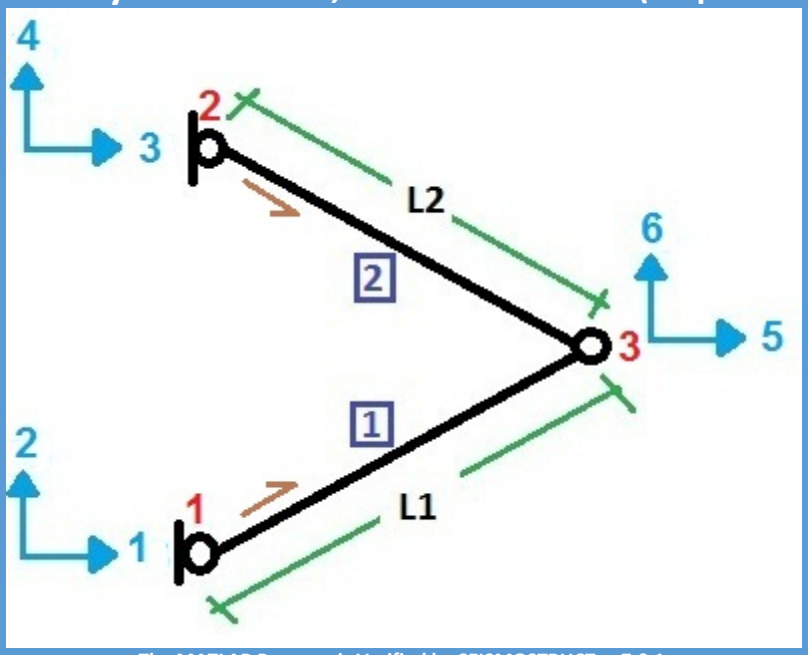
>> IN THE NAME OF GOD <<

Large axial displacement analysis of two elements truss with effect of material plasticity in MATLAB, SEISMOSTRUCT (Displacement Control)



The MATLAB Program is Verified by SEISMOSTRUCT v.7.0.1
This MATLAB program is written by Salar Delavar Ghashghaei - Date of Publication: October/21/2016
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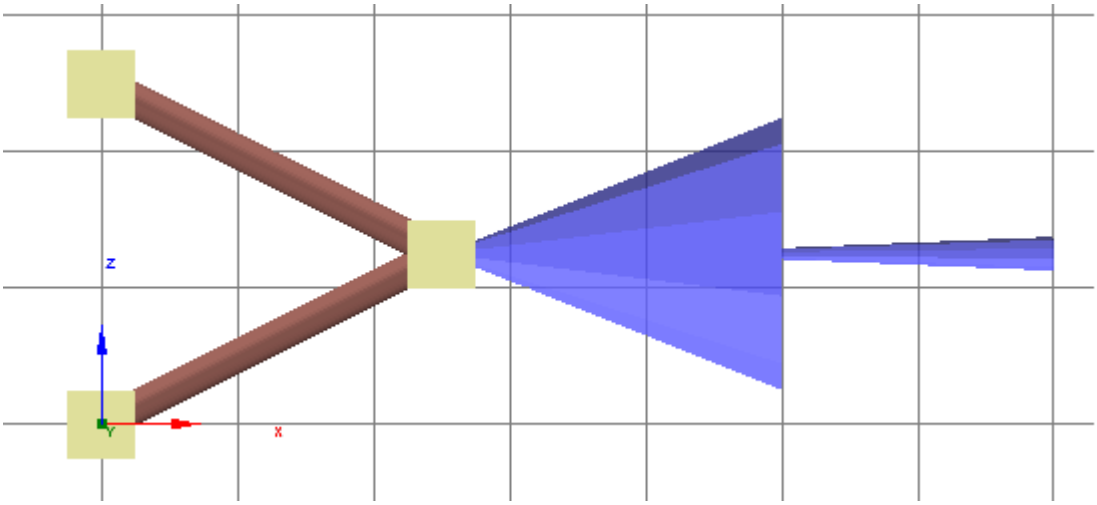
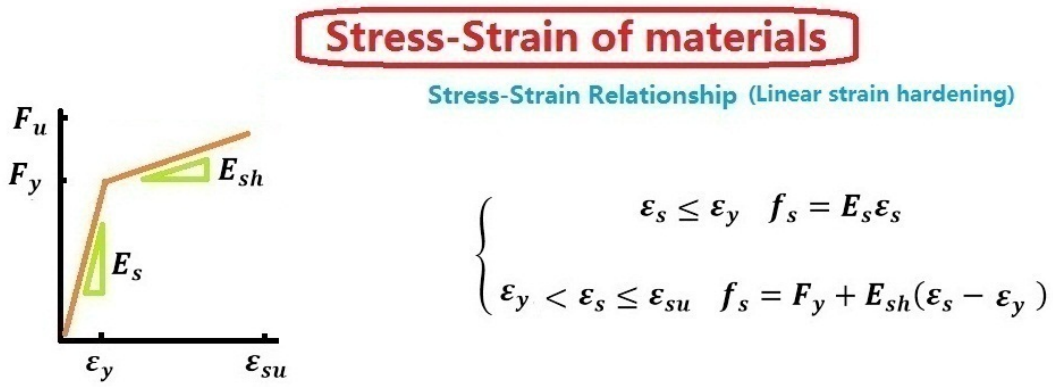


Figure(1) Two elements truss modelling in Seismostruct version 7.0.1

Define Parameters:

```
% Define Parameters in unit: [mm,kN]
P5=0; % [kN]
P6=0; % [kN]
D5=-.002;% [mm] Initial Displacement  [DOF (5)] Incremantal Displacement
D6=.002;% [mm] Initial Displacement  [DOF (6)] Incremantal Displacement
D5max=100; % [mm] Maximum displacement [DOF (5)]
D6max=100; % [mm] Maximum displacement [DOF (6)]
XY1i=[0 0]; % [x y] Point 1 Coordinate
XY2i=[0 500]; % [x y] Point 2 Coordinate
```

```
XY3i=[500 250]; % [x y] Point 3 Coordinate
A1 = 3.1415*(50)^2/4; % [mm^2]
A2 = 3.1415*(50)^2/4; % [mm^2]
%% Steel Section Properties
fy =.24;% [kN/mm^2] Yield strength of steel section
Es =200;% [kN/mm^2] Modulus of elasticity of steel section
fu=1.5*fy;% Ultimate steel stress
ey=fy/Es;% Yield steel strain
esu=0.35;% Ultimate steel strain
Esh=(fu-fy)/(esu-ey);
m = 10000; % number of calculation
itermax = 1000;% maximum number of iterations
tolerance = 1e-4; % specified tolerance for convergence
L1i=(((XY3i(1)-XY1i(1))^2+(XY3i(2)-XY1i(2))^2)^.5);
L2i=(((XY3i(1)-XY2i(1))^2+(XY3i(2)-XY2i(2))^2)^.5);
```



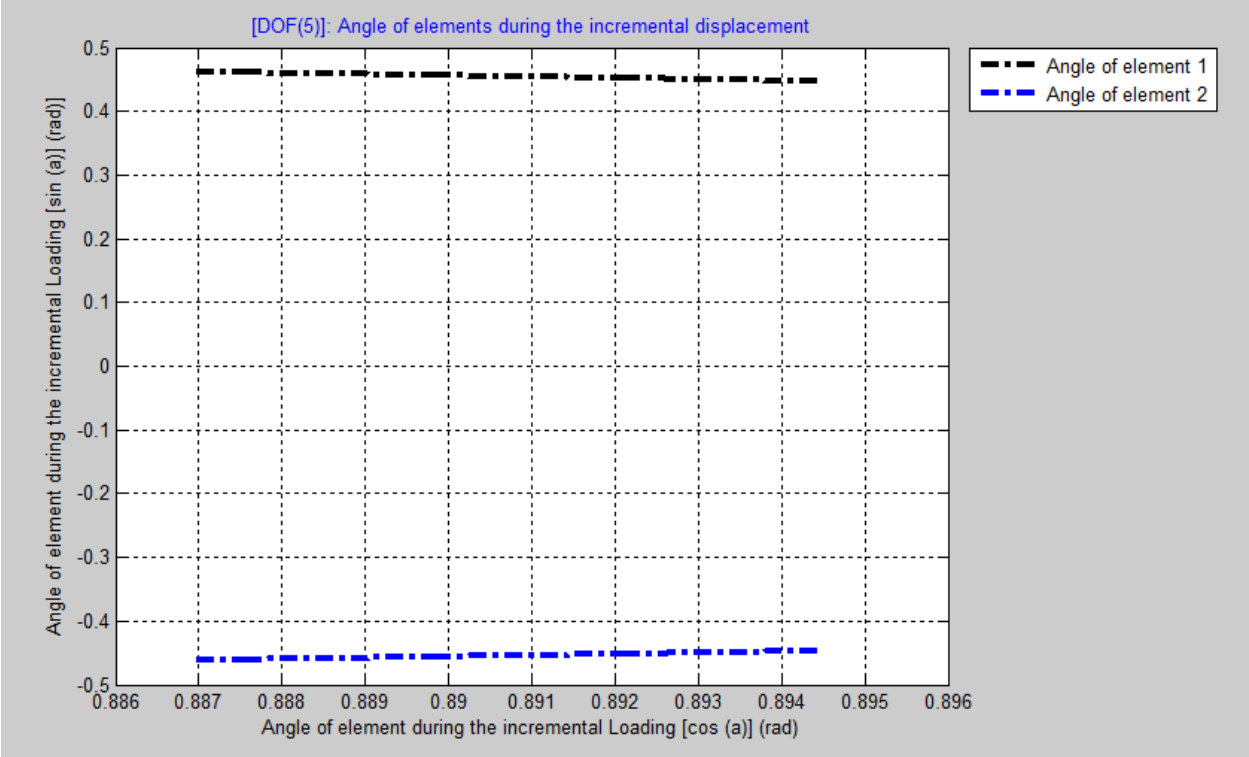
Figure(2) Bilinear stress-Strain Relation for steel modelling in MATLAB and Seismostruct version 7.0.1

Analysis Report:

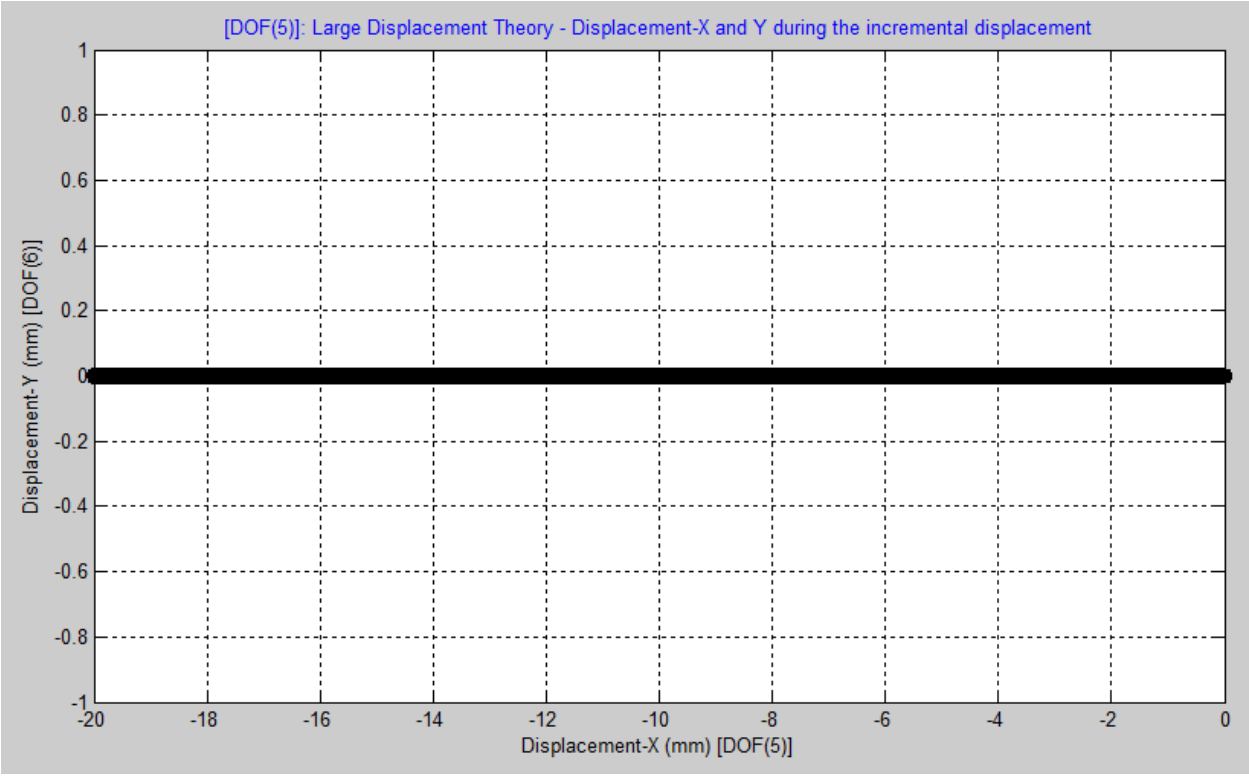
```
##################################
# Large Displacement Analysis [DOF(5)] #
##################################
(+)Increment 1 : It is converged in 1 iterations
(+)Increment 2 : It is converged in 1 iterations
(+)Increment 3 : It is converged in 1 iterations
(+)Increment 4 : It is converged in 1 iterations
(+)Increment 5 : It is converged in 1 iterations
(+)Increment 6 : It is converged in 1 iterations
(+)Increment 7 : It is converged in 1 iterations
(+)Increment 8 : It is converged in 1 iterations
(+)Increment 9 : It is converged in 1 iterations
(+)Increment 10 : It is converged in 1 iterations
(+)Increment 11 : It is converged in 1 iterations.
.
.
.
(+)Increment 9989 : It is converged in 1 iterations
(+)Increment 9990 : It is converged in 1 iterations
(+)Increment 9991 : It is converged in 1 iterations
(+)Increment 9992 : It is converged in 1 iterations
(+)Increment 9993 : It is converged in 1 iterations
(+)Increment 9994 : It is converged in 1 iterations
(+)Increment 9995 : It is converged in 1 iterations
(+)Increment 9996 : It is converged in 1 iterations
(+)Increment 9997 : It is converged in 1 iterations
(+)Increment 9998 : It is converged in 1 iterations
(+)Increment 9999 : It is converged in 1 iterations
(+)Increment 10000 : It is converged in 1 iterations
```

Displacement at [DOF (5)] reached to Ultimate Displacement

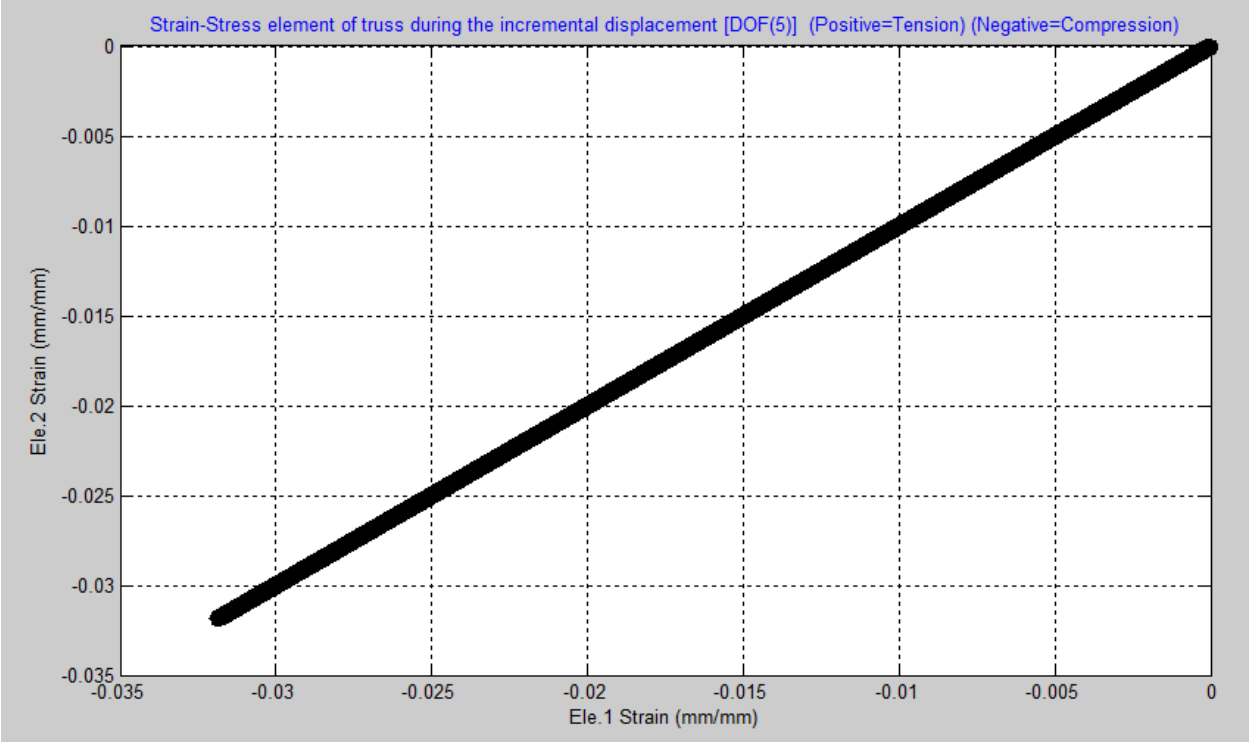
Plot :



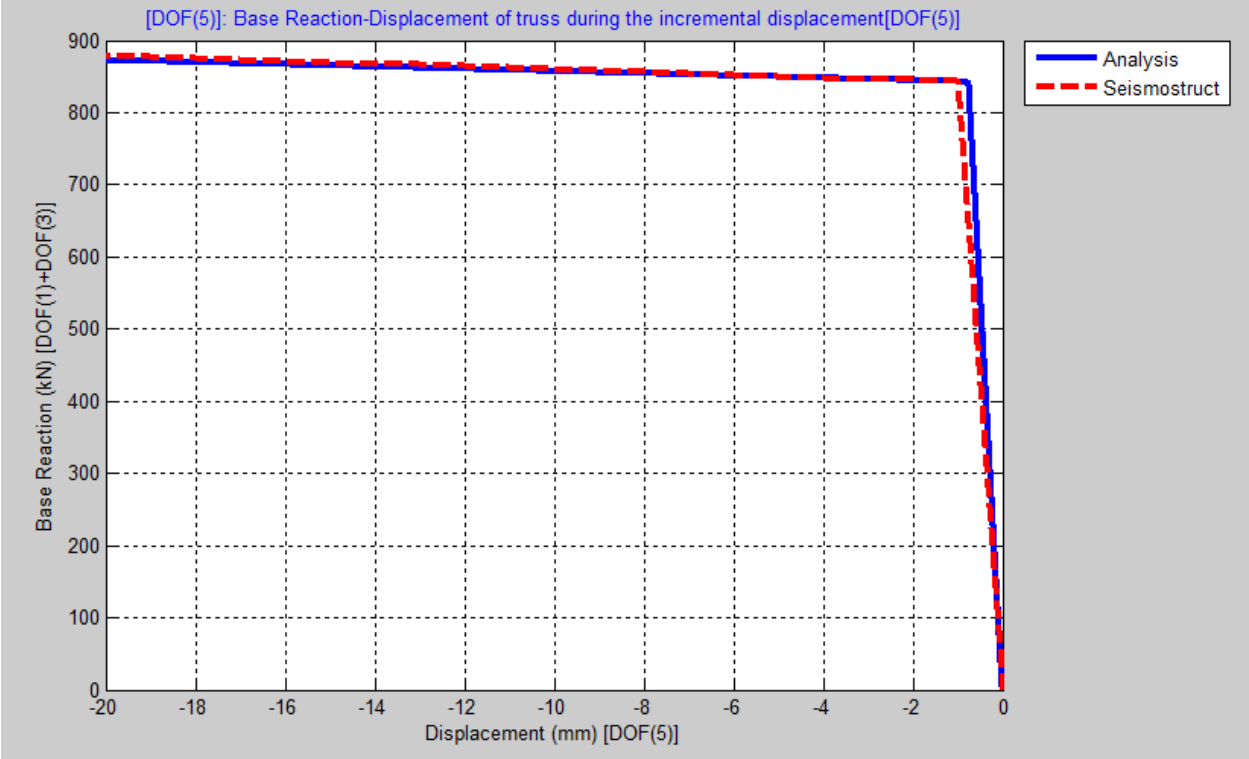
Figure(3) Angle of elements during the incremental displacement



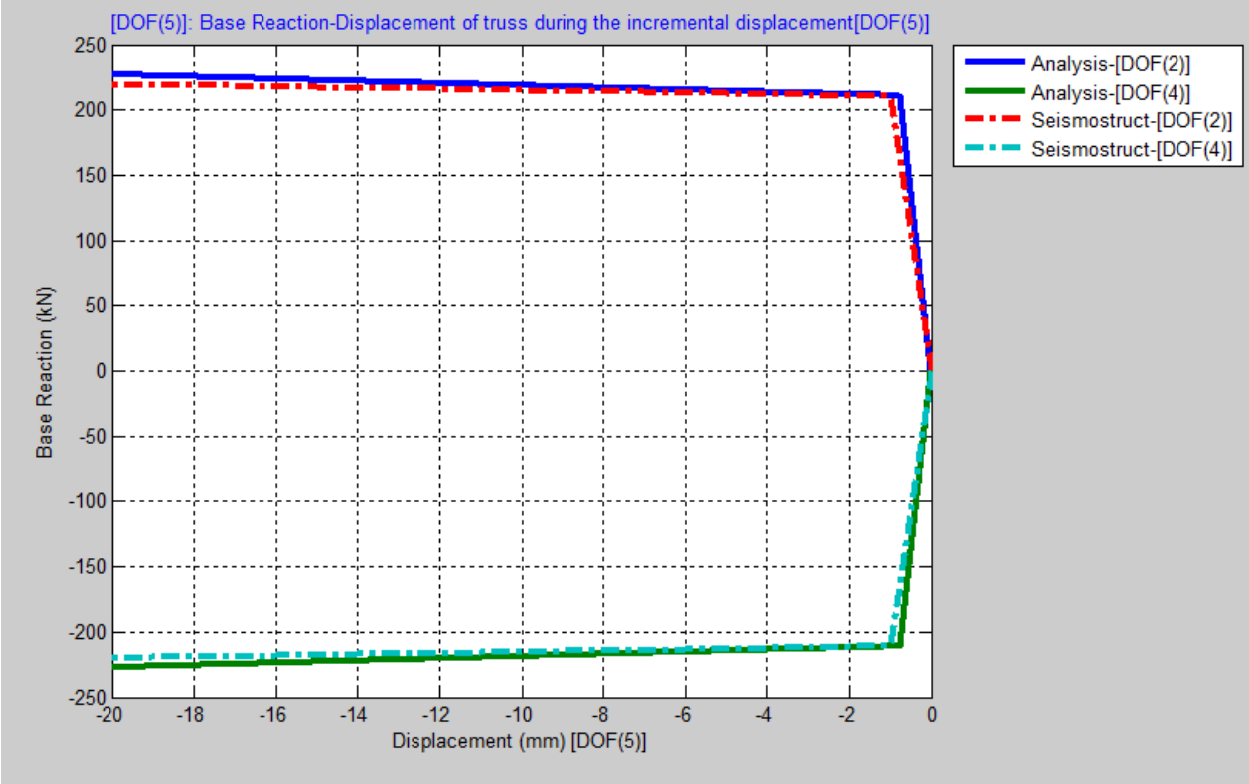
Figure(4) Displacement-X and Y during the incremental displacement



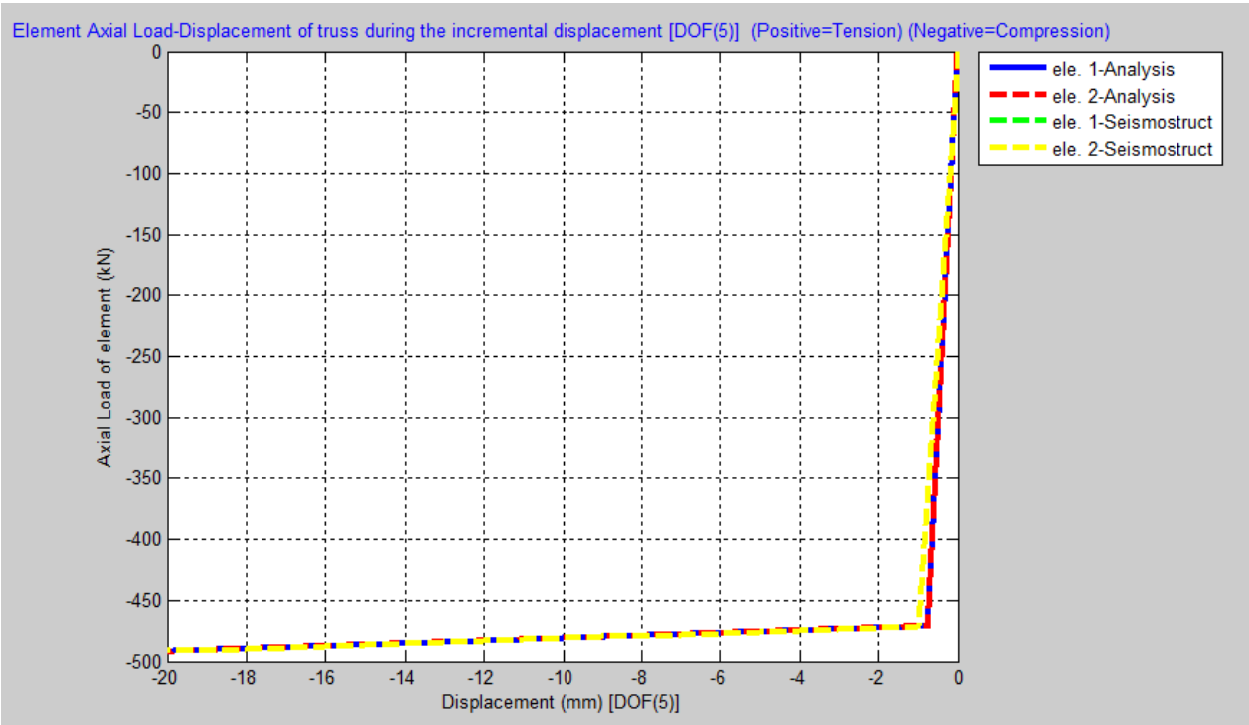
Figure(5) Strain in elements of truss during the incremental displacement



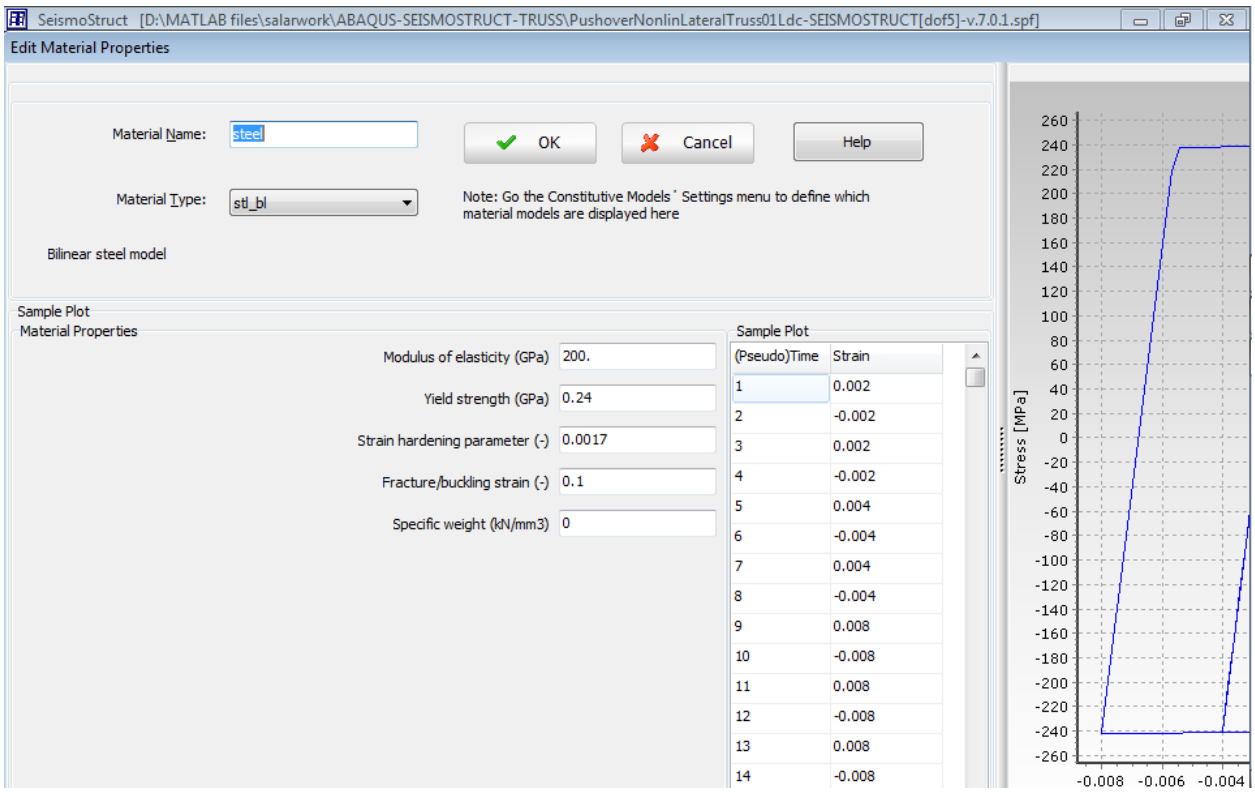
Figure(6) Base reaction-Displacement of truss during the incremental displacement in MATLAB and Seismsotruct



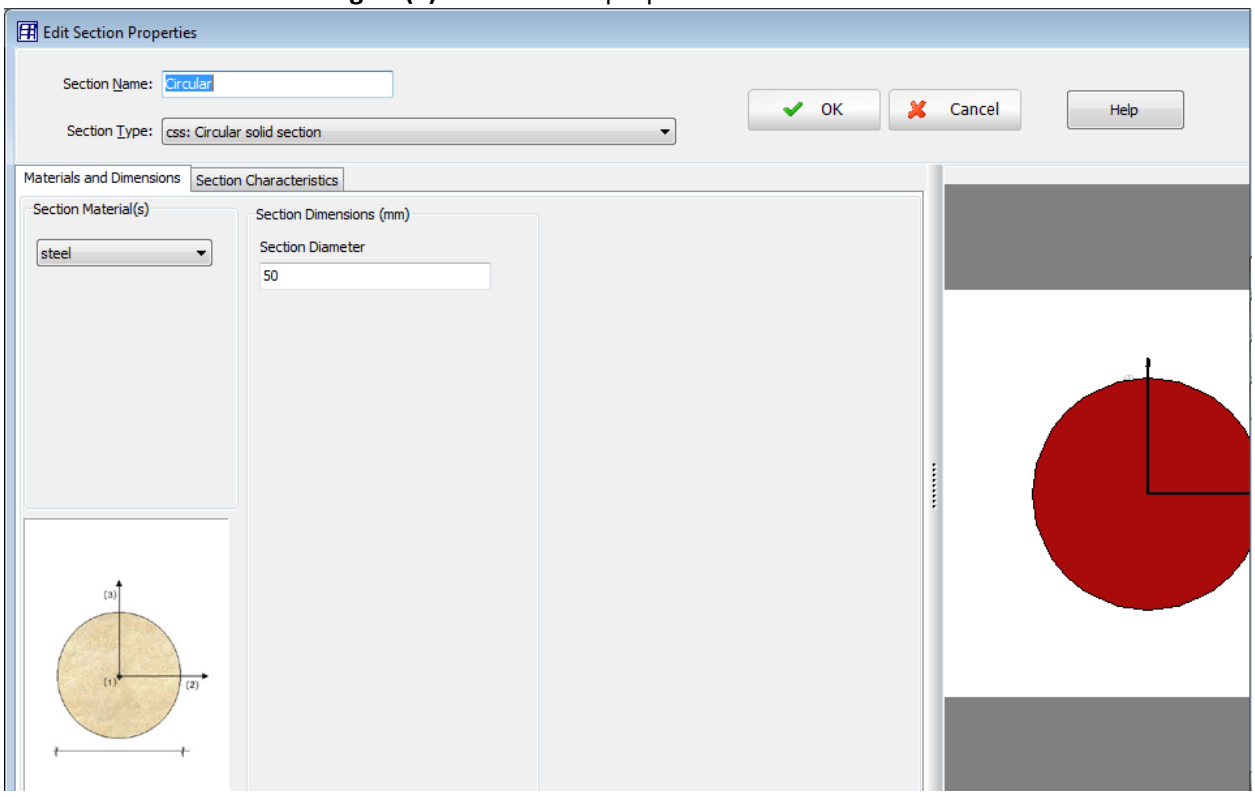
Figure(7) Base reaction-Displacement of truss during the incremental displacement in MATLAB and Seismostruct



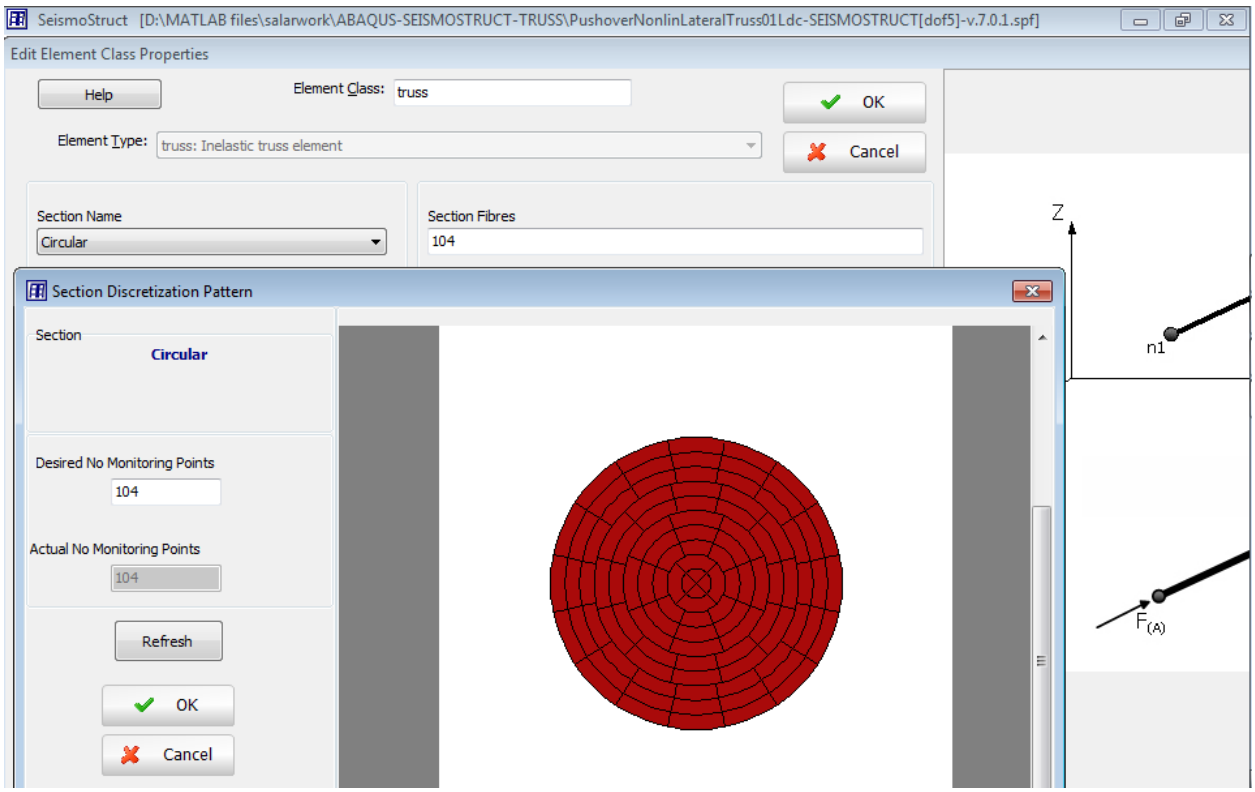
Figure(8) Element Axial Load-Displacement of truss during the incremental displacement in MATLAB and Seismostruct



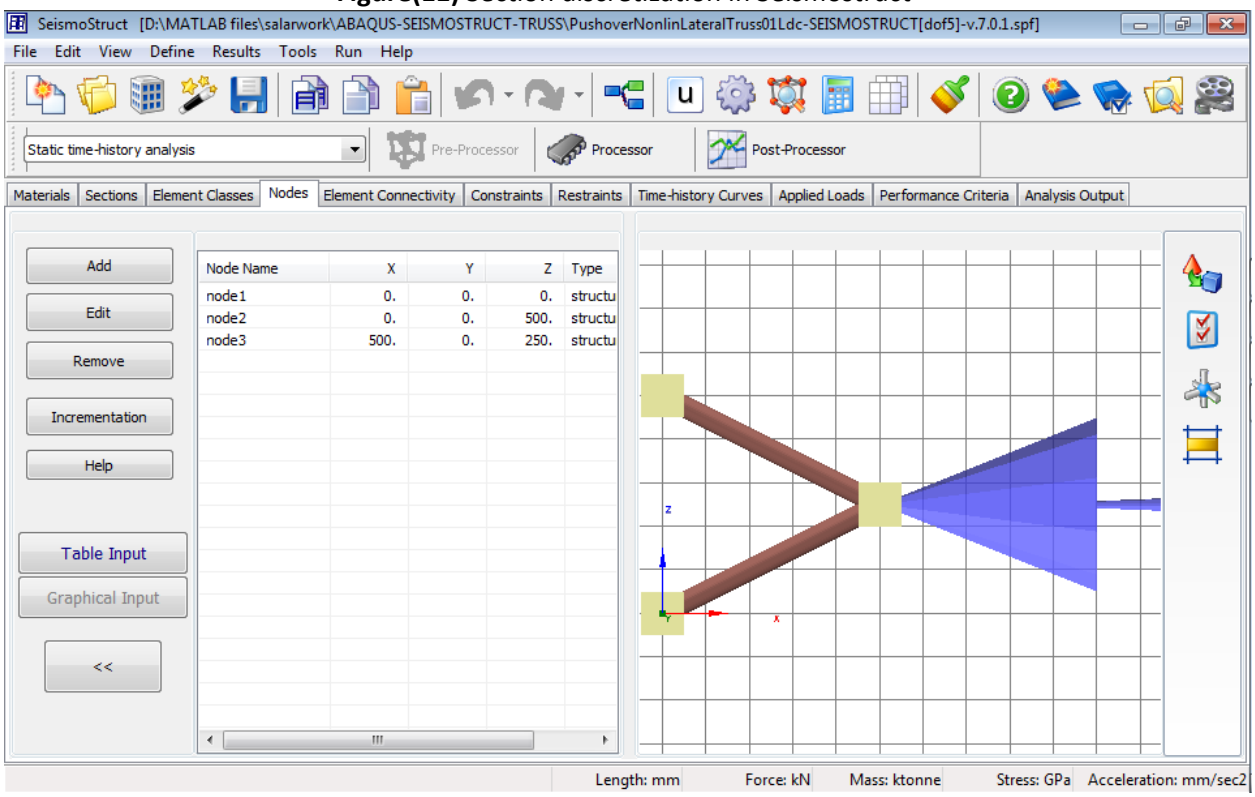
Figure(9) Bilinear steel properties in Seismostruct



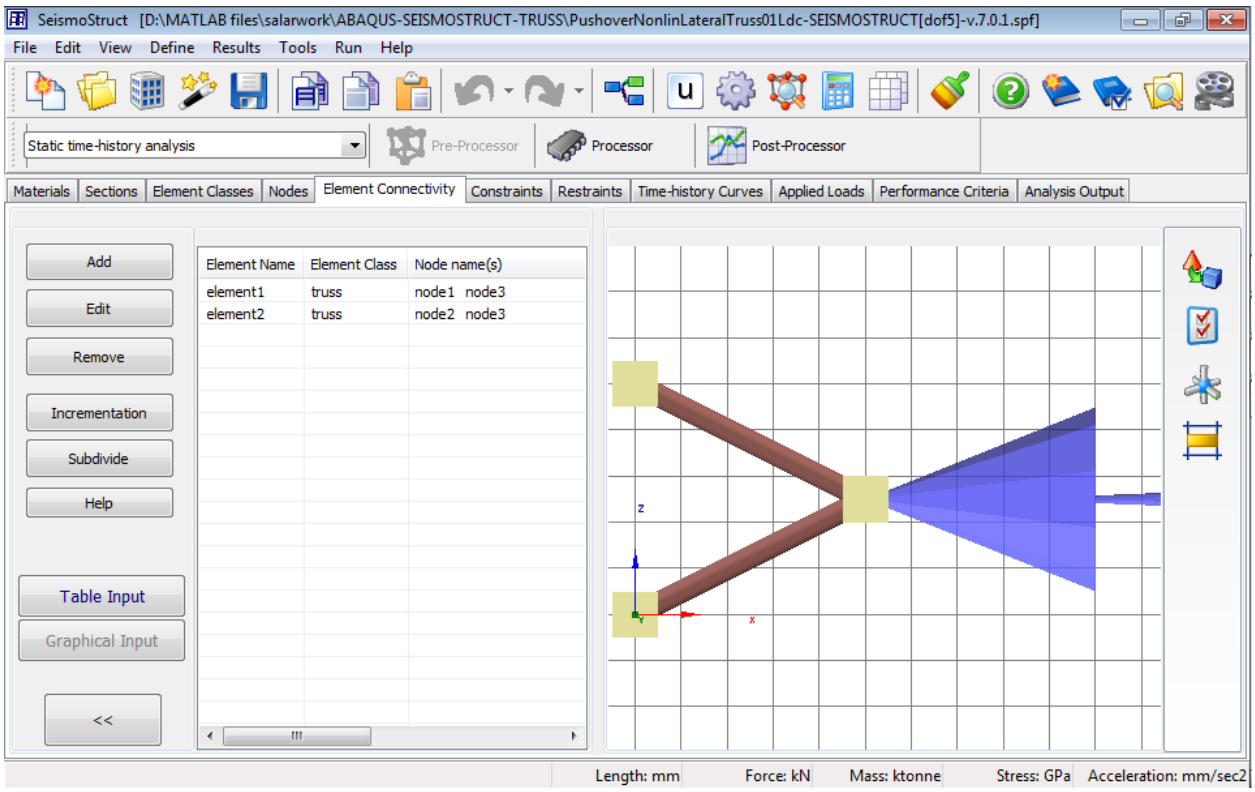
Figure(10) Section propperties in Seismostruct



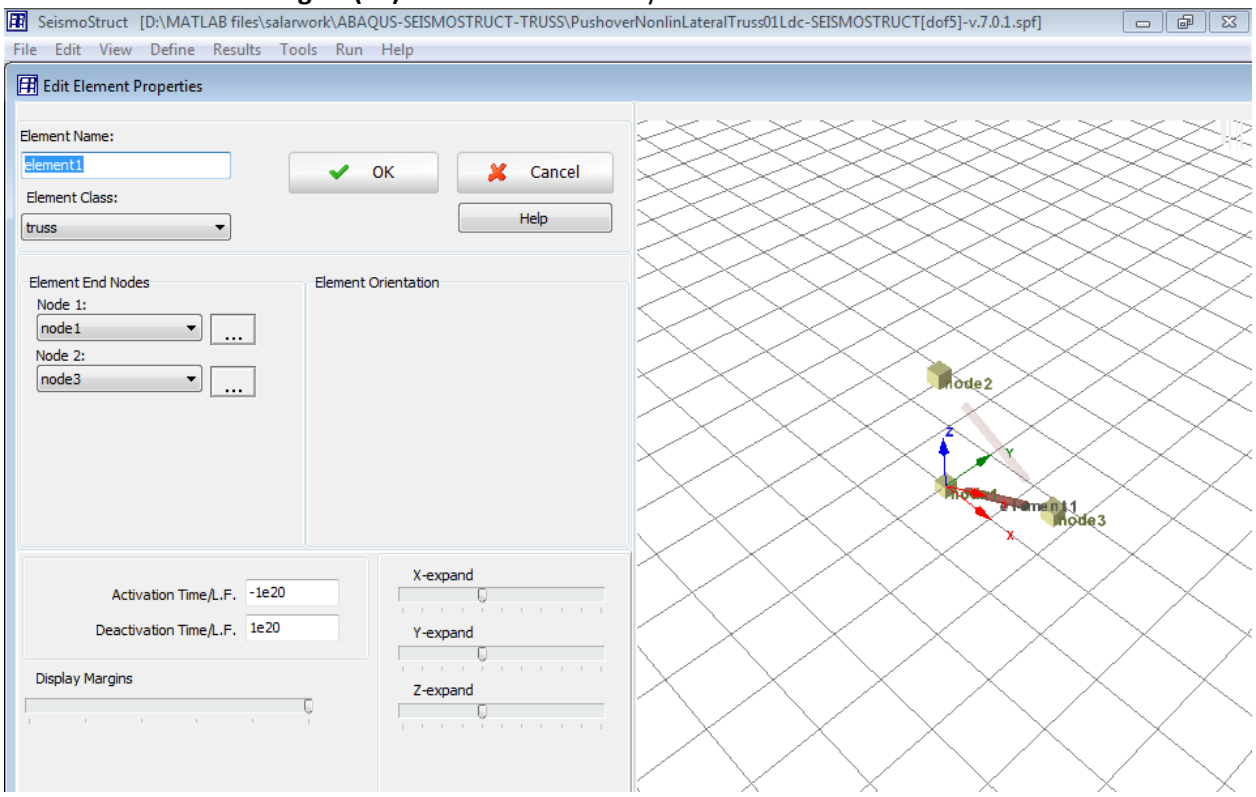
Figure(11) Section discretization in Seismostruct



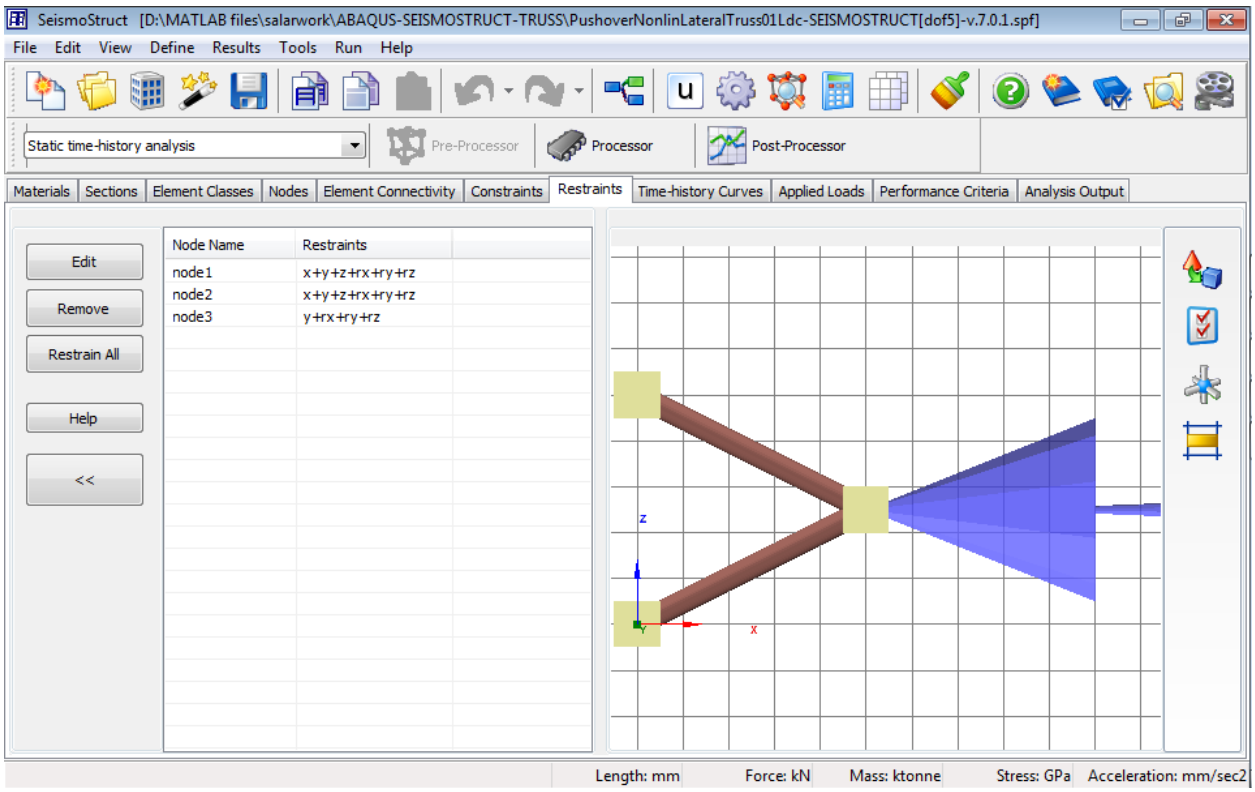
Figure(12) Nodes definition in Seismostruct



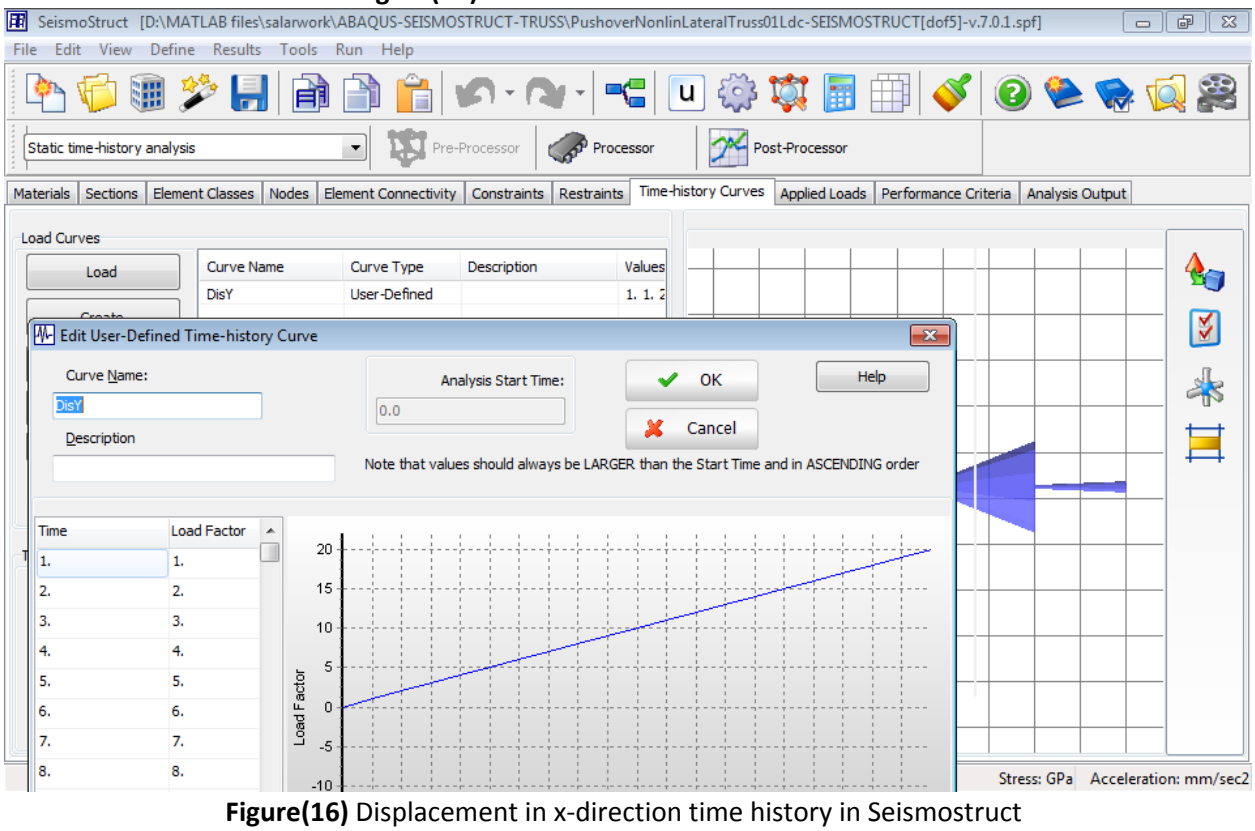
Figure(13) Element connectivity definition in Seismostruct



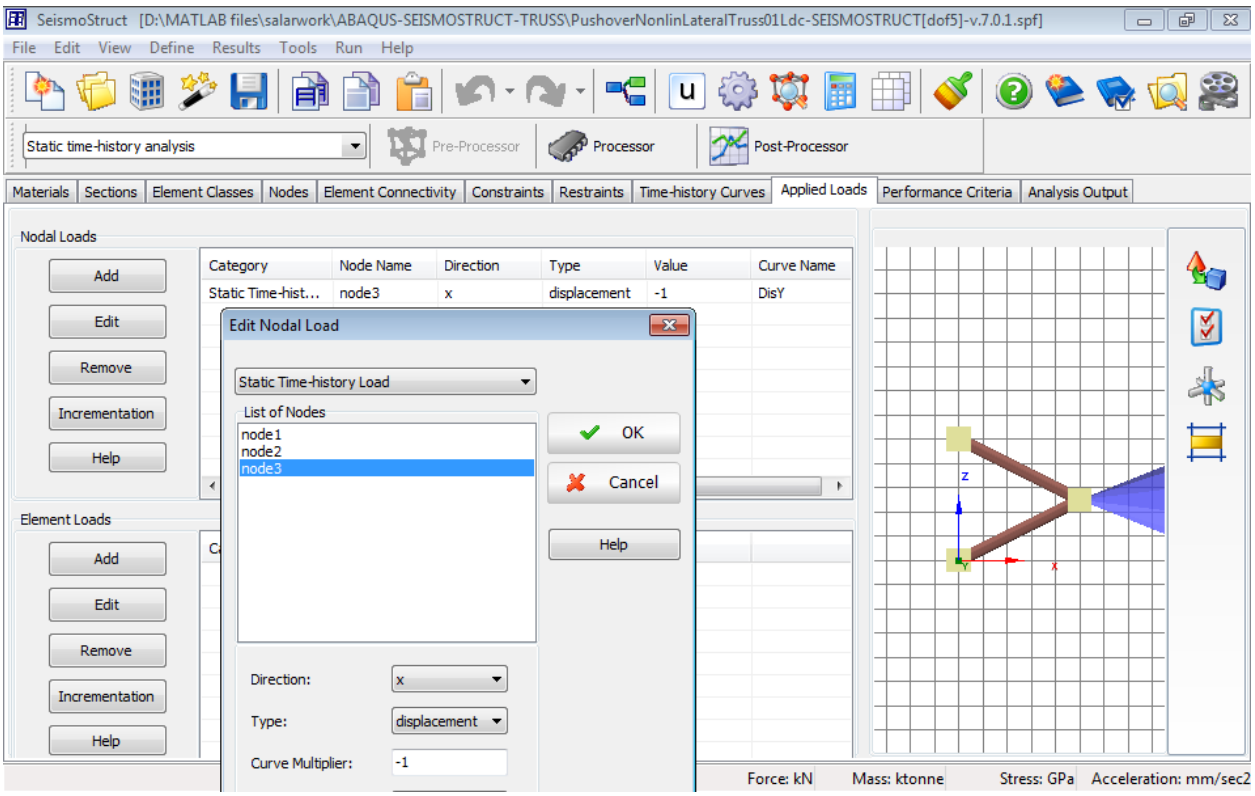
Figure(14) Element connectivity definition in Seismostruct



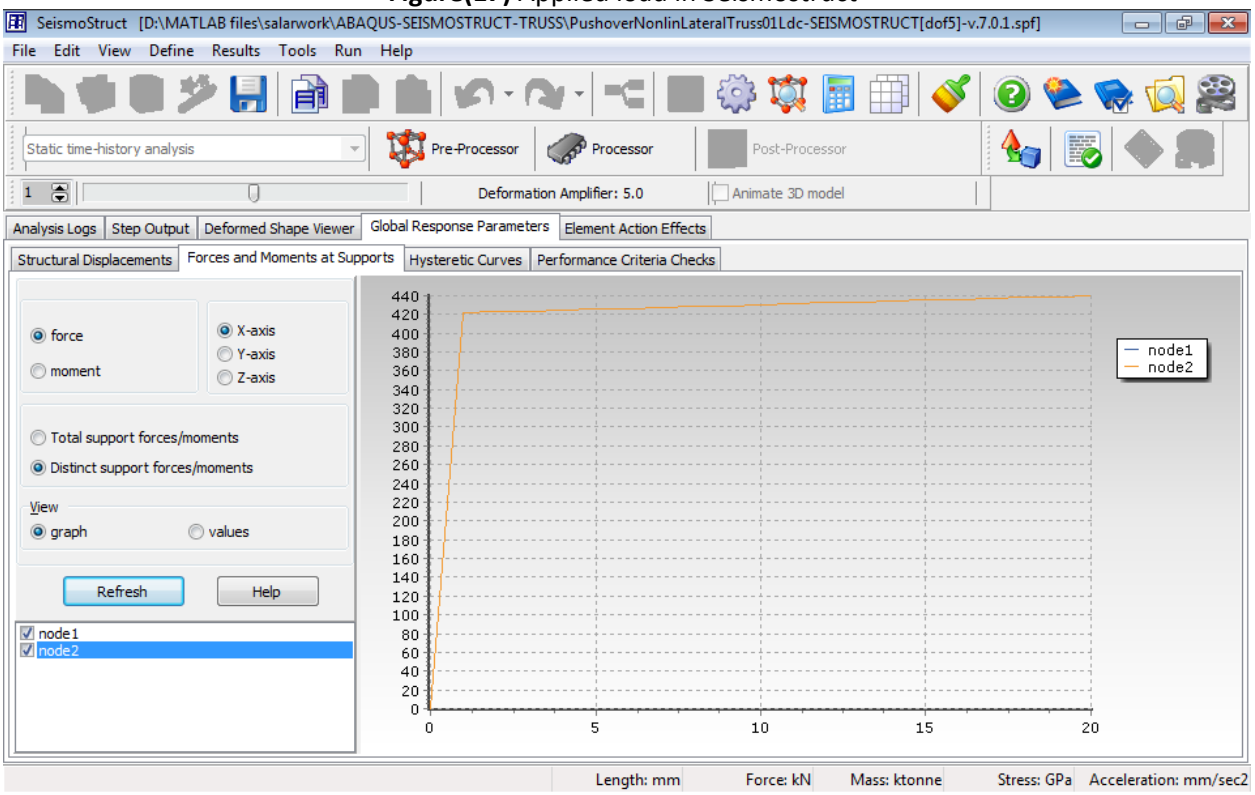
Figure(15) Restraint of nodes in Seismostruct



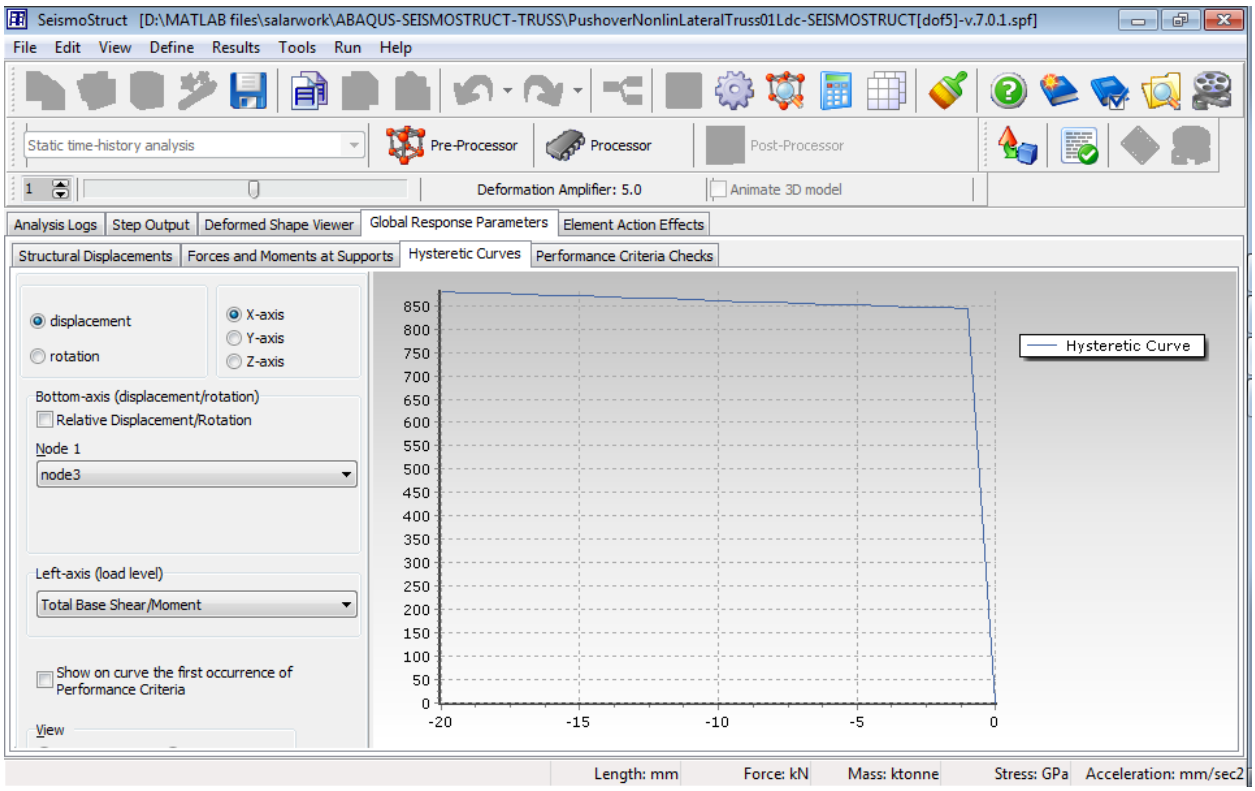
Figure(16) Displacement in x-direction time history in Seismostruct



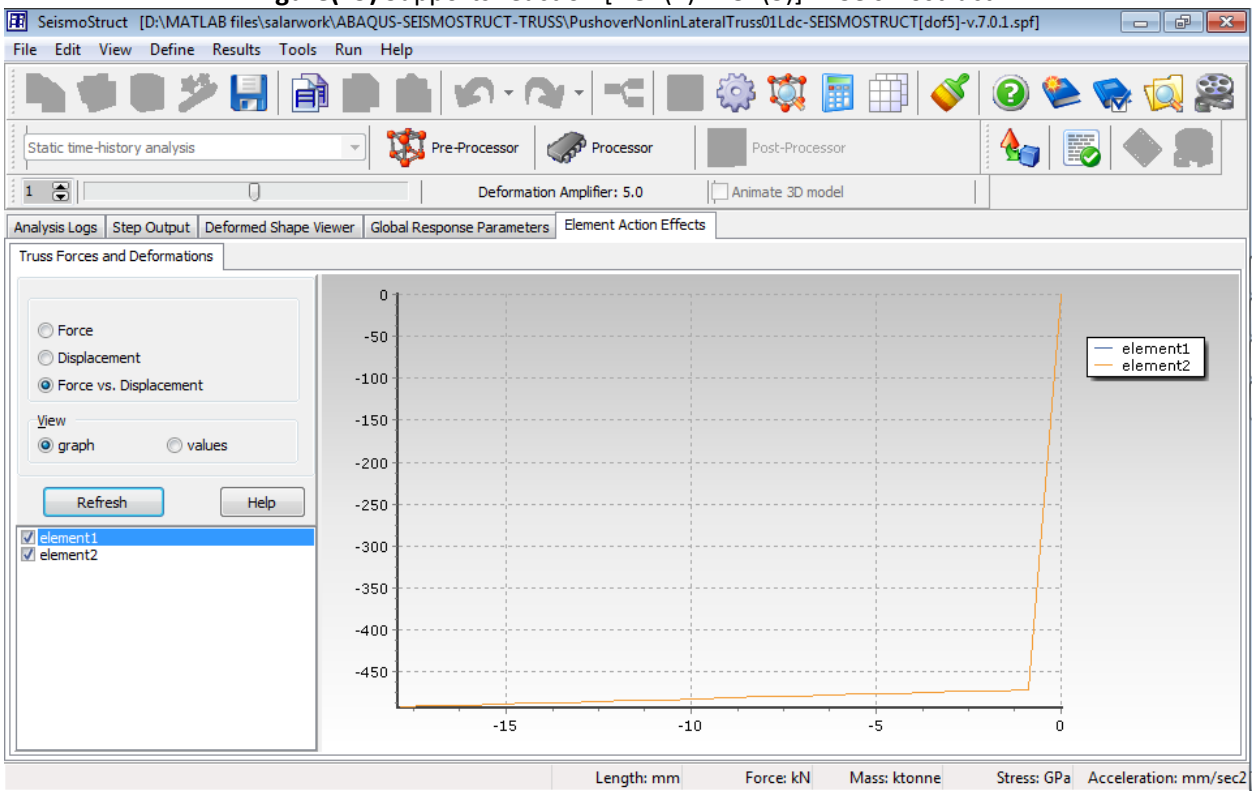
Figure(17) Applied load in Seismostruct



Figure(18) Supports reaction DOF(1) and DOF(3) in Seismostruct



Figure(19) Supports reaction [DOF(1)+DOF(3)] in Seismostruct



Figure(20) Axial force of elements in Seismostruct