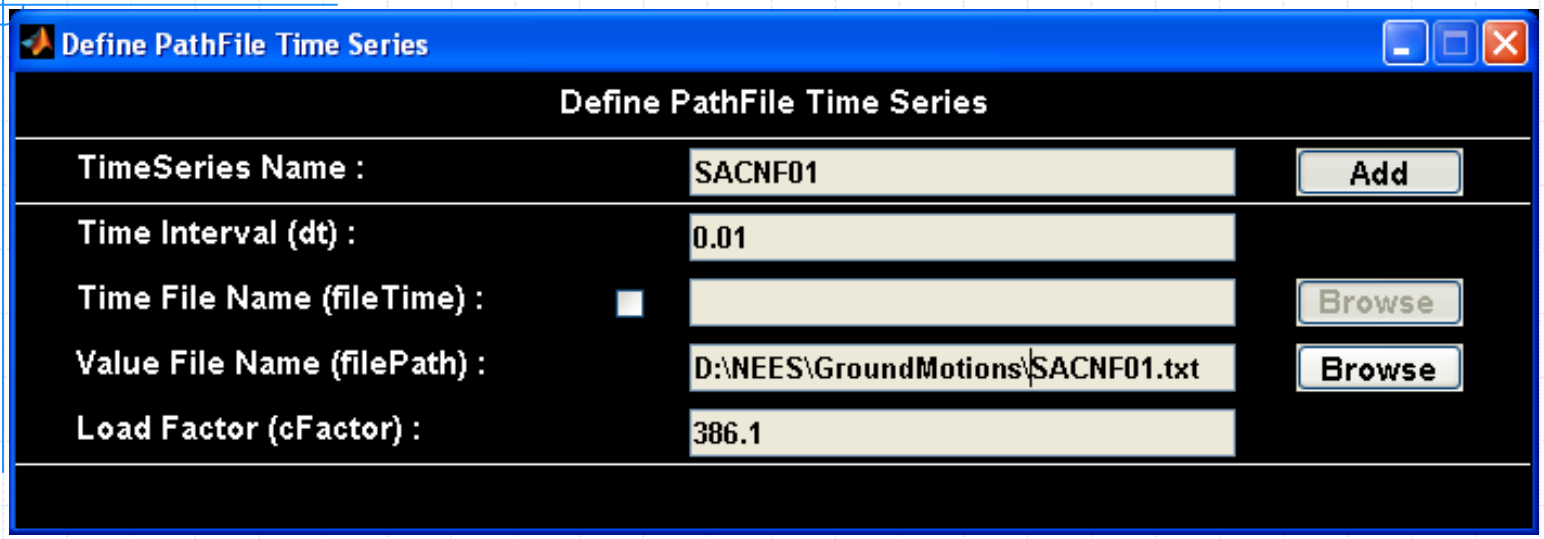
-Pulse

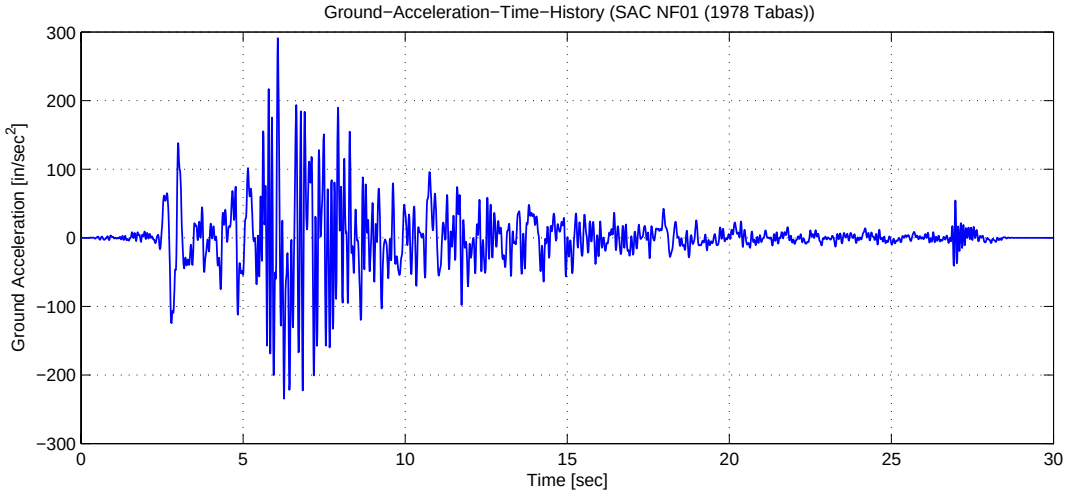
-Rectangular

-Sine

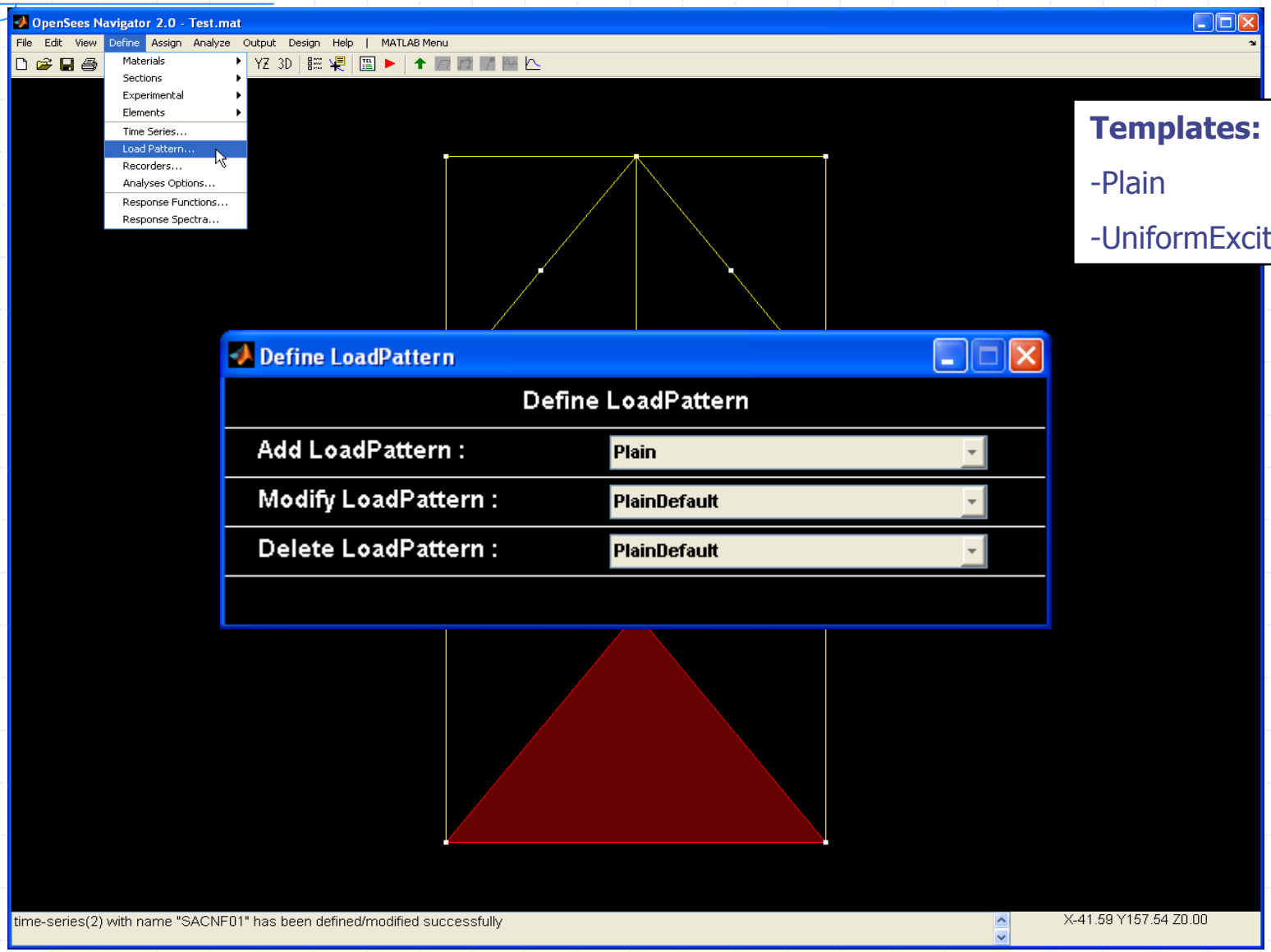
-Triangle

Define PathFile TimeSeries: SACNF01





Define LoadPattern

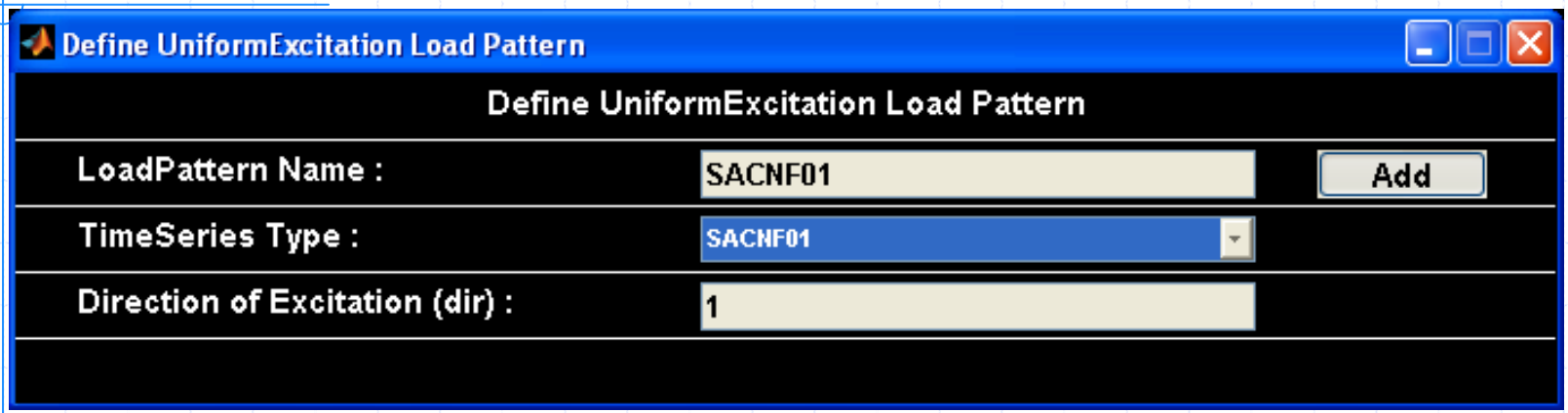


Templates:

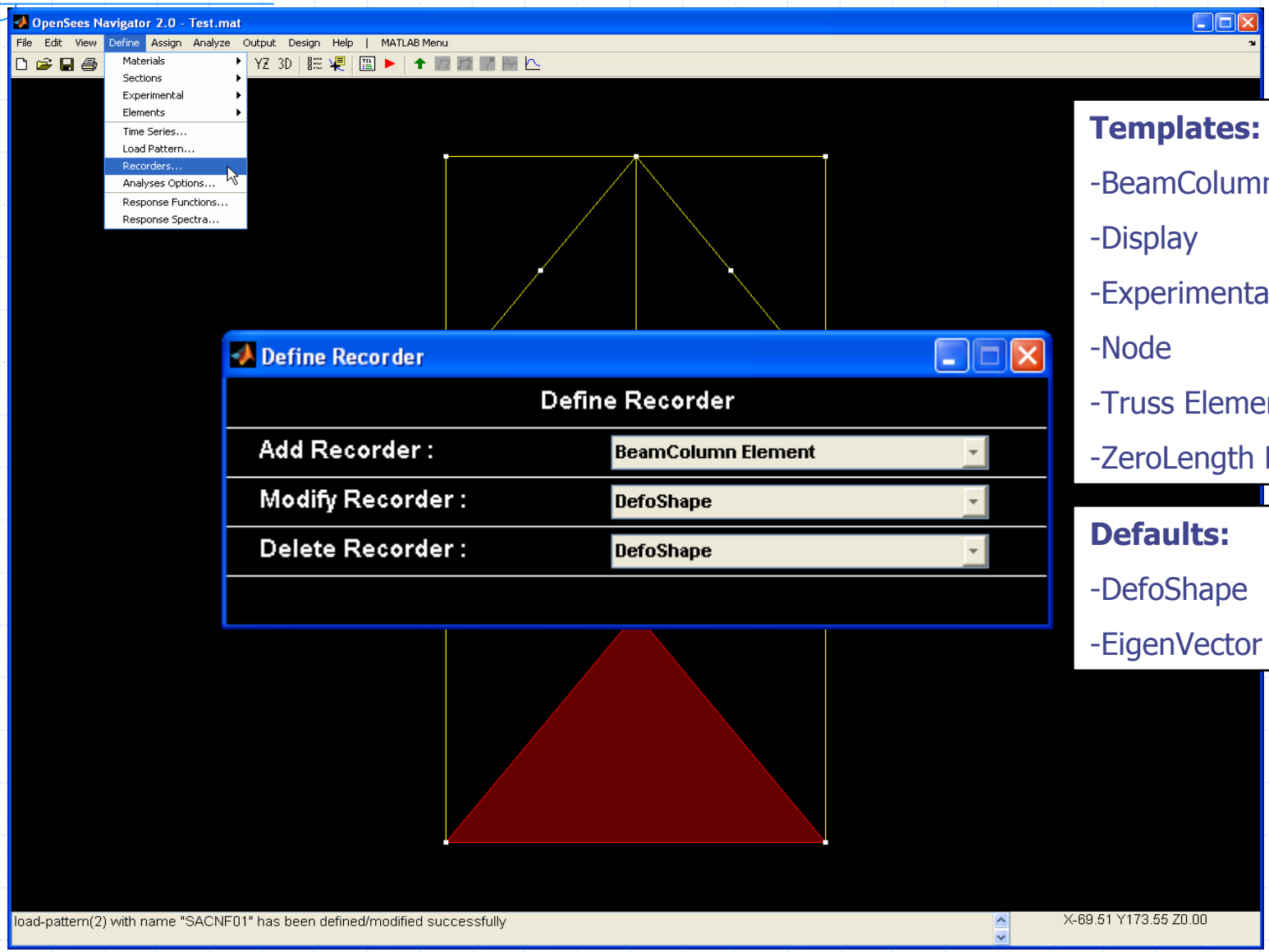
-Plain

-UniformExcitation

Define UniformExcitation LoadPattern



Define Recorder



Templates:

-BeamColumn Element

-Display

-Experimental Element

-Node

-Truss Element

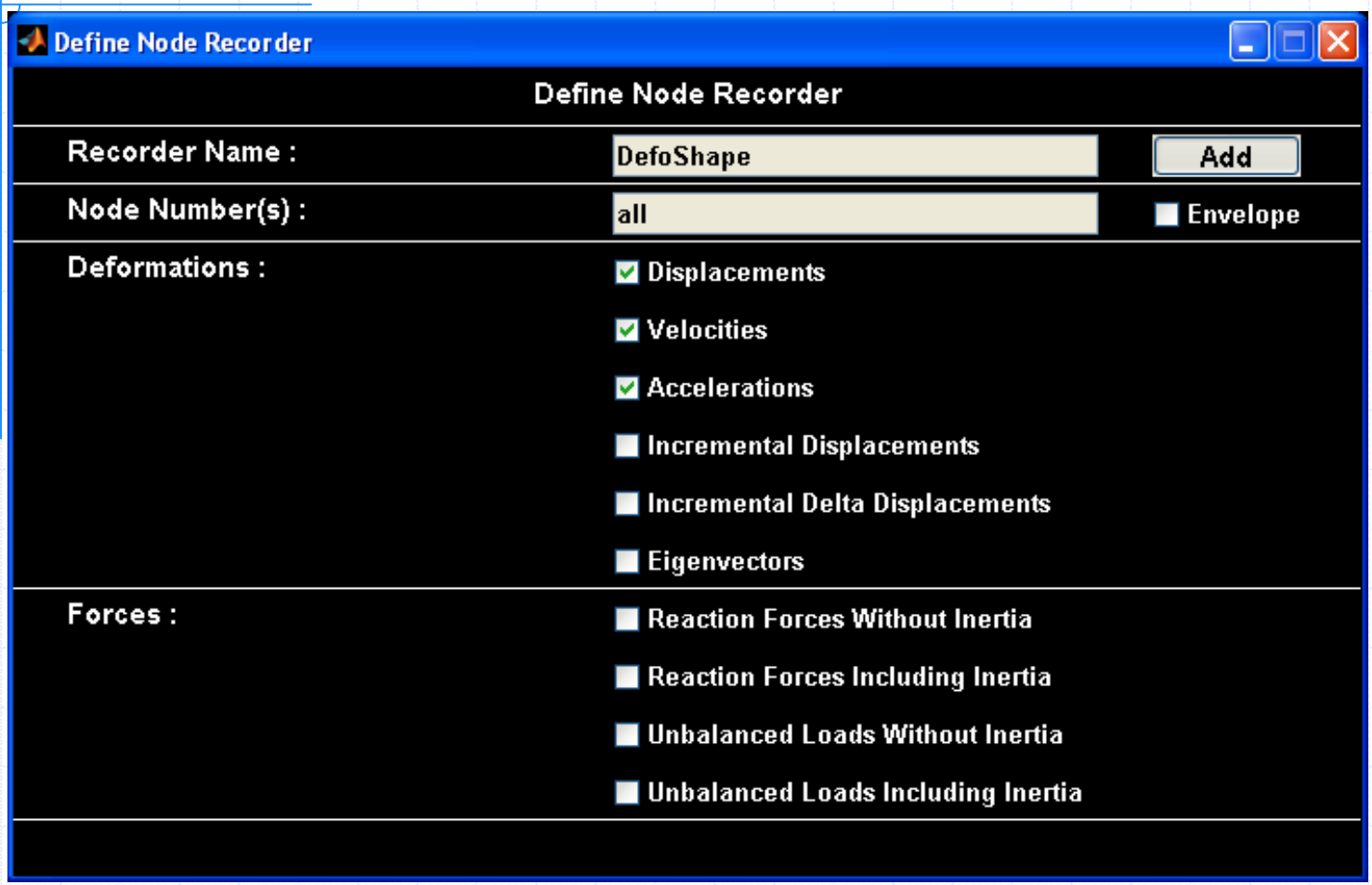
-ZeroLength Element

Defaults:

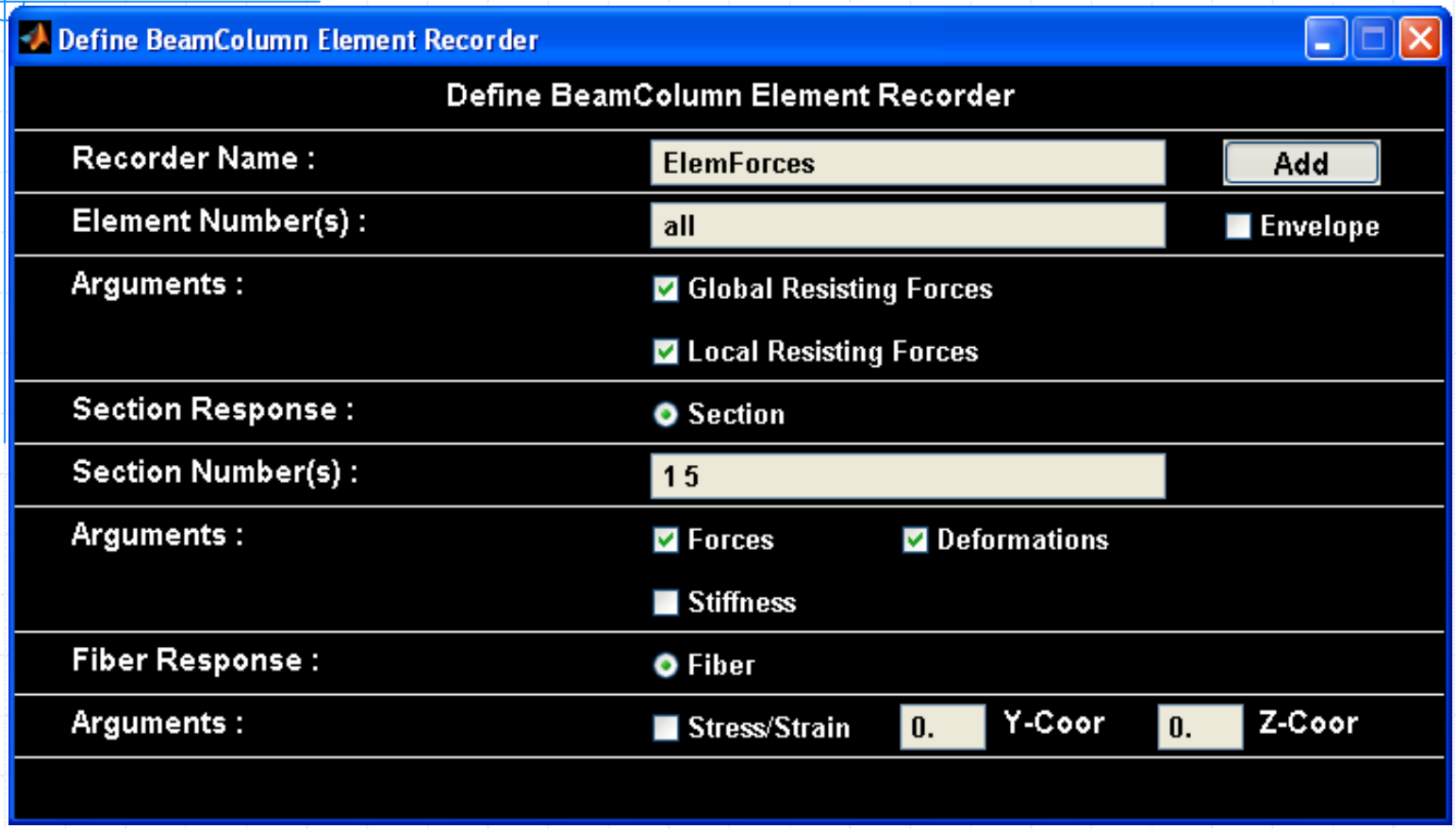
-DefoShape

-EigenVector

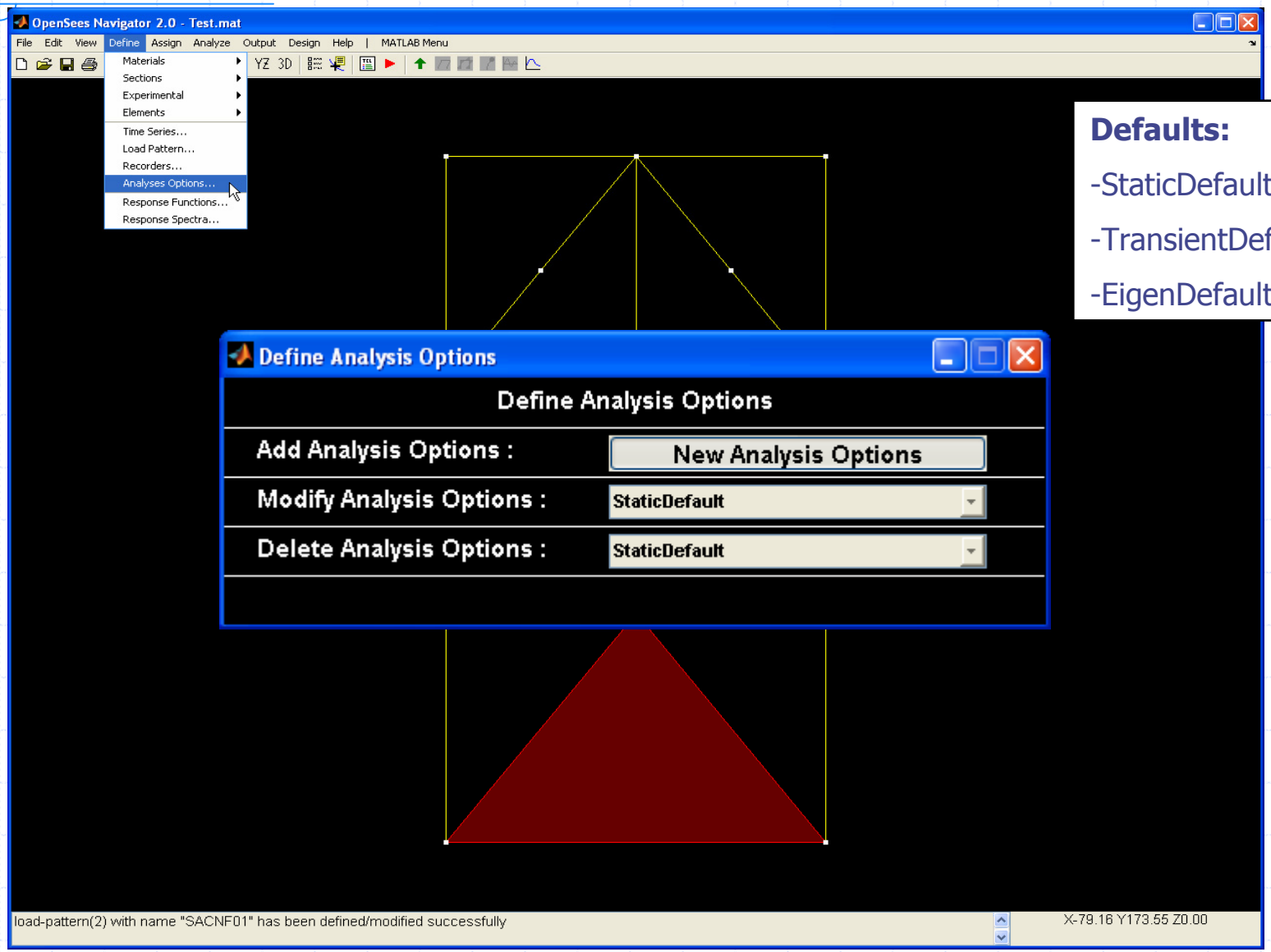
Define Node Recorder



Define BeamColumn Recorder



Define Analysis Options



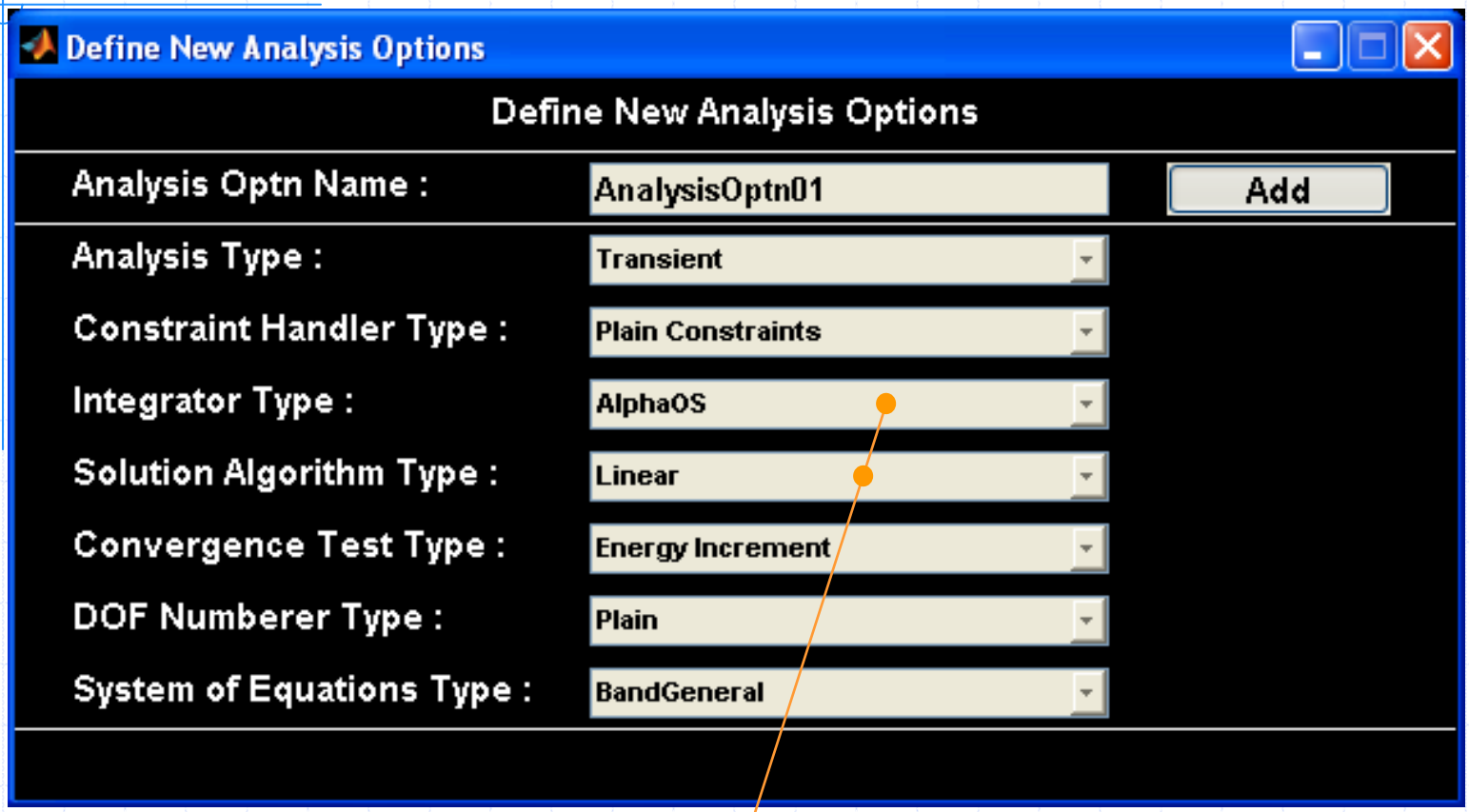
Defaults:

-StaticDefault

-TransientDefault

-EigenDefault

Define New Analysis Options



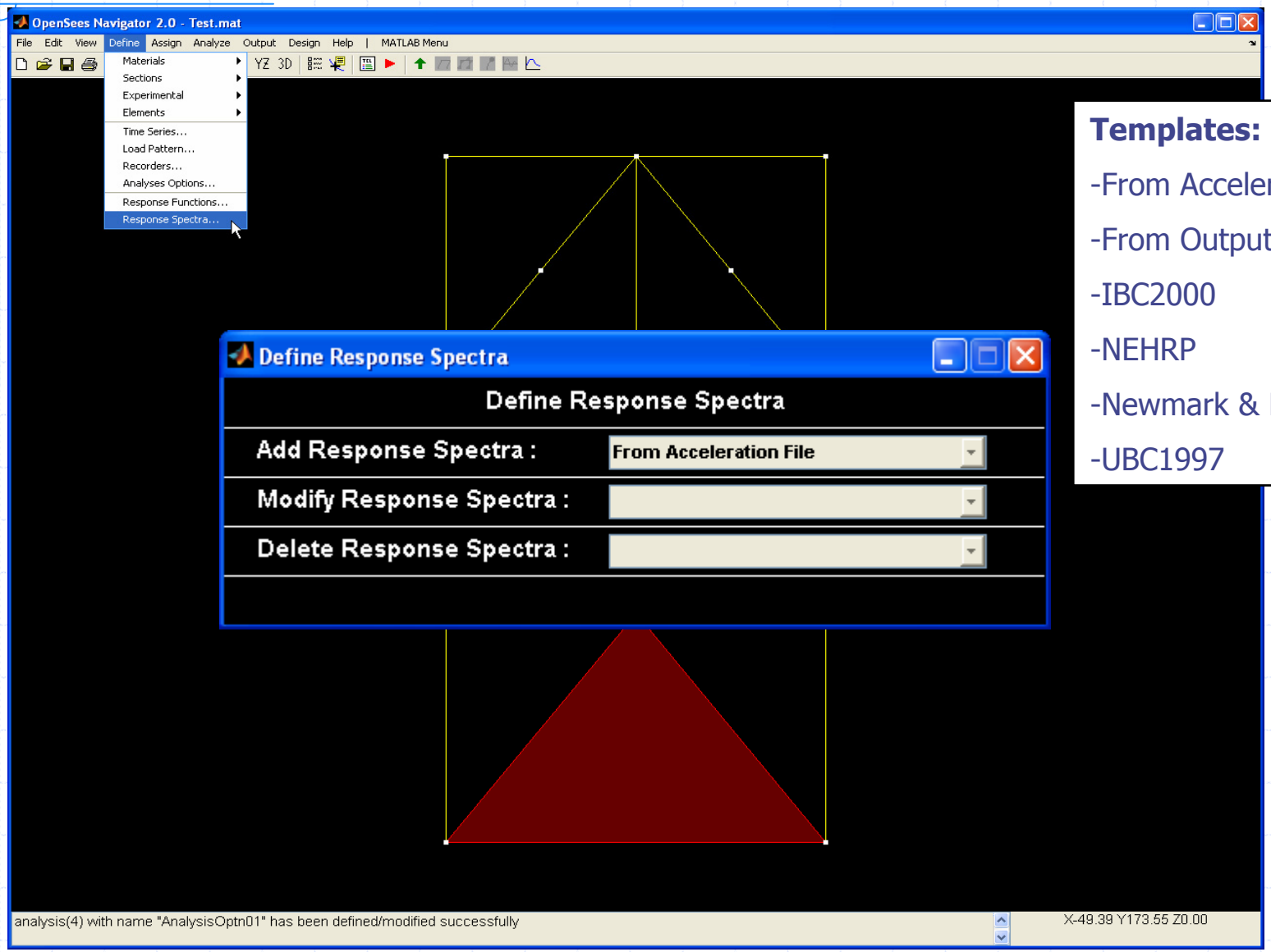
Integrator Type:

For example use AlphaOS Method for Hybrid Simulation

Solution Algorithm:

The AlphaOS Method requires a Linear solution algorithm

Define Response Spectra



Templates:

-From Acceleration File

-From Output

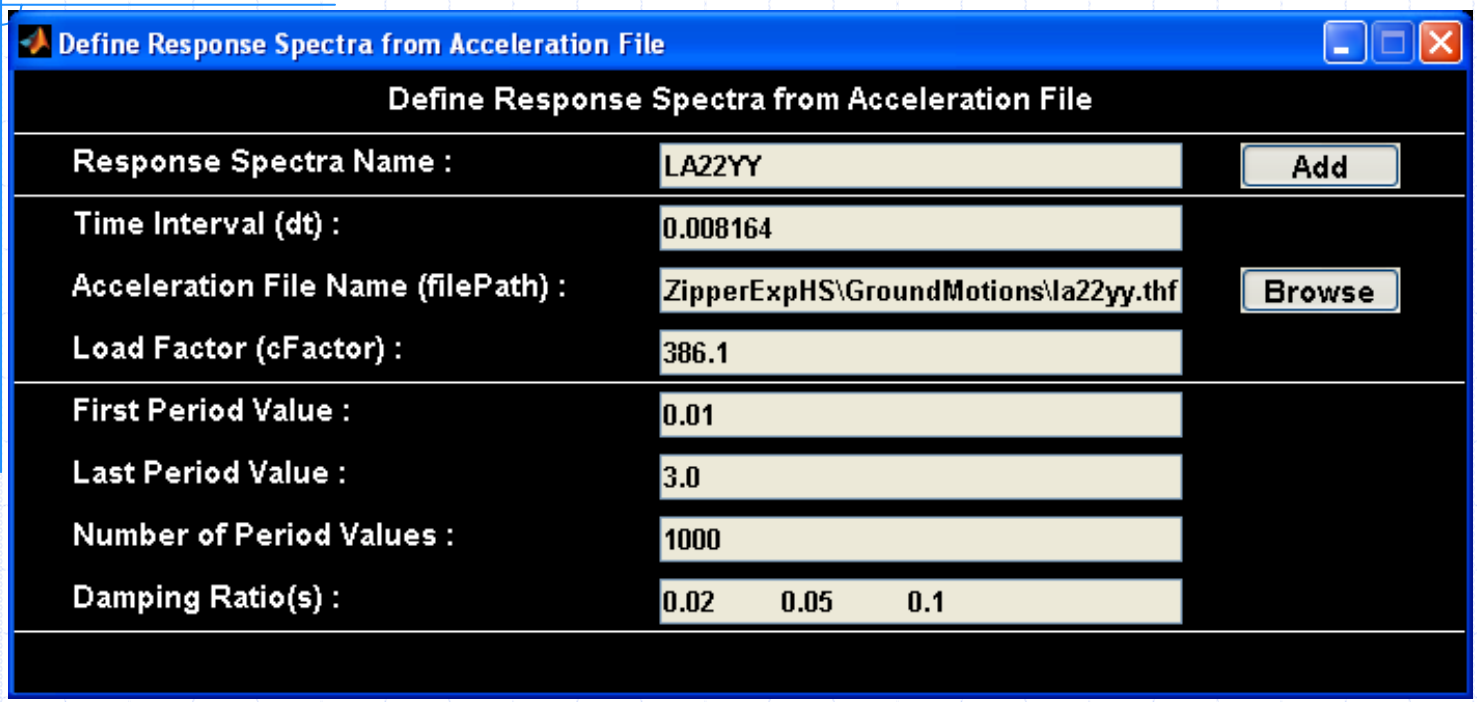
-IBC2000

-NEHRP

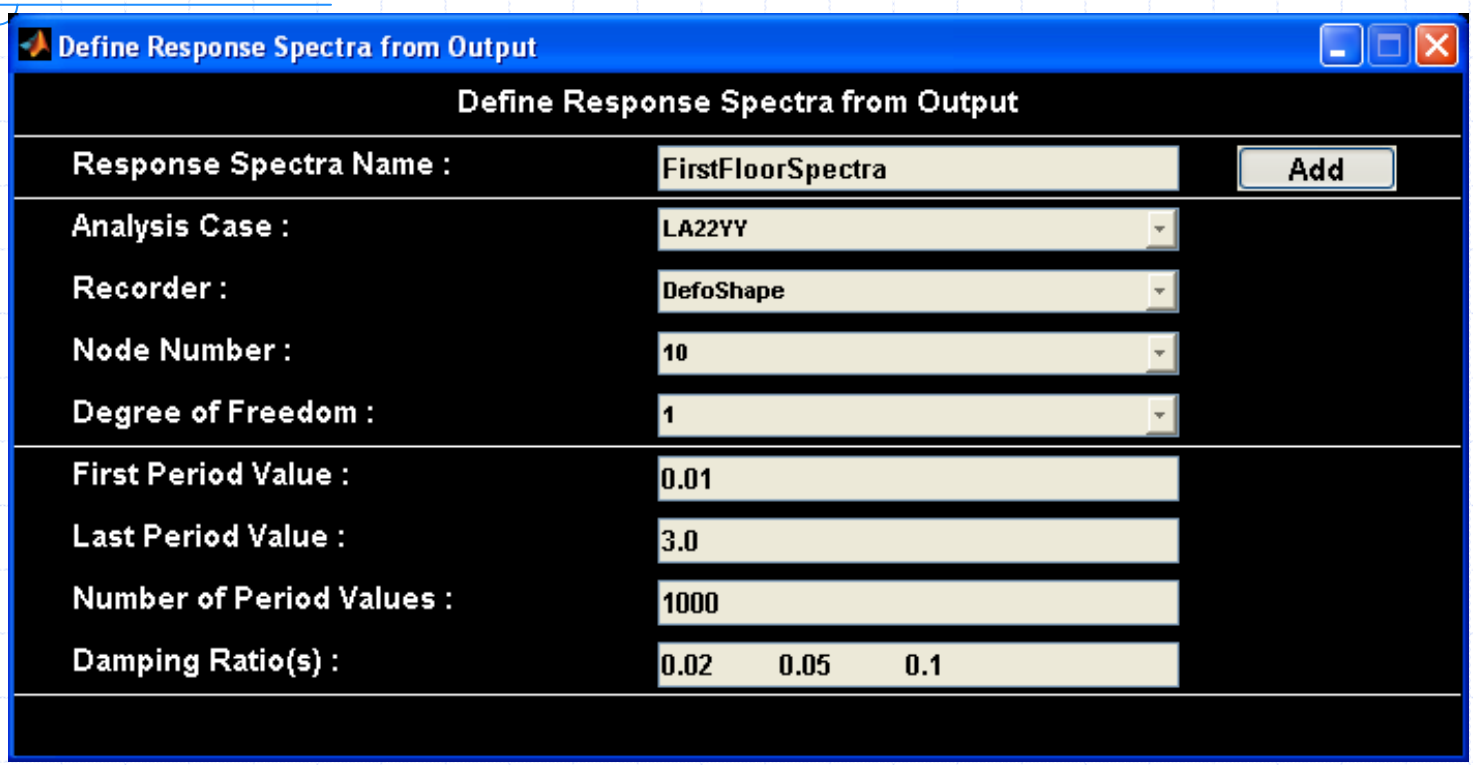
-Newmark & Hall

-UBC1997

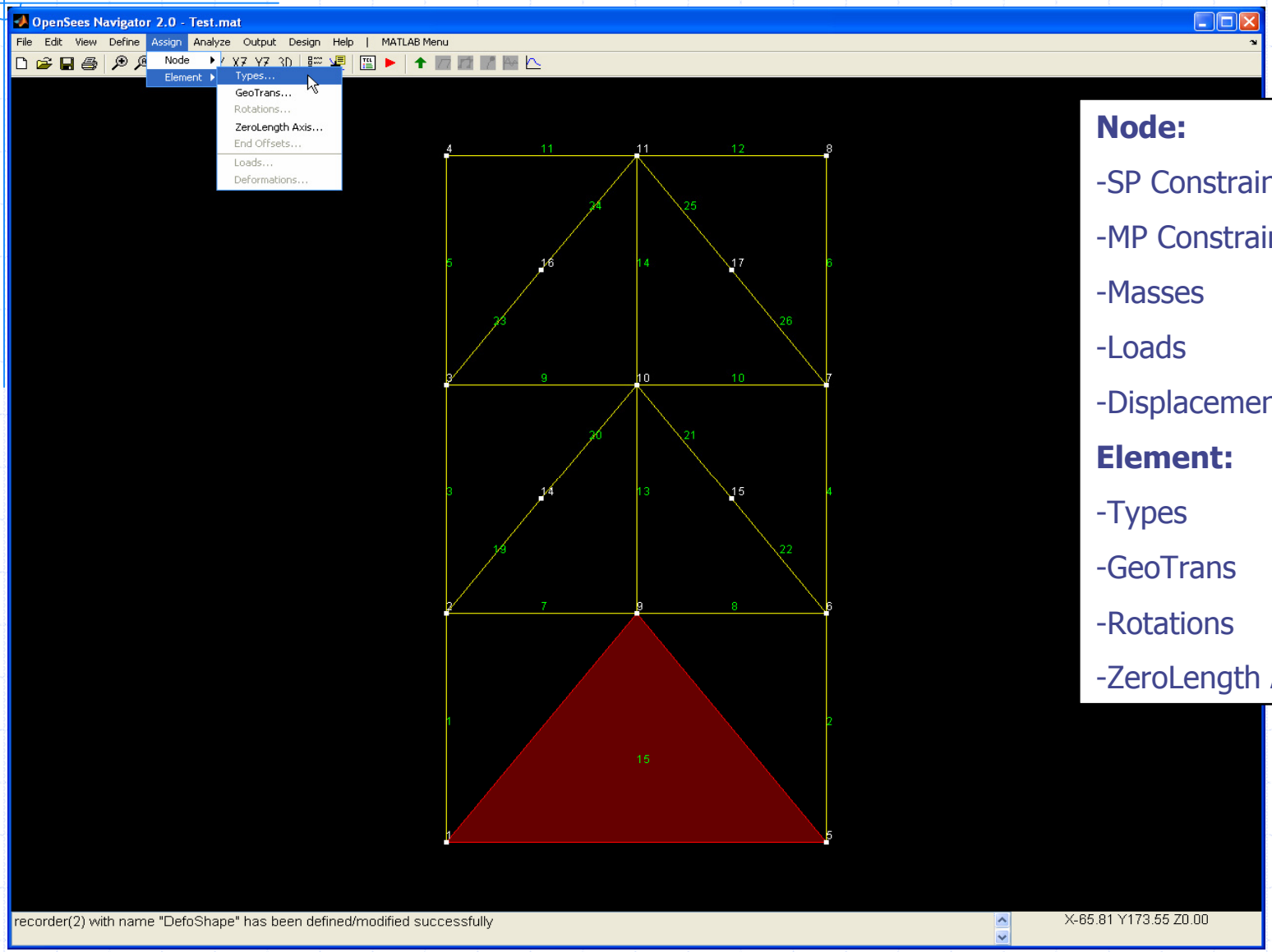
Define From Acceleration File Spectra



Define From Output Spectra



Assign Menu



Node:

-SP Constraints

-MP Constraints

-Masses

-Loads

-Displacements

Element:

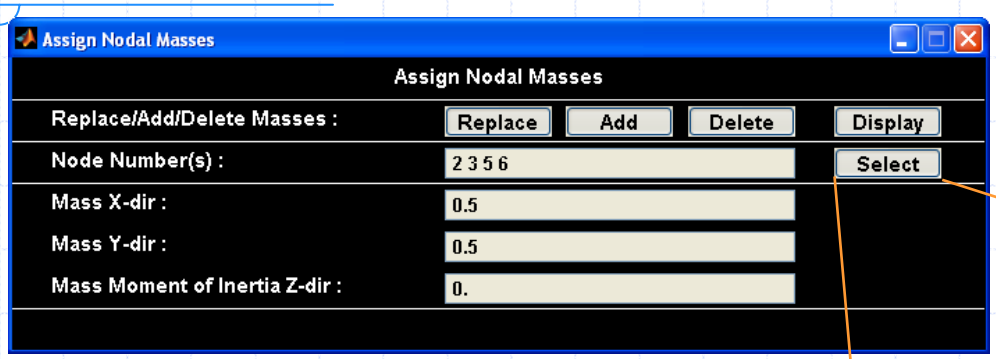
-Types

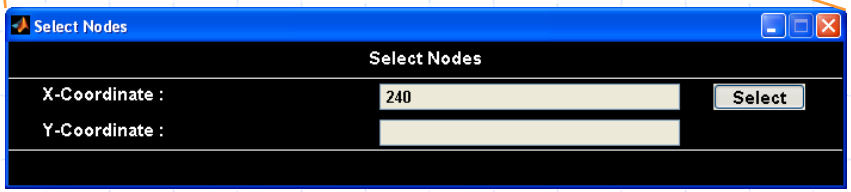
-GeoTrans

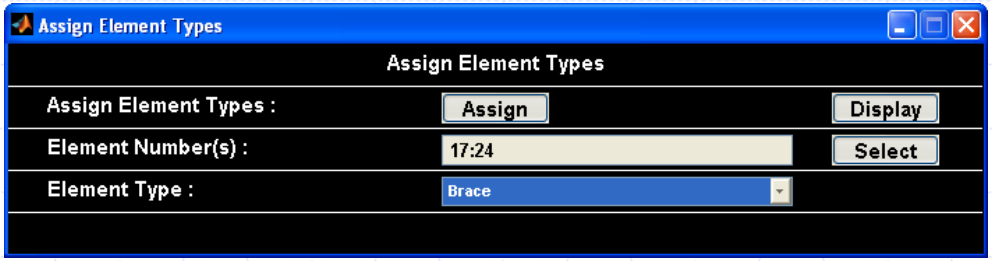
-Rotations

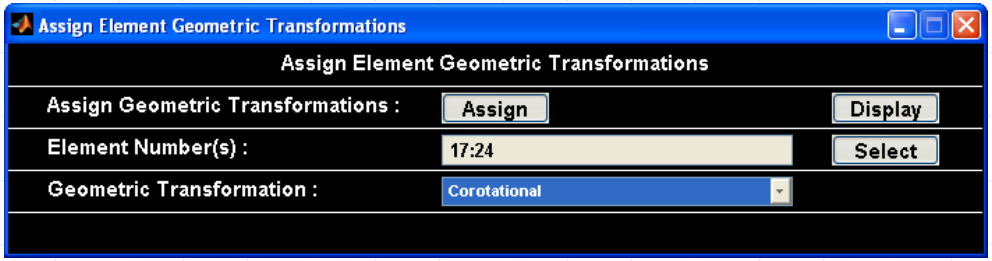
-ZeroLength Axis

Assign Menu

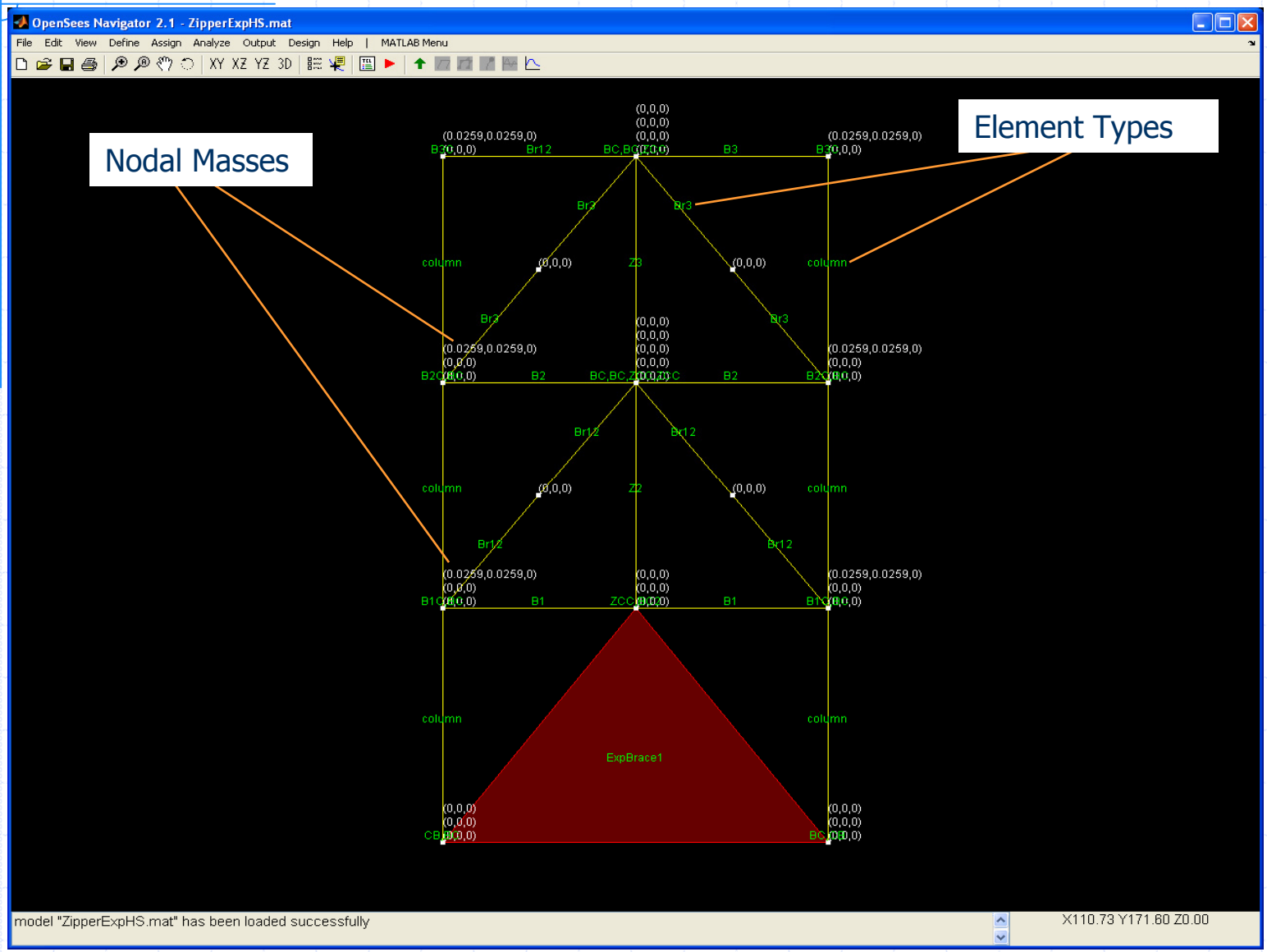

Assign Nodal Masses
Assign Nodal Masses
Replace/Add/Delete Masses :
Replace
Add
Delete
Display
Node Number(s) :
2 3 5 6
Select
Mass X-dir :
0.5
Mass Y-dir :
0.5
Mass Moment of Inertia Z-dir :
0.


Select Nodes
Select Nodes
X-Coordinate :
240
Select
Y-Coordinate :

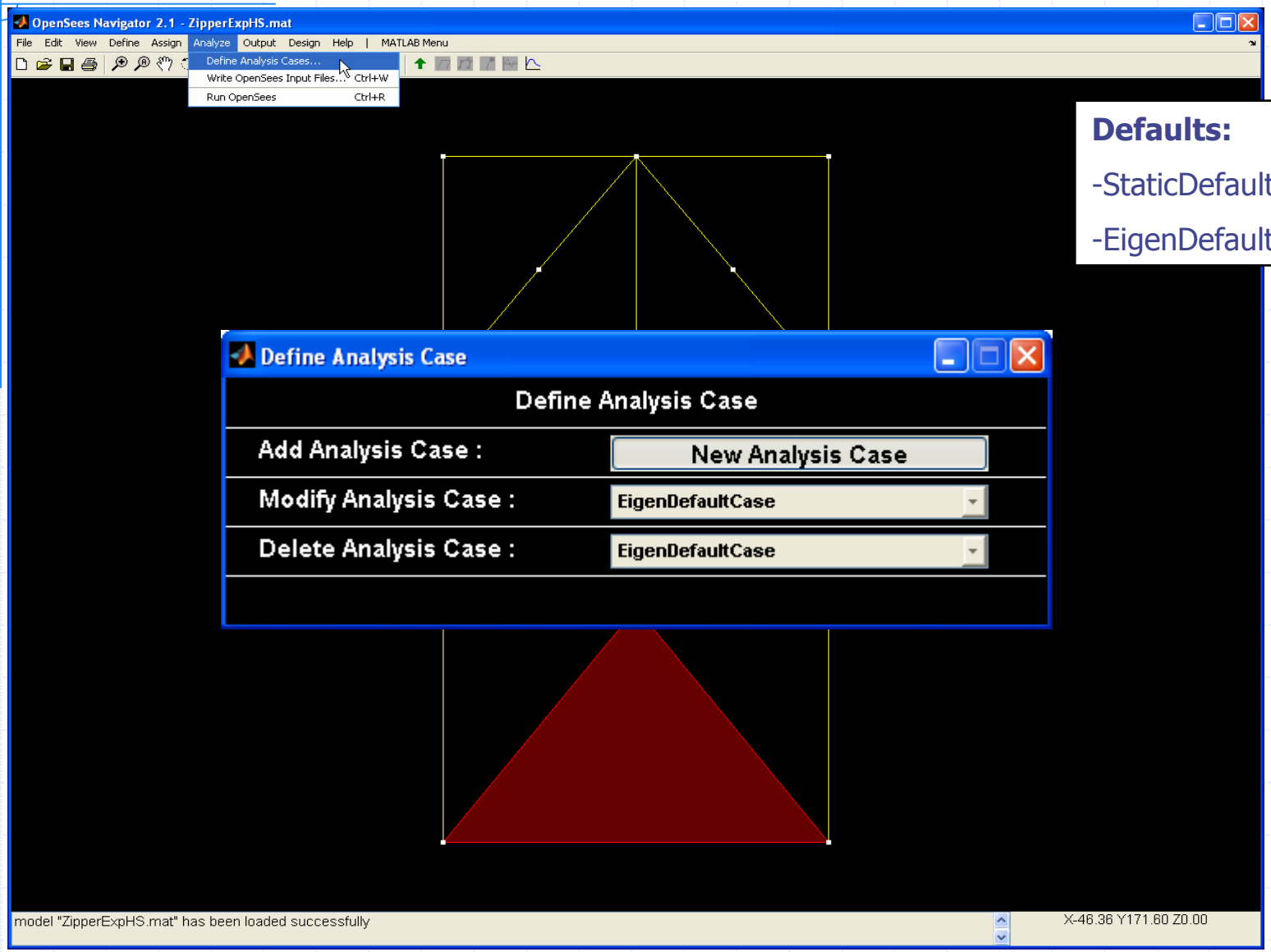

Assign Element Types
Assign Element Types
Assign Element Types :
Assign
Display
Element Number(s) :
17:24
Select
Element Type :
Brace


Assign Element Geometric Transformations
Assign Element Geometric Transformations
Assign Geometric Transformations :
Assign
Display
Element Number(s) :
17:24
Select
Geometric Transformation :
Corotational

Assigned Properties



Define Analysis Cases

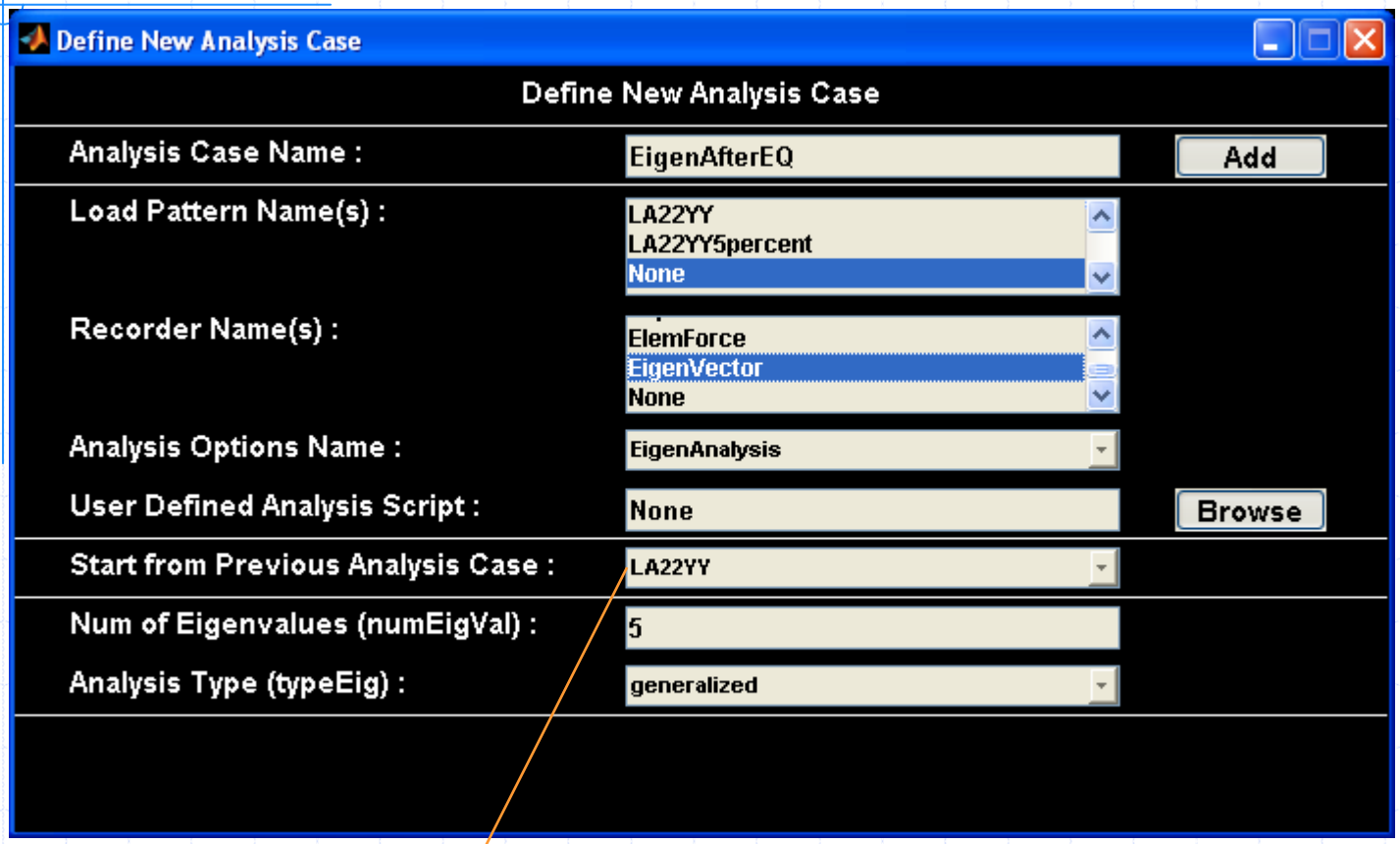


Defaults:

-StaticDefaultCase

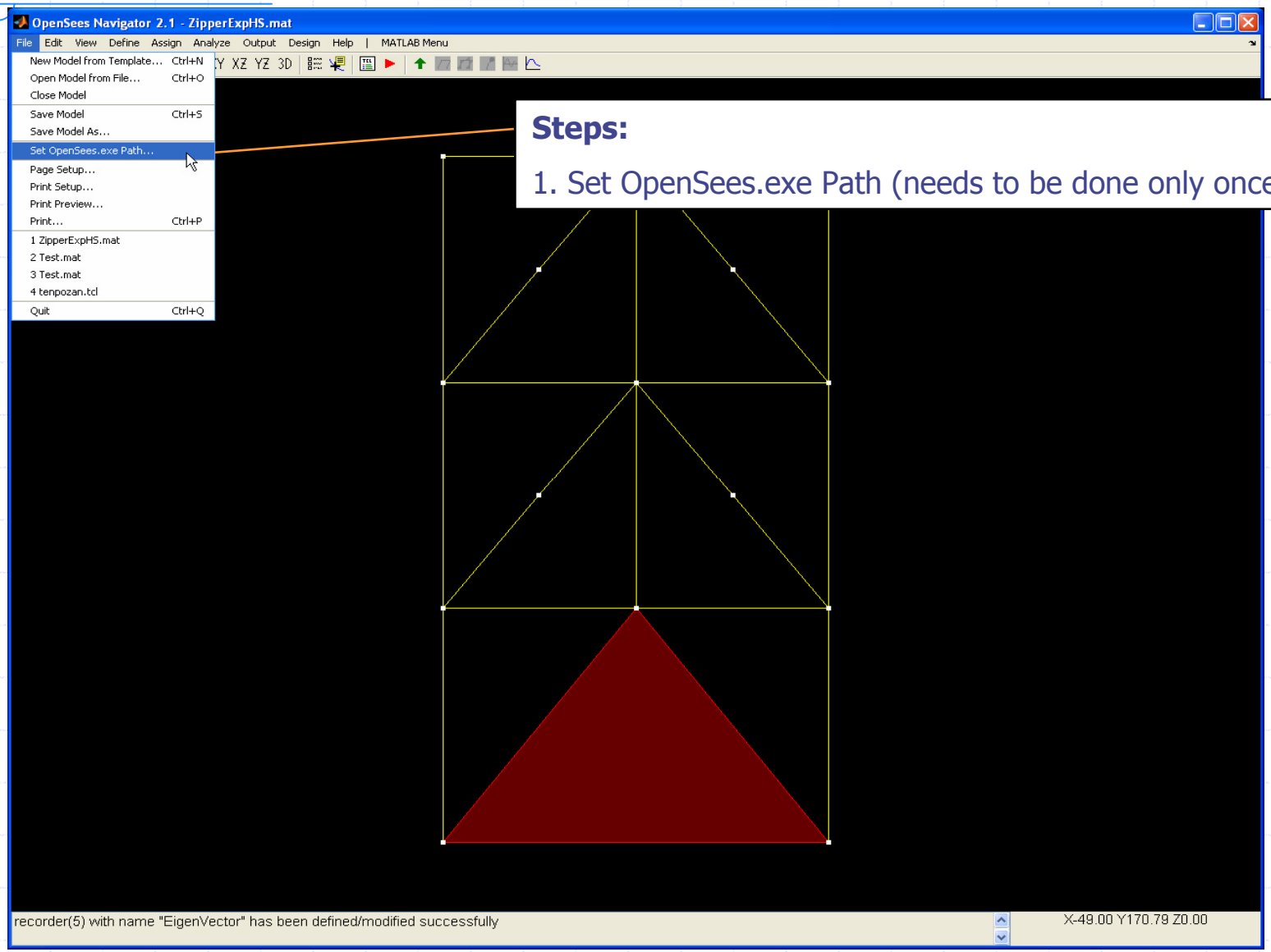
-EigenDefaultCase

Define New Analysis Case



For Example:
Periods and Mode Shapes after Time-History Analysis

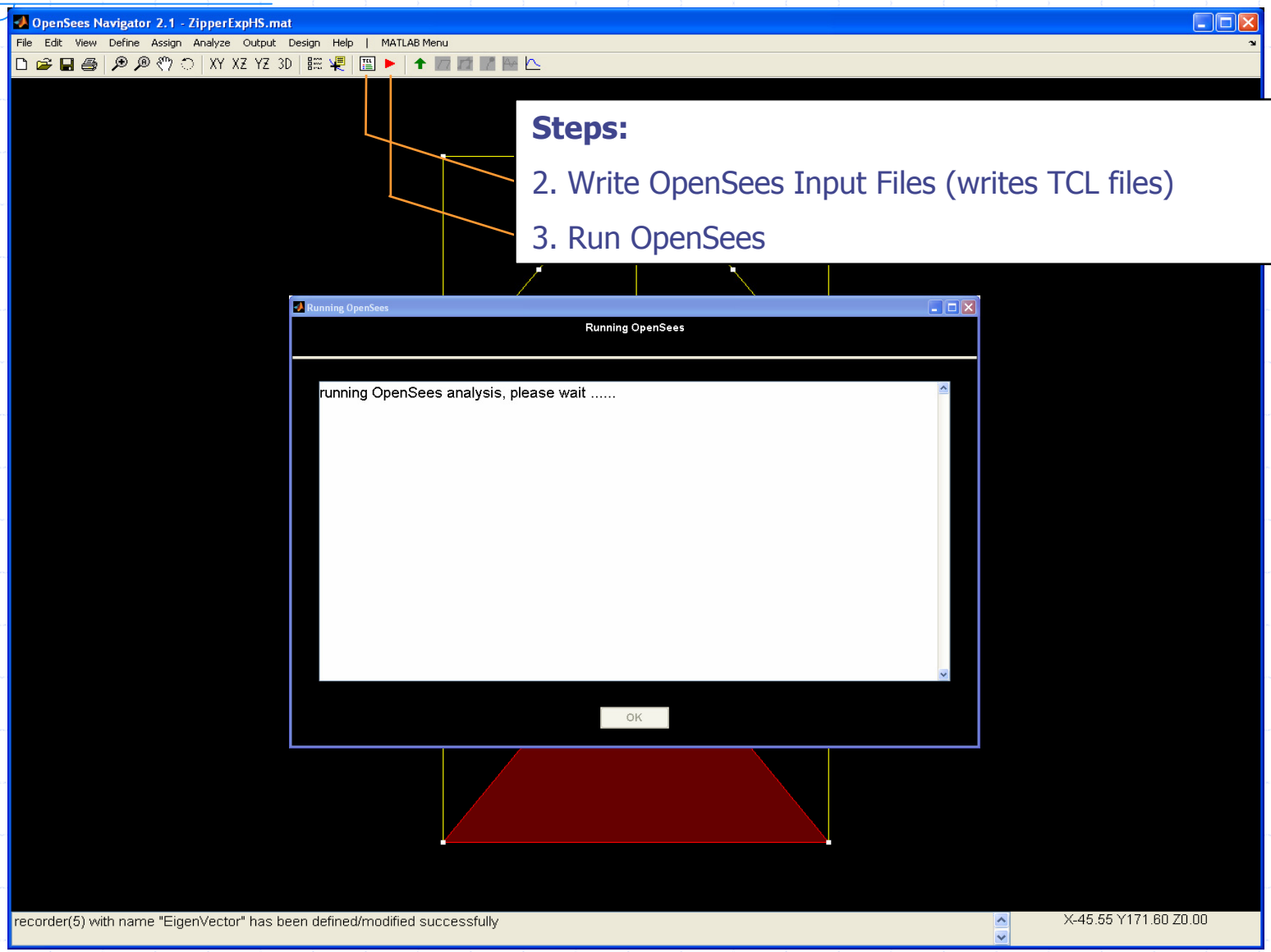
To Run OpenSees



Steps:

1. Set OpenSees.exe Path (needs to be done only once)

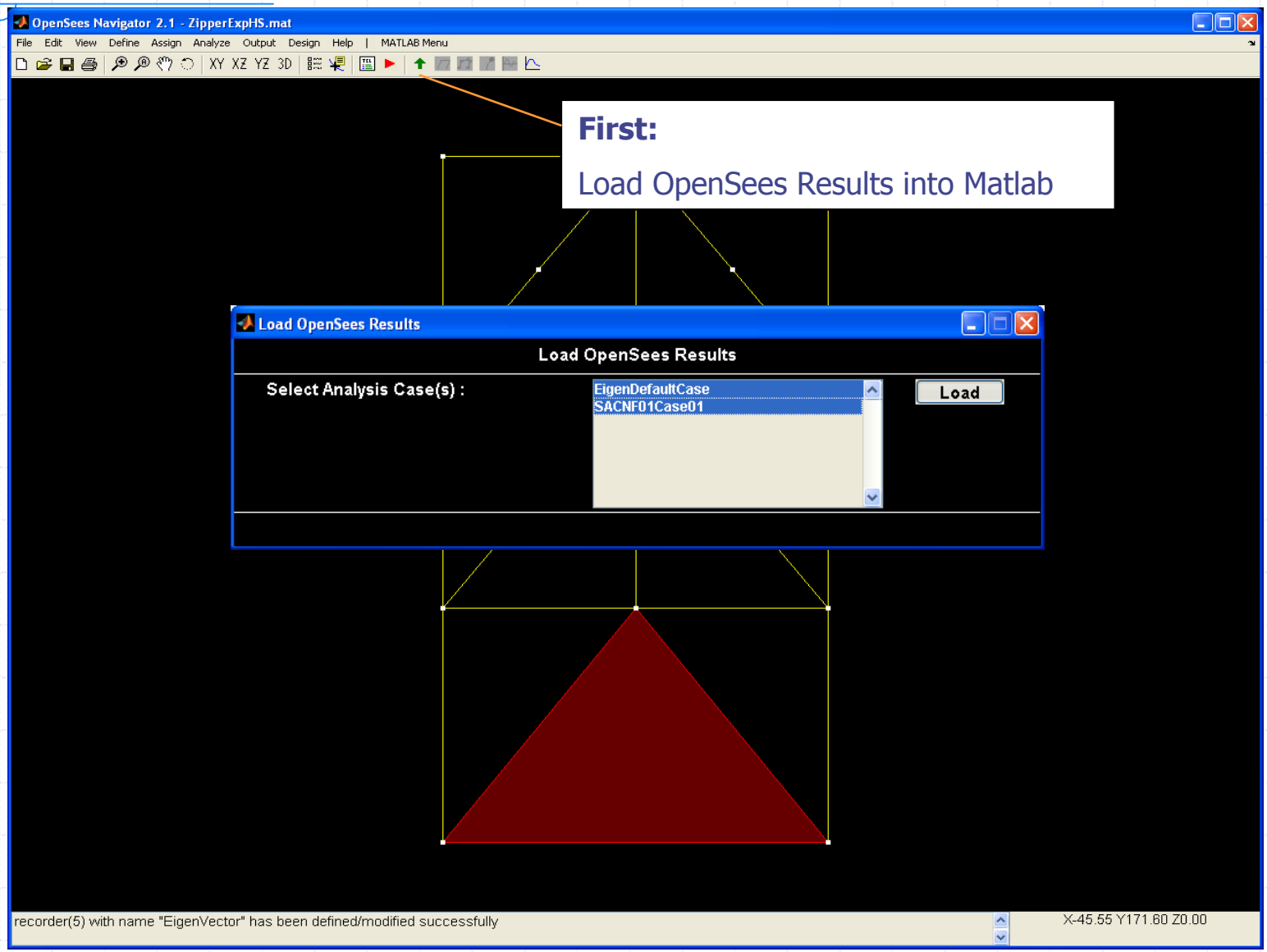
To Run OpenSees



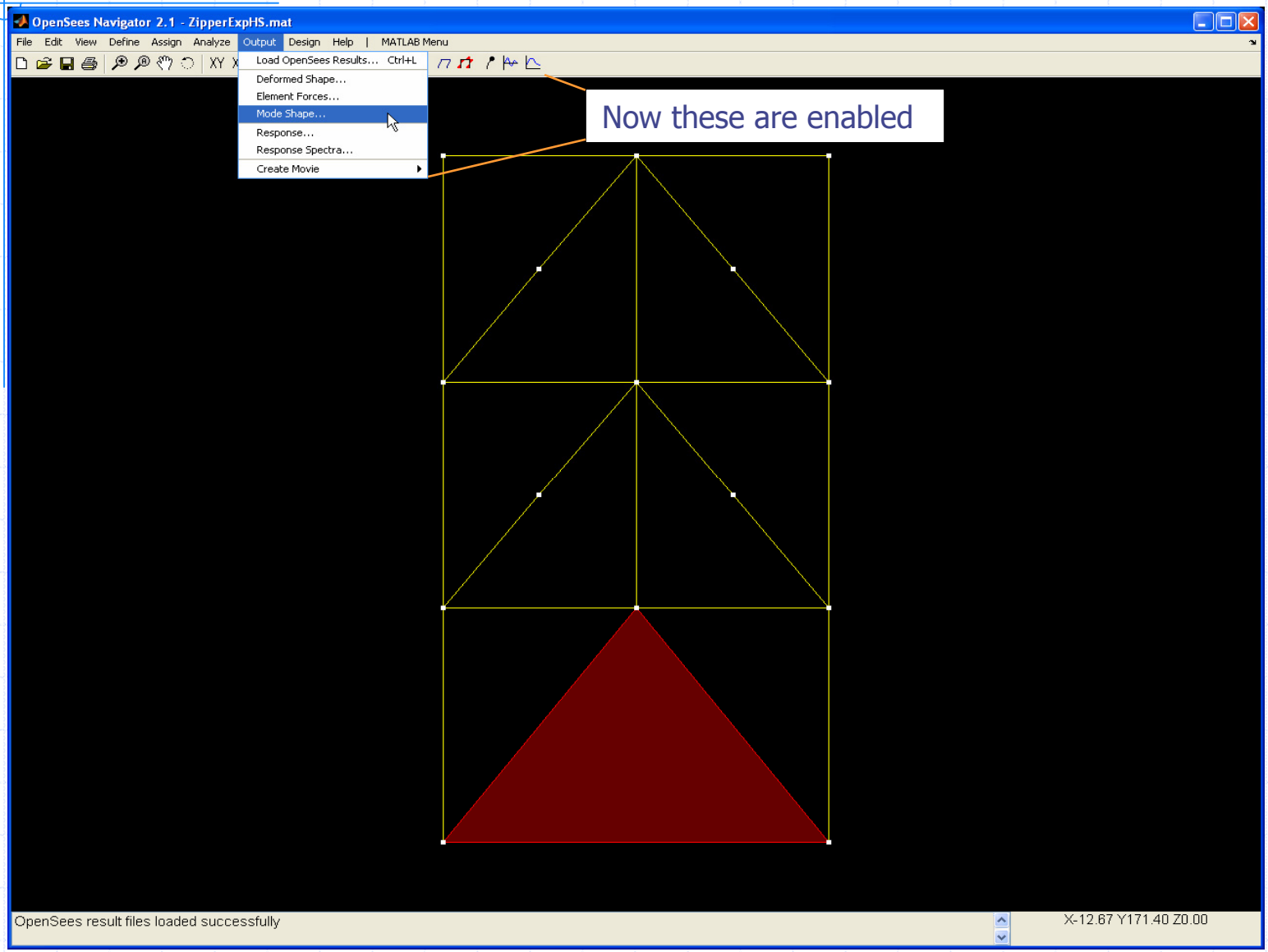
Steps:

2. Write OpenSees Input Files (writes TCL files)
3. Run OpenSees

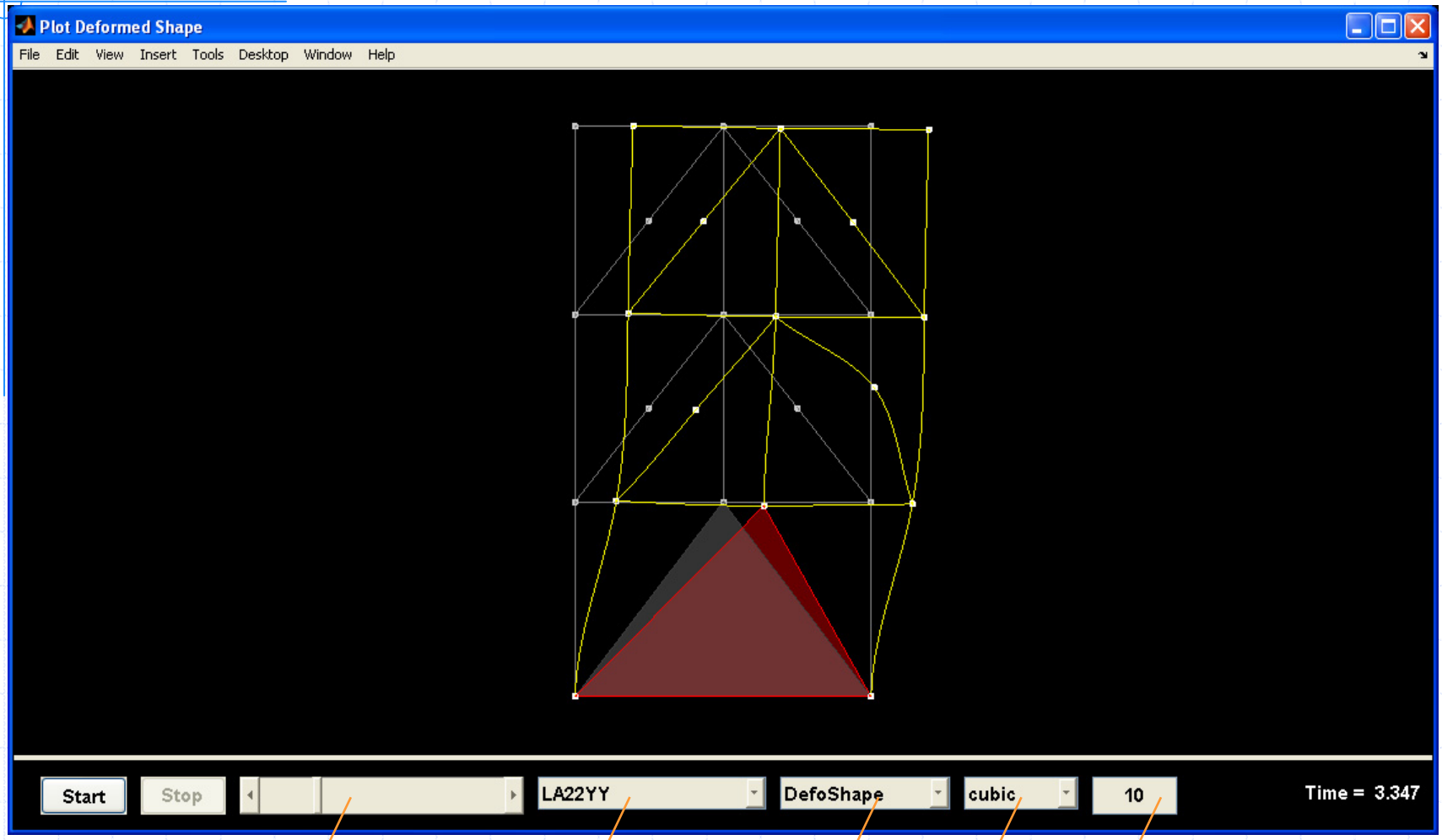
Post-Processing: Output



Post-Processing: Output

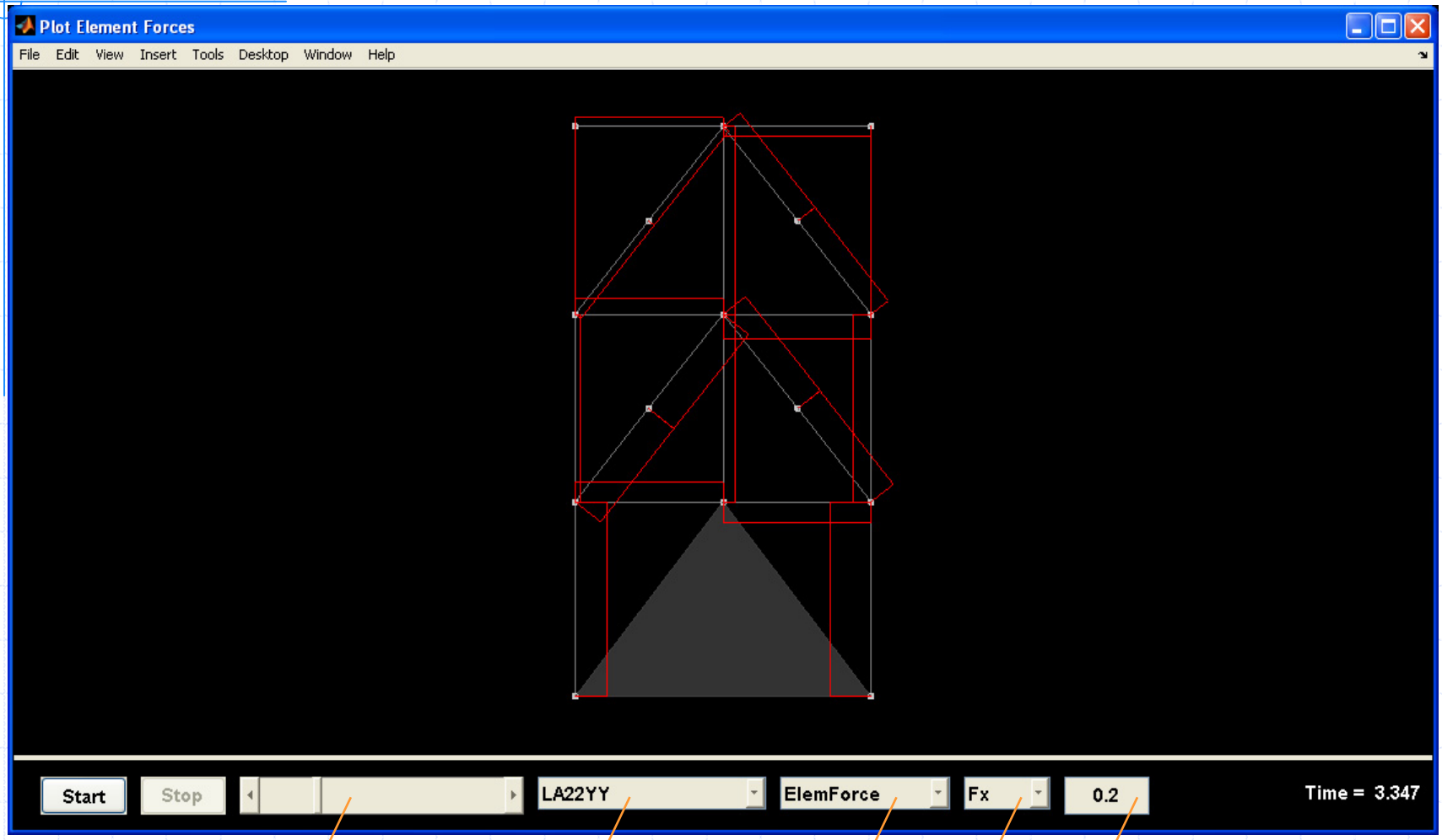


Plot Deformed Shape

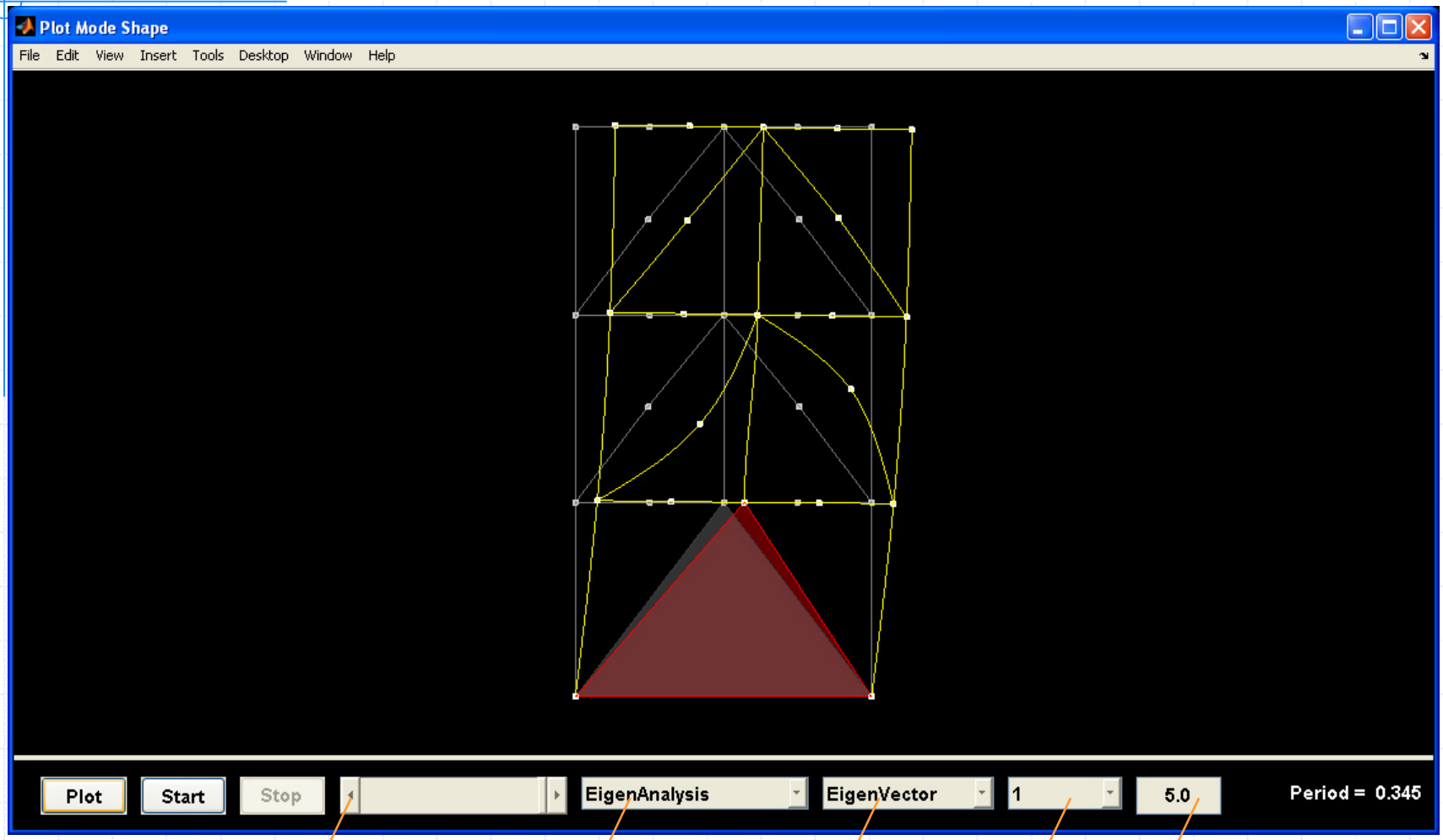


Time Step AnalysisCase Recorder Order Magnification

Plot Element Forces: Axial Forces

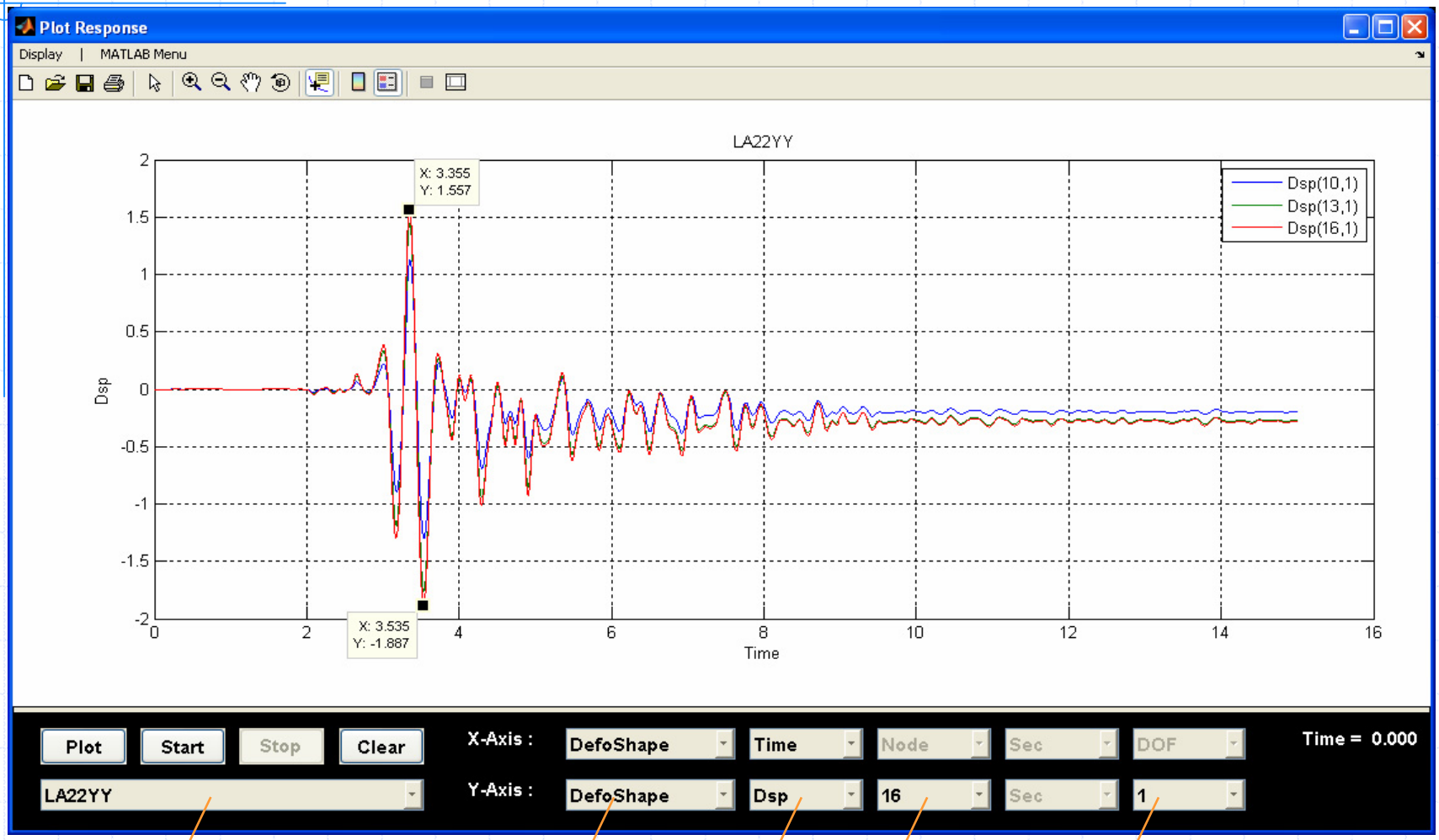


Plot Mode Shape: 1st Mode



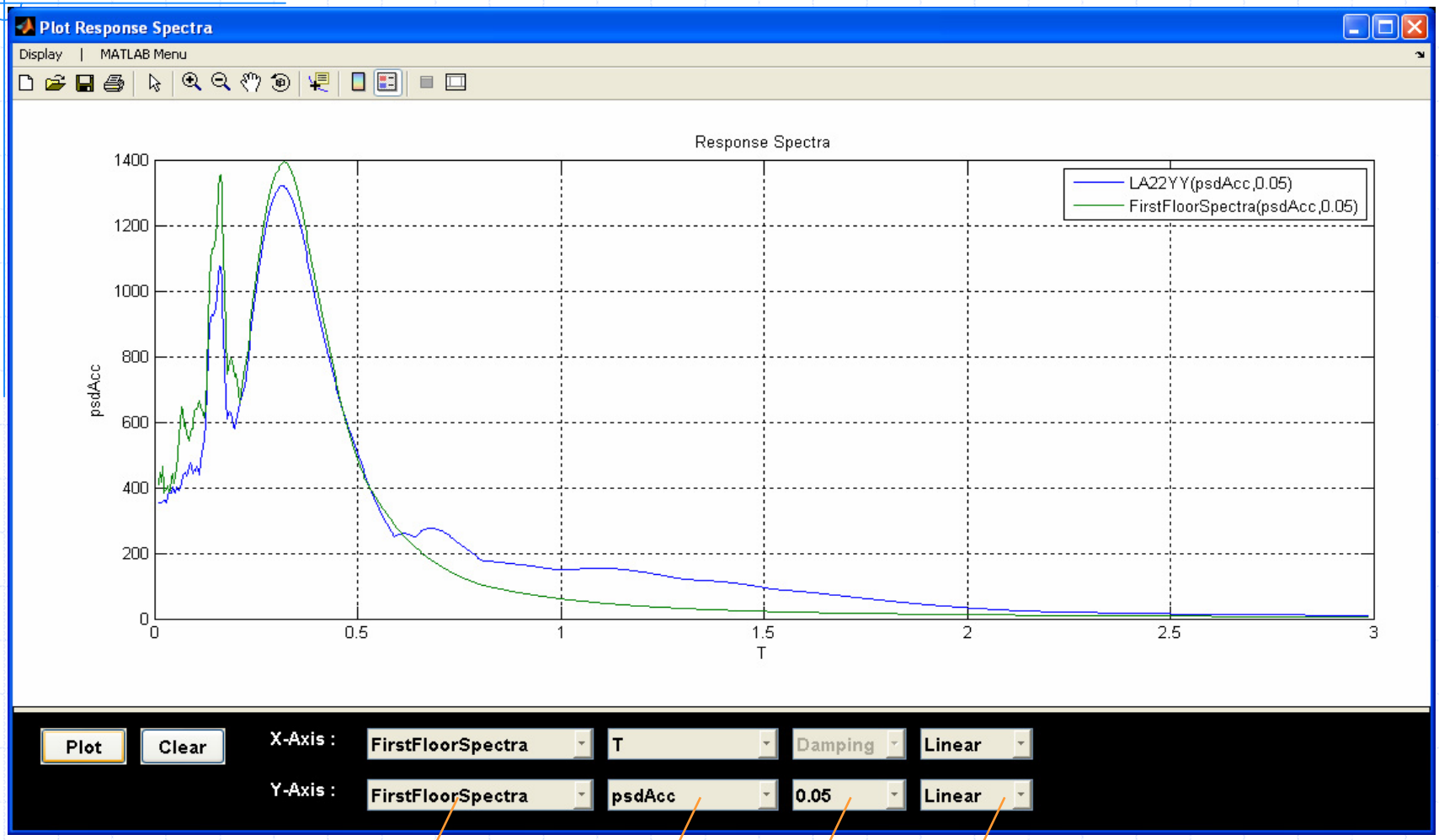
Animation Speed AnalysisCase Recorder Mode Magnification

Plot Response



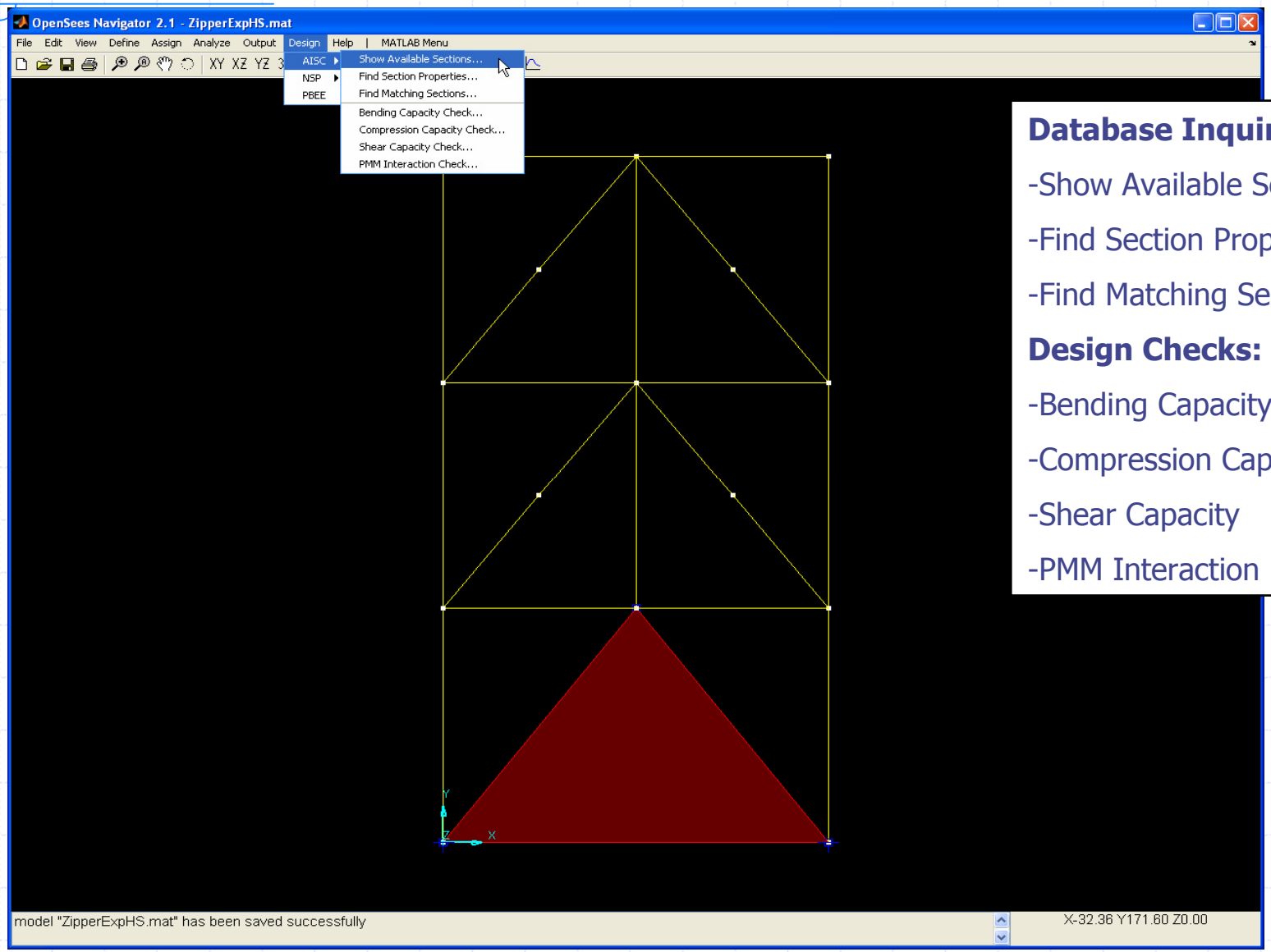
AnalysisCase Recorder Parameter Node/Element DOF

Plot Response Spectra



Spectra Name Response Damping Axis Scale

AISC Design Toolbox



Database Inquiries:

-Show Available Sections

-Find Section Properties

-Find Matching Sections

Design Checks:

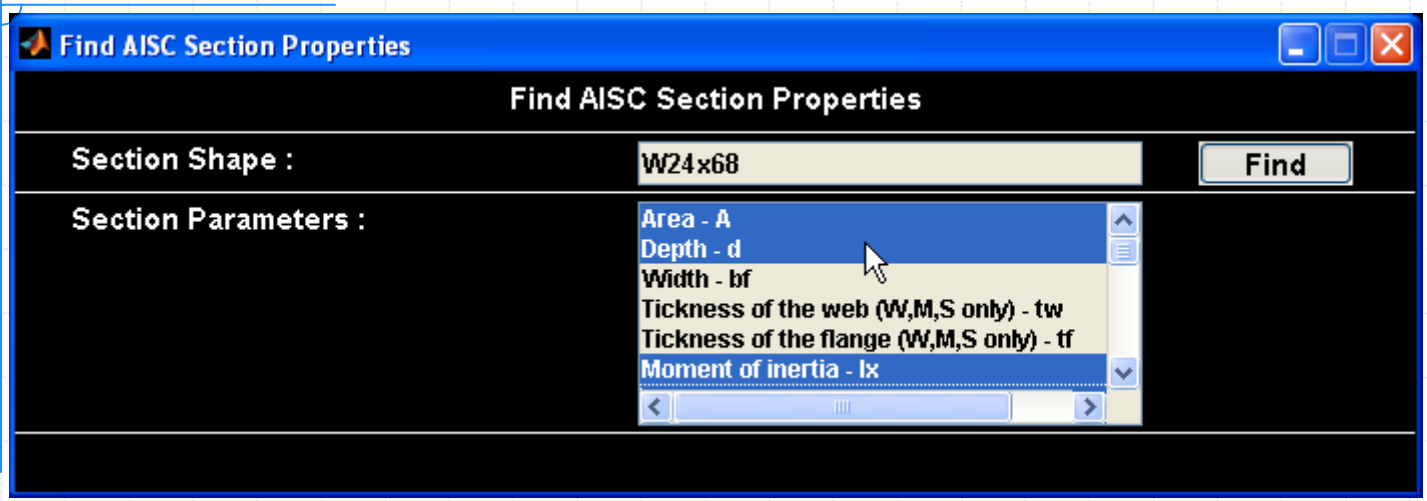
-Bending Capacity

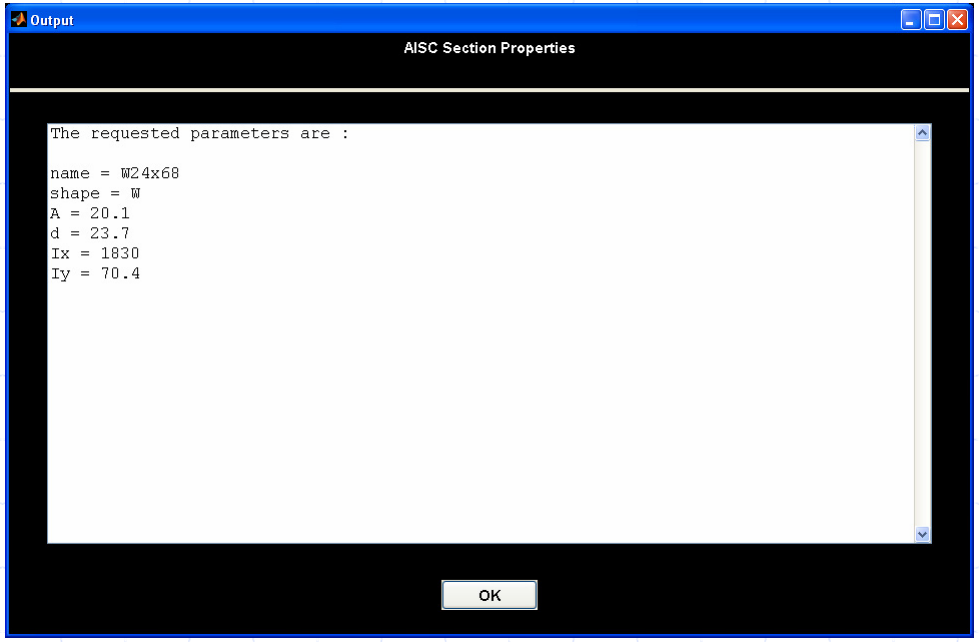
-Compression Capacity

-Shear Capacity

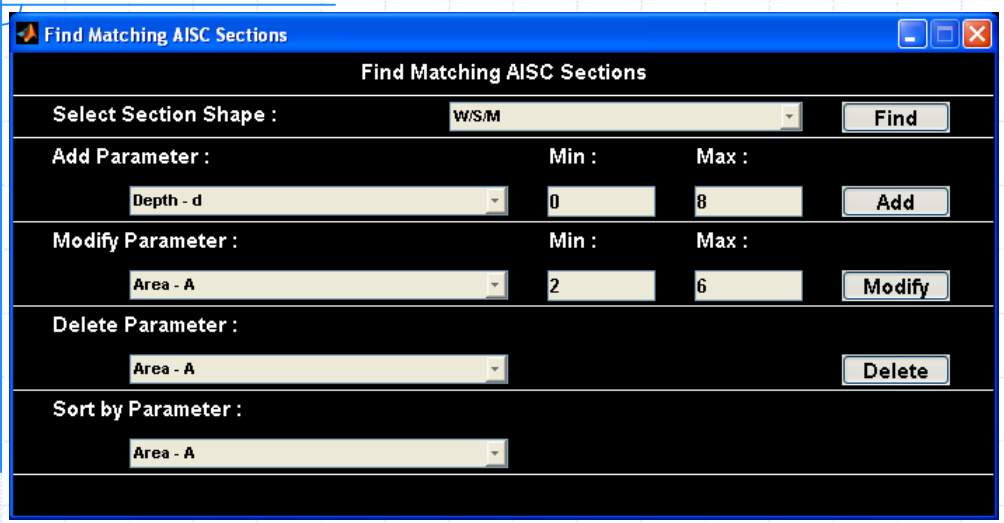
-PMM Interaction

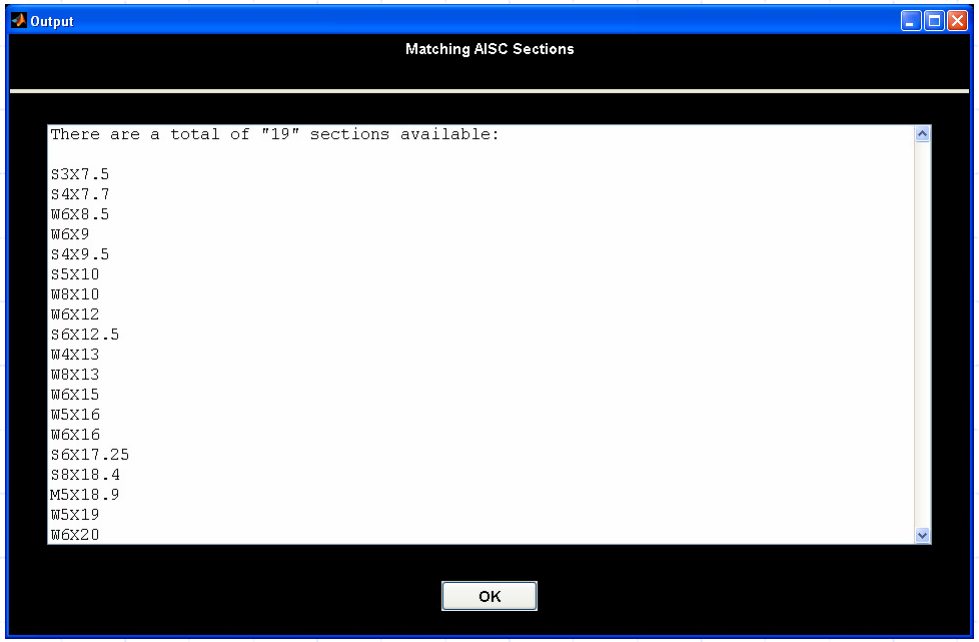
AISC Toolbox: Find Section Prop.



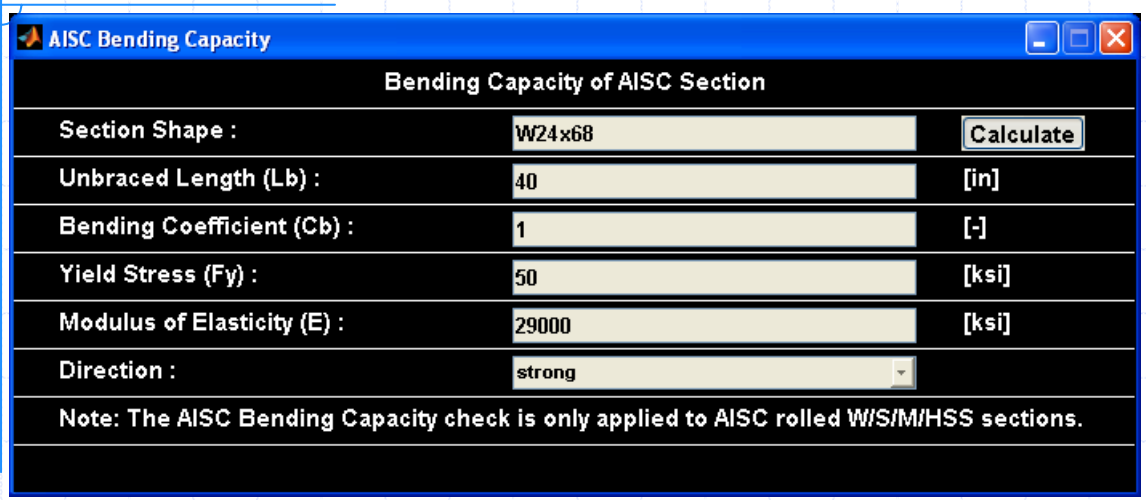


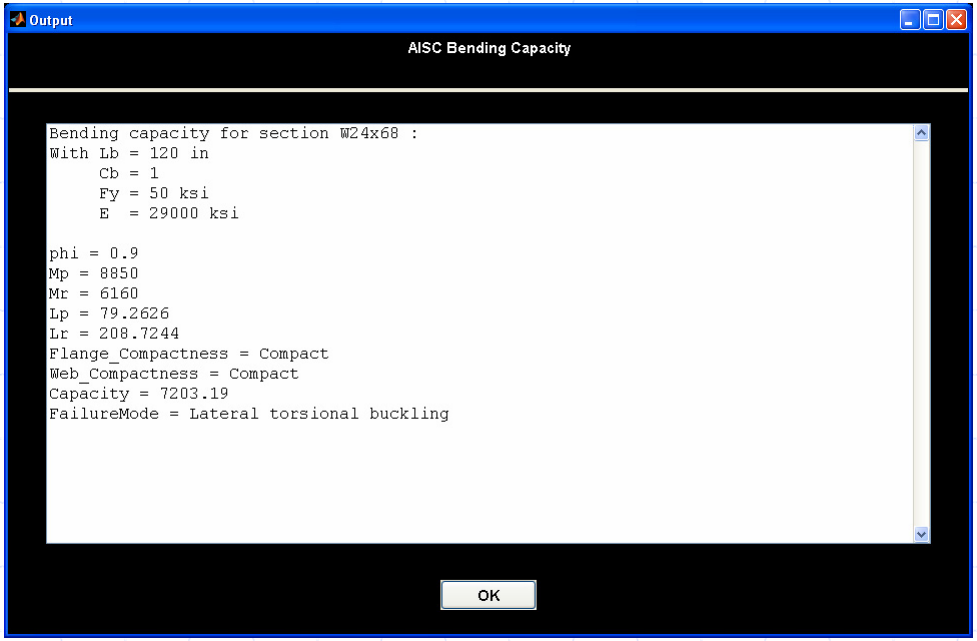
AISC Toolbox: Find Matching Sec.



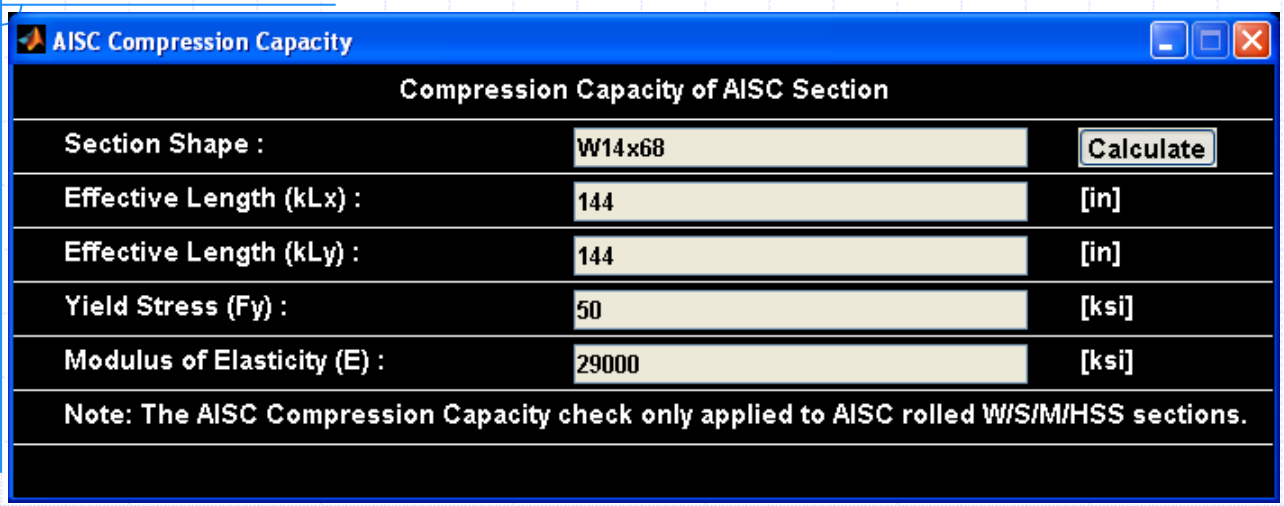


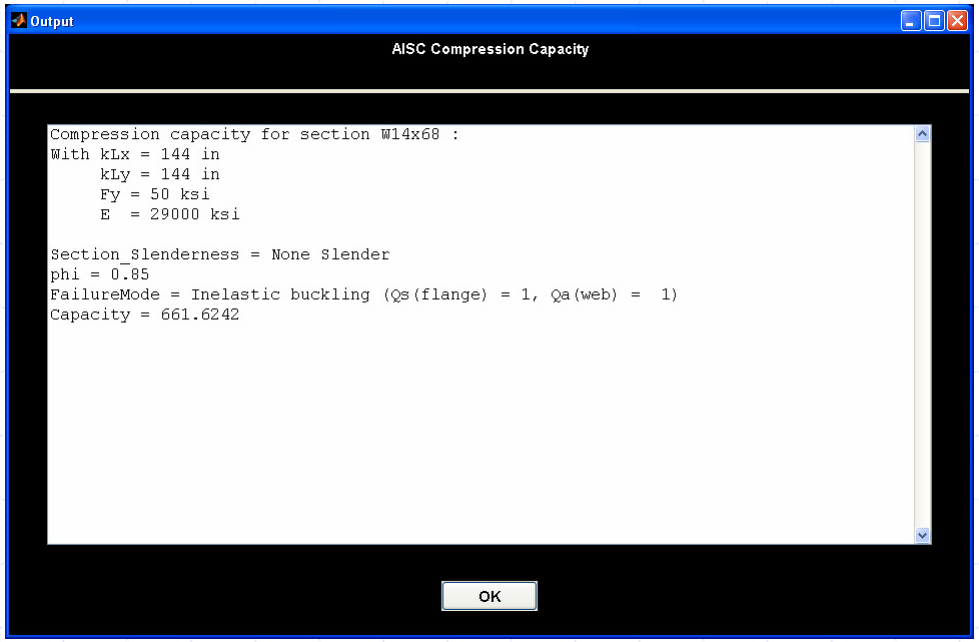
AISC Toolbox: Bending Capacity



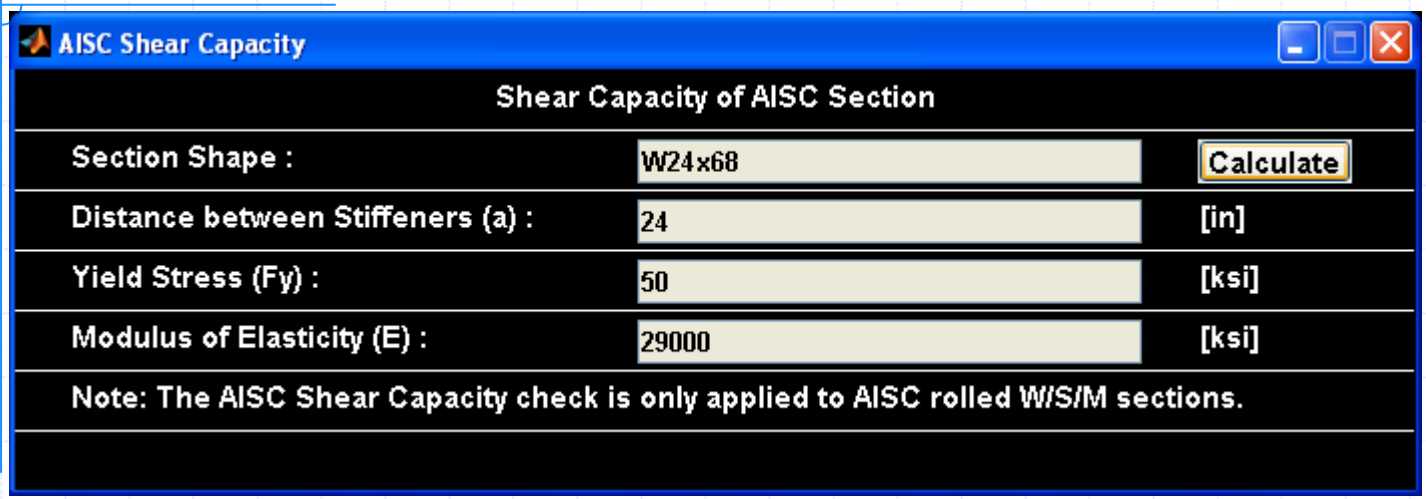


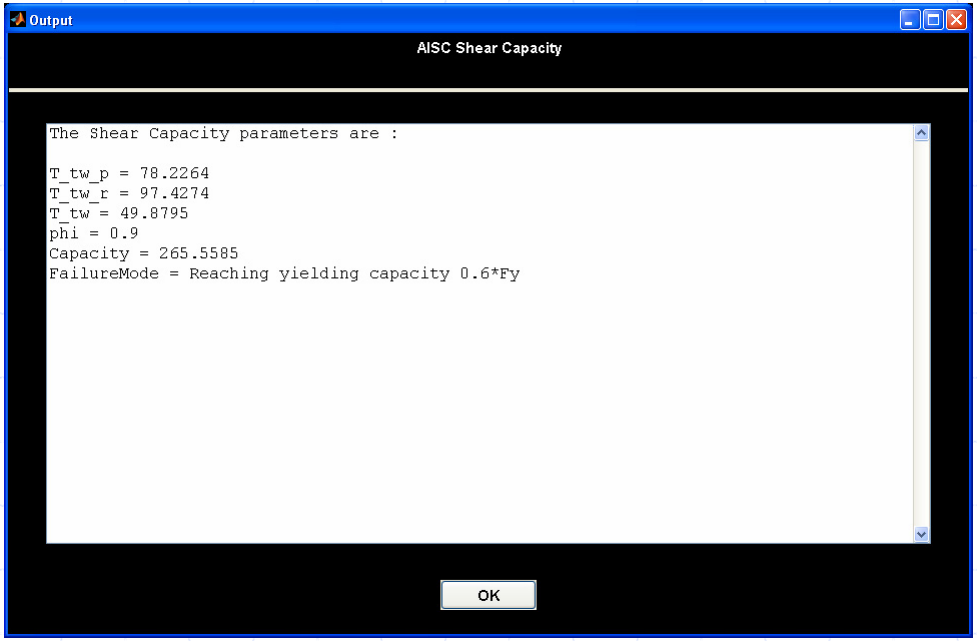
AISC Toolbox: Compression Capacity



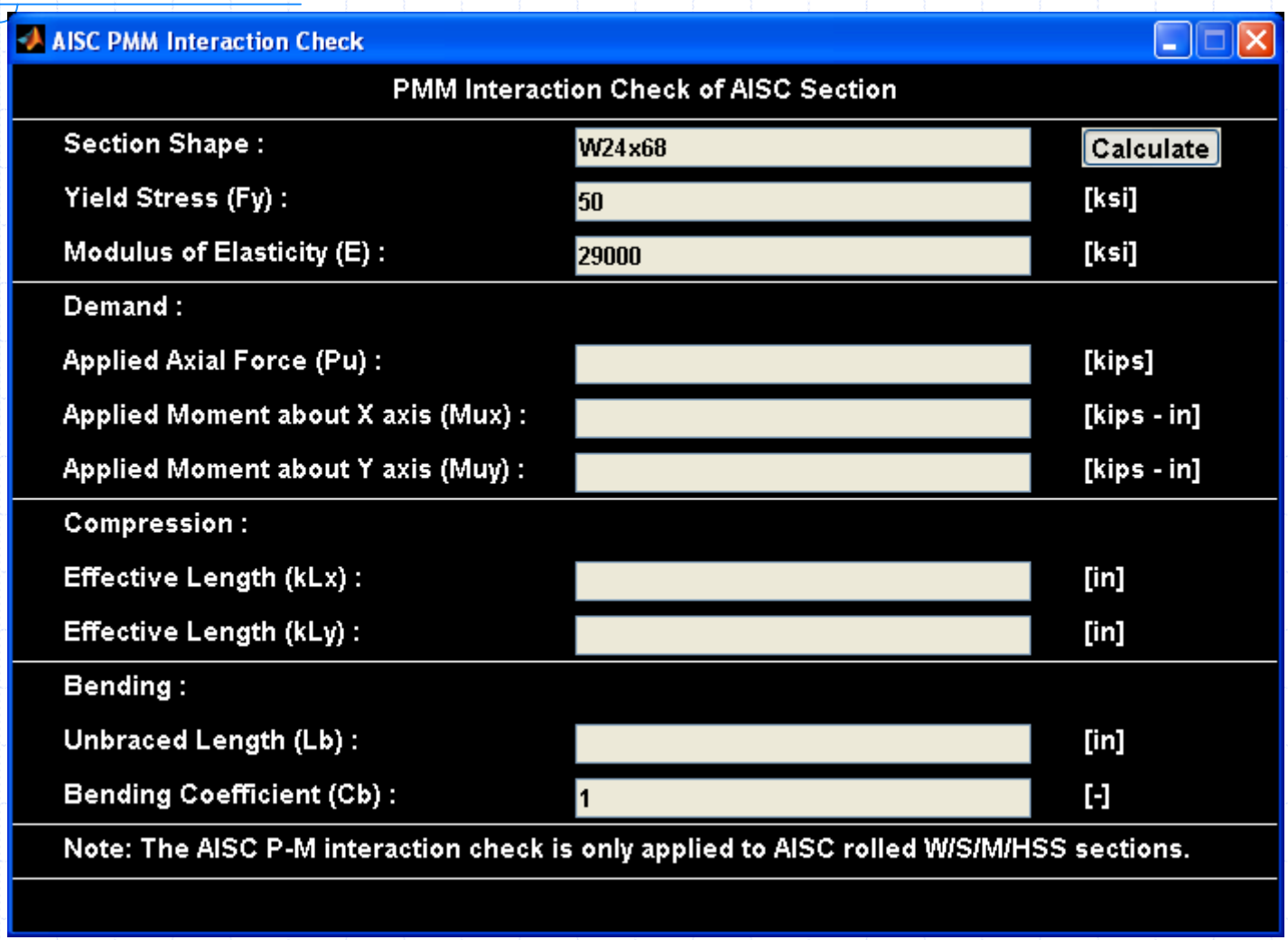


AISC Toolbox: Shear Capacity





AISC Toolbox: PMM Interaction



Summary

- OpenSees Navigator provides
  - Flexible and user friendly graphical user interface
  - Easy way to study material, section, element or system behavior
  - Hybrid Simulation interface
  - Many built in post processing toolboxes
  - Great tool to visualize structural behavior
  - Response Spectra generation
  - Graphical user interface for AISC steel manual
  - Design toolboxes

Website: Home

OpenSees Navigator

Home | Introduction | Manuals | Tutorials | Presentations | Discussion | Updates | Downloads | Links

Home> Search

- Introduction
- Manuals
- Tutorials
- Presentations
- Discussion
- Updates
- Downloads
- Links

Dear OpenSees Navigator users,

Thanks for your interest in OpenSees Navigator. This program is intended to be self-explanatory, nevertheless a basic user manual will be added to the website shortly. We are very happy to have the opportunity to distribute this software for OpenSees Navigator users. We encourage everyone to try out all of the functions of the program and send us criticism, corrections or suggestions to improve future versions. We also encourage users to e-mail us at either andreas.schellenberg@gmail.com or yangtony2004@gmail.com so that we can add the e-mail addresses to the OpenSees Navigator user list. We will use such list to contact everyone about new releases or major updates. We will try our best to improve the next release.

Thank you.

Please feel free to visit our websites to discover in what other fun research we are involved:

Andreas Schellenberg & Tony Yang

Hit Counter

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Website: Downloads

OpenSees Navigator

Home | Introduction | Manuals | Tutorials | Presentations | Discussion | Updates | Downloads | Links

Home> Downloads> Stand-Alone Windows>

Search

MCRInstaller.exe

OpenSeesNavigator.zip

Installation Instructions:

1. Download the two files on the left.
2. Install the Matlab component runtime libraries by executing MCRInstaller.exe and following the on screen instructions (this has only to be done once).
3. Extract OpenSeesNavigator.zip in any folder of your choice and then execute OpenSeesNavigator.exe.
4. If you like you can create a shortcut to OpenSeesNavigator.exe on your Desktop.

Hit Counter

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Thank you!

OpenSees Navigator 2.0 is available at
http://peer.berkeley.edu/OpenSeesNavigator

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