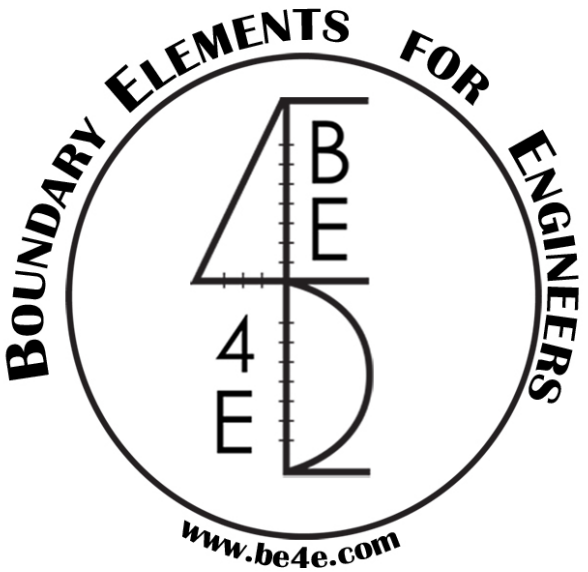

The Dynamic Tool

User MANUAL

PLPAK™ Version 2.00

STRUCTURAL ANALYSIS SOFTWARE USING

THE BOUNDARY ELEMENTS METHOD

E-mail: plpak@be4e.com

Disclaimer

Considerable time, effort and expense have gone into the development and documentation of the PLPAK™ software. The PLPAK™ software has been thoroughly tested and used. The PLPAK™ software should be used by engineers with good understanding of concrete behavior, pre-stressing and structural mechanics. The user accepts and understands that no warranty is expressed or implied by the developers or the distributors on the accuracy or the reliability of the PLPAK™ software. The user must explicitly understand the assumptions of the PLPAK™ software and must independently verify the results produced by the PLPAK™ software.

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1 Introduction

In this manual, Dynamic tool manual steps using Autodesk Revit addins tool is demonstrated. In the Autodesk Revit addins tool dynamics wizard can be used to solve a building supported on fixed base under dynamic loads. The user chooses Dynamics package, from Analysis and Design tool as shown in Figure 1

2 Browse for the PLPAK installation folder

The user browses for the directory of PLPAK installation folder (C:\Program Files\PLPAK) as shown in Figure 2

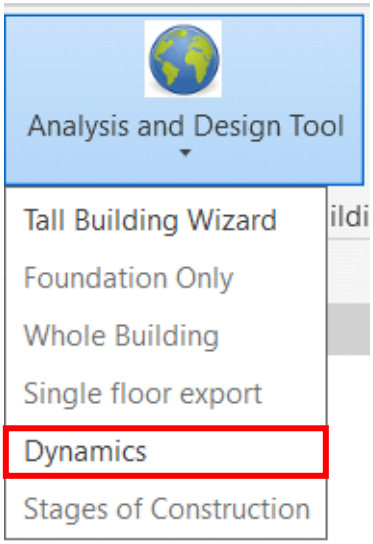


Figure 1 Dynamics Package wizard

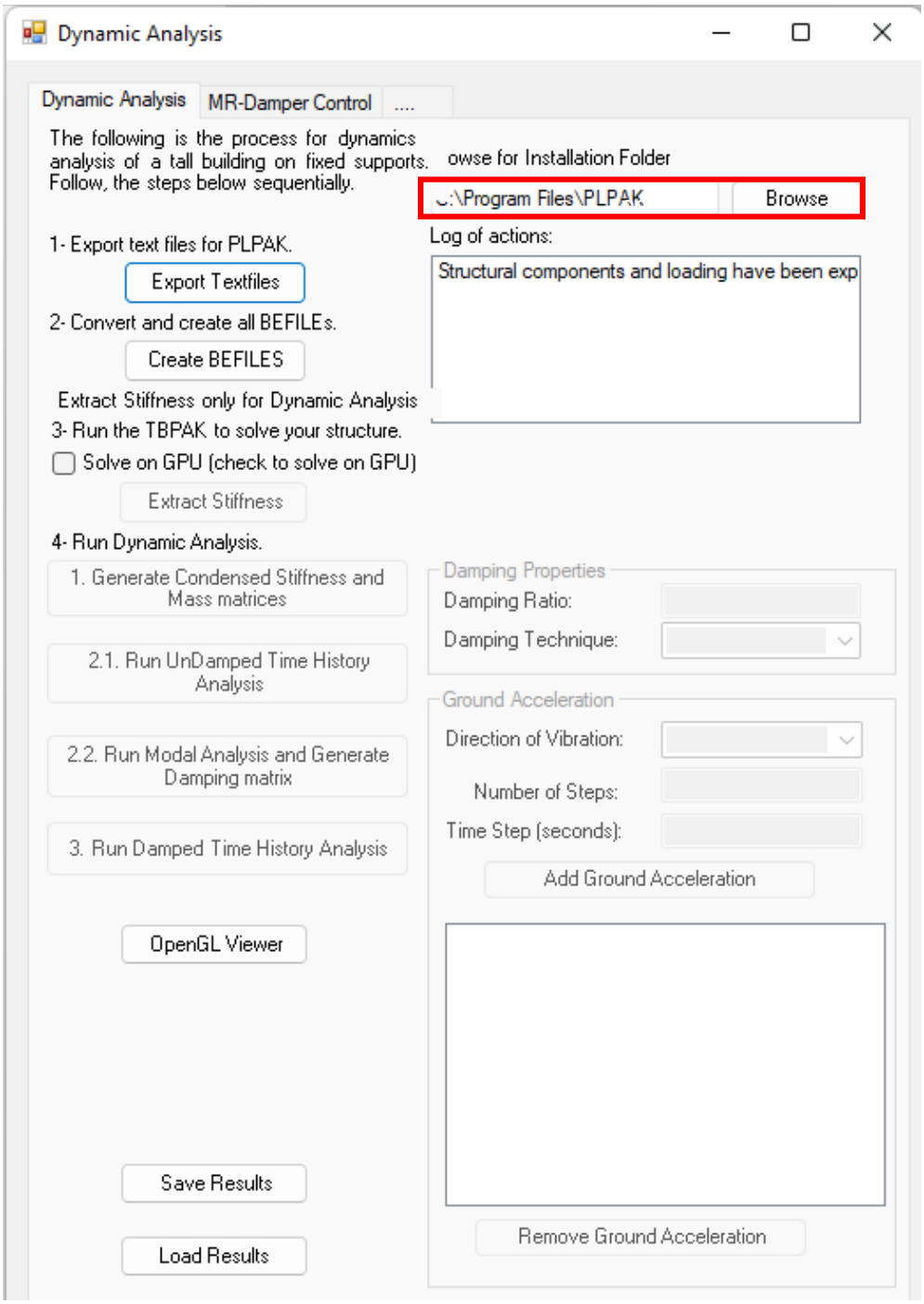


Figure 2 Browse for installation folder

3 Export text file

The user clicks on export text files to export all required text files for solving the super structure under dynamic load such as mat text file as shown in Figure 3

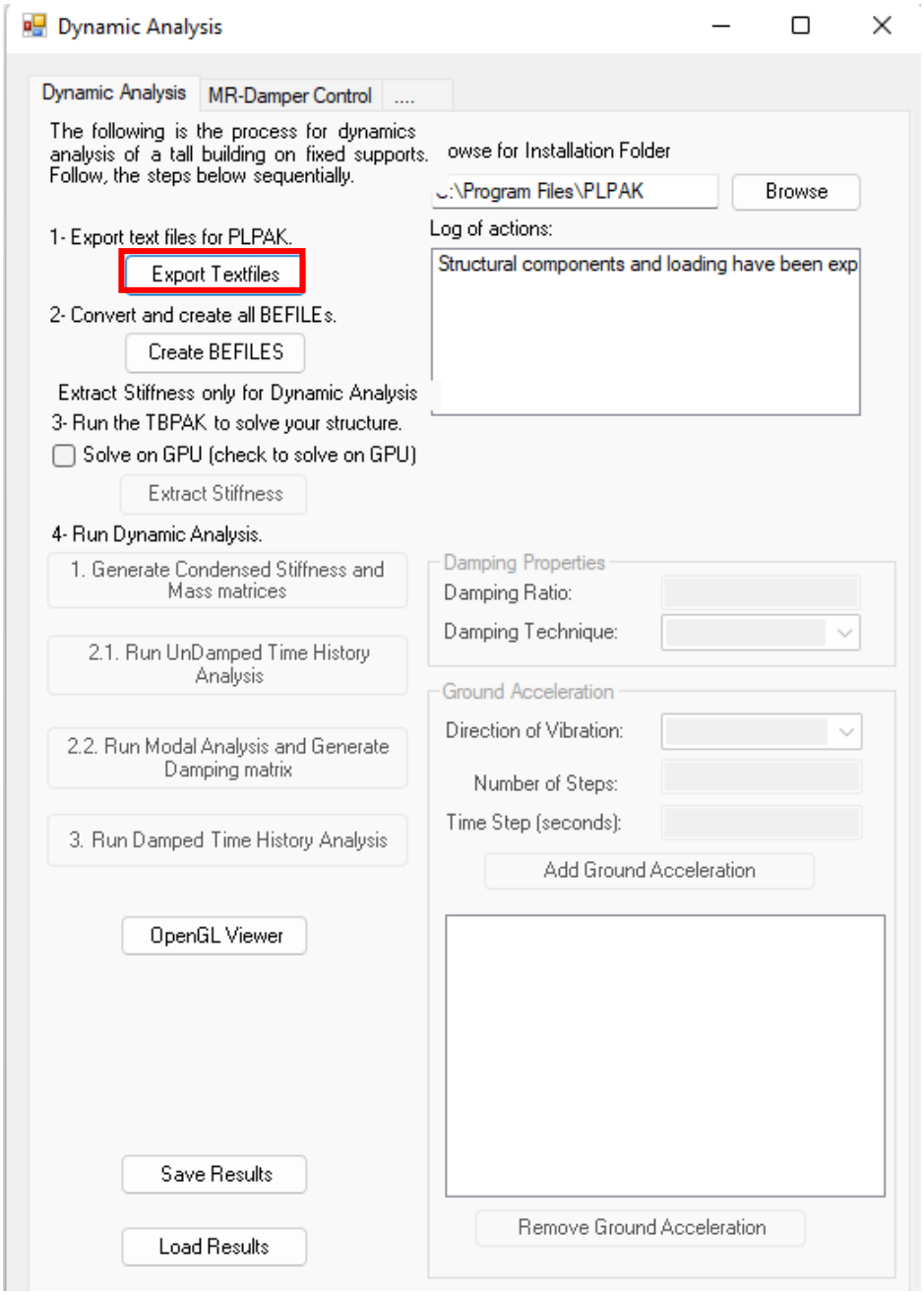


Figure 3 Export text files button

4 Create BEFILES

The user clicks on Befiles as shown in Figure 4 to Convert text files into numerical boundary elements models for each floor.

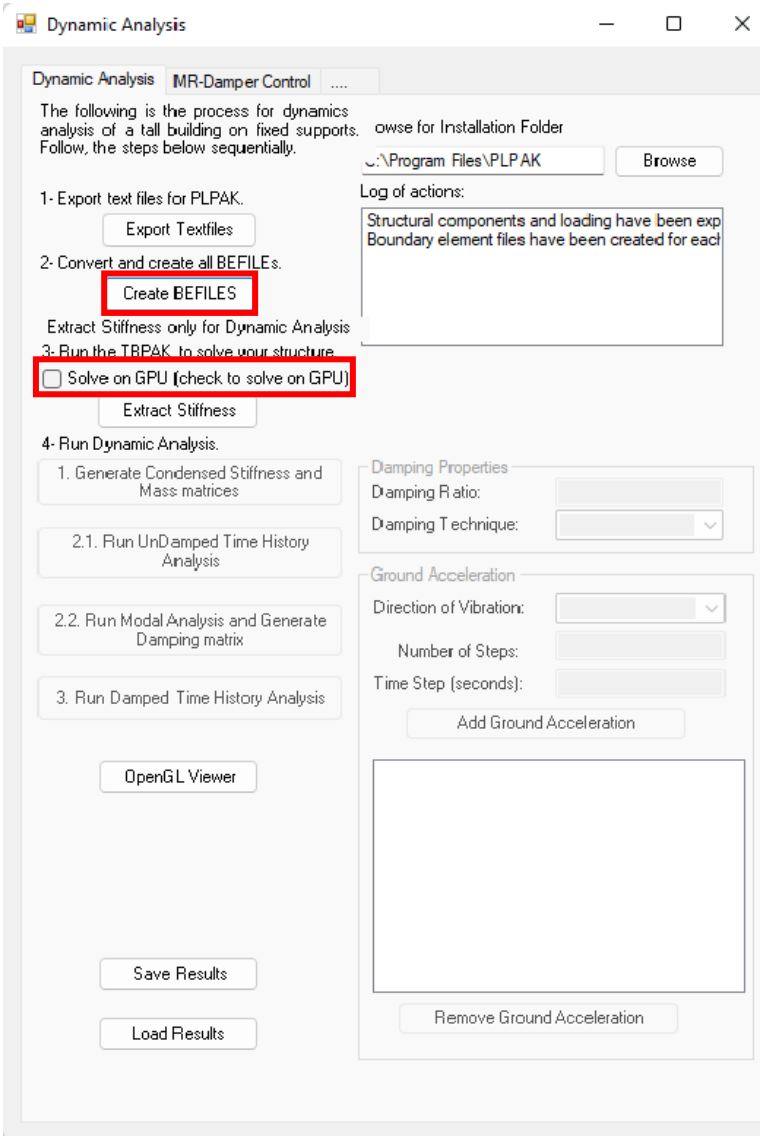


Figure 4 Create all BEFILES

5 GPU/CPU SOLVER

The user selects either select to perform structure stiffness matrix calculations using GPU or CPU solver. GPU solver is faster than CPU option. To use GPU option check on solve on GPU as shown in Figure 4

6 Extract Stiffness

The user click on Extract stiffness to construct structure stiffness matrix as shown in Figure 5

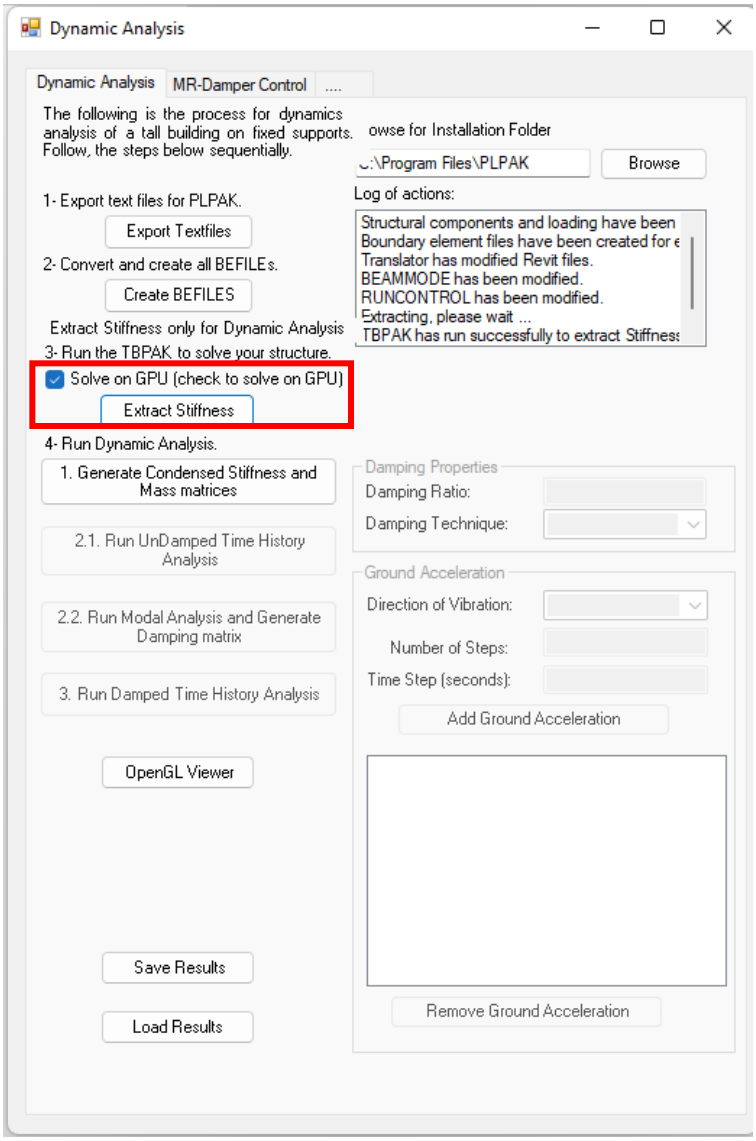


Figure 5 Extract structure stiffness matrix button

7 Generate condensed stiffness and mass matrices

The user clicks on Generate condensed stiffness and mass matrices to construct structure stiffness and mass matrix as shown in Figure 6

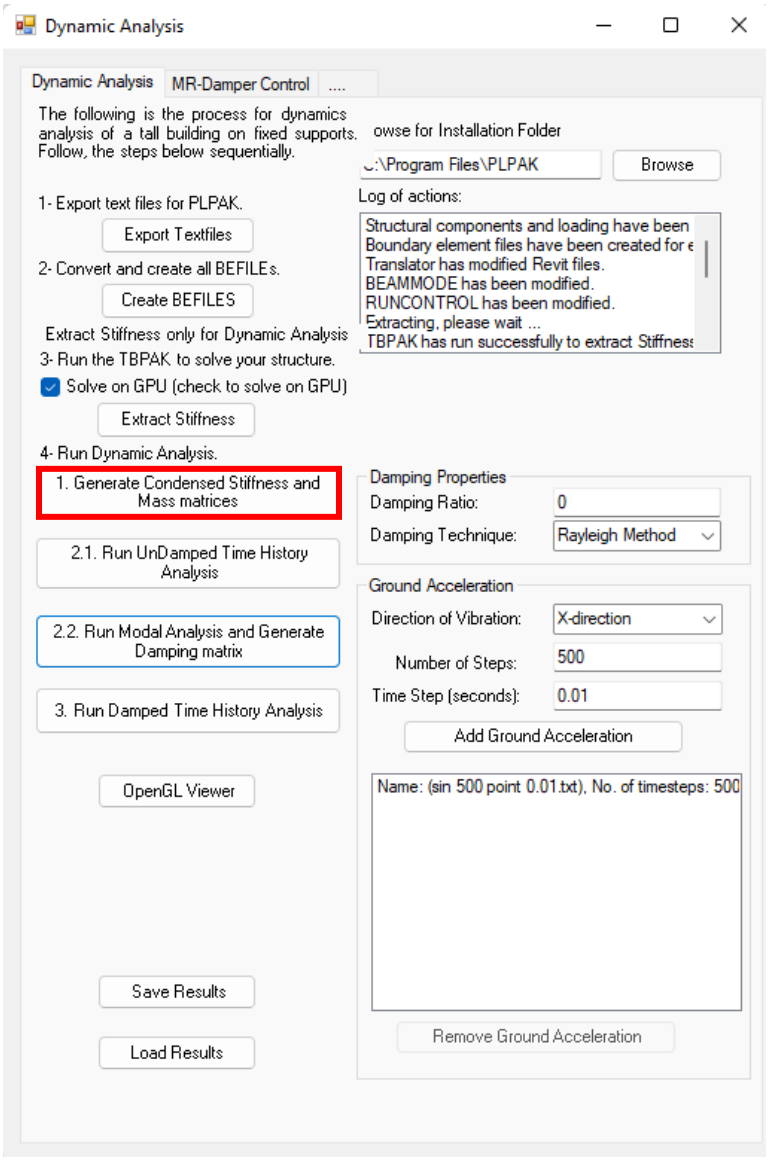


Figure 6 Generate stiffness and mass matrices button

8 Perform undamped time history analysis

The user clicks on Run Undamped Time History Analysis to perform undamped time history analysis where equation of motion is solved to get the structure time history responses. The user should insert the following inputs for ground acceleration: the direction of vibration, number of ground accelerations steps and time step as shown in Figure 7

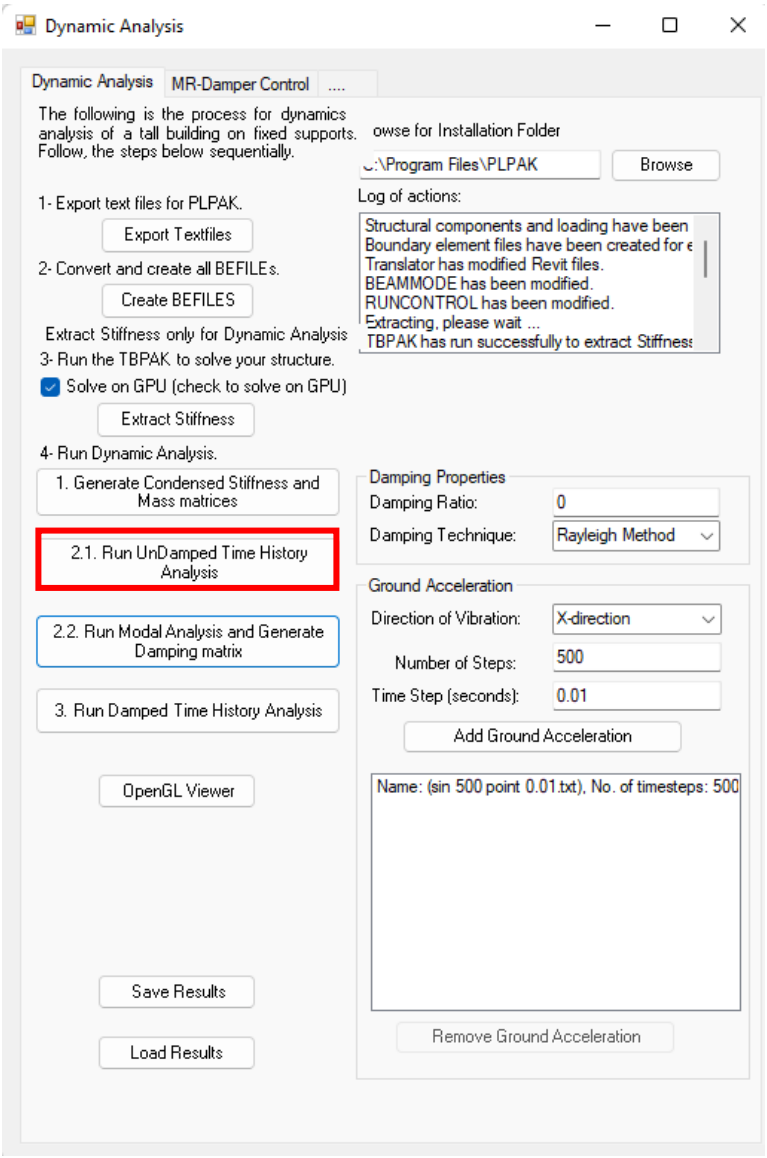


Figure 7 Running undamped time history analysis button

9 Perform modal analysis and generate damping matrix

The user clicks on Run modal analysis and Generating Damping matrix to perform modal analysis, calculating mode shapes as shown in Figure 8. The user should insert damping properties: Damping techniques either using Caughey or Rayleigh method.

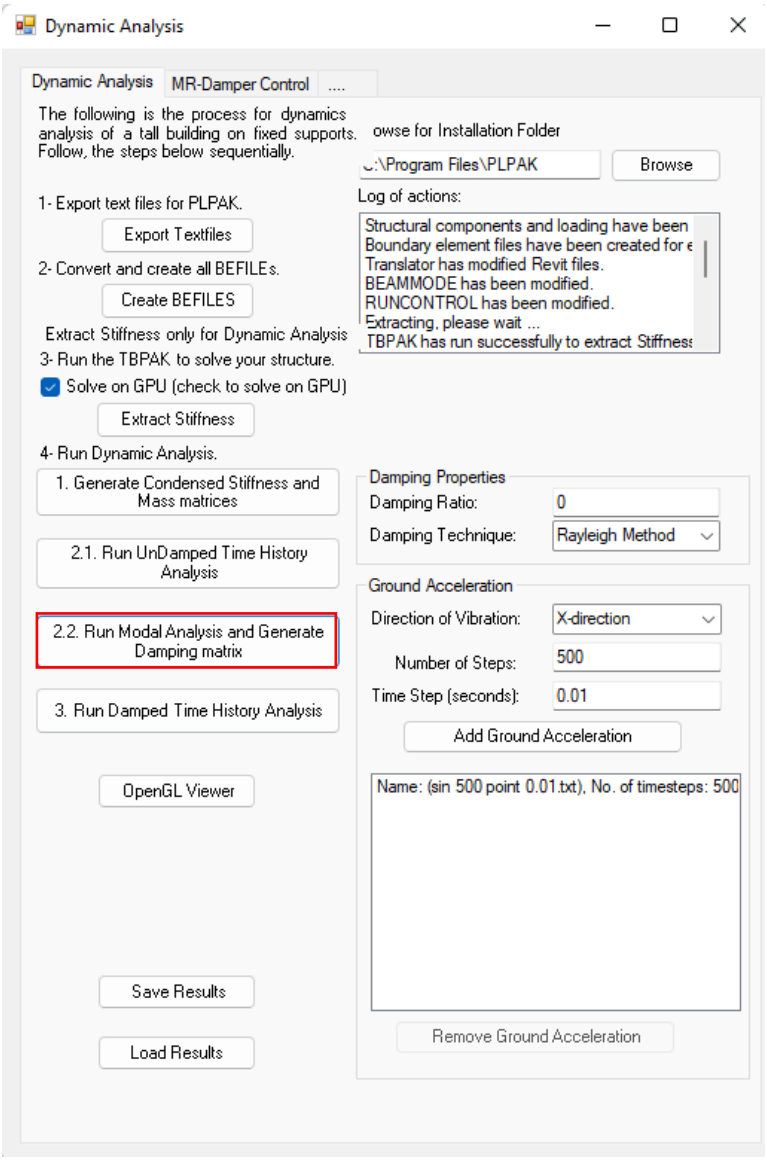


Figure 8 Performing modal analysis and generating damping matrix button

10 Perform damped time history analysis

The user clicks on Run Damped Time History Analysis to performing damped time history analysis to get the structure responses. The user should insert the following input for ground accelerations: the direction of vibration, number of ground accelerations steps and time step and damping properties: Damping techniques either using Caughey or Rayleigh method as shown in Figure 9.

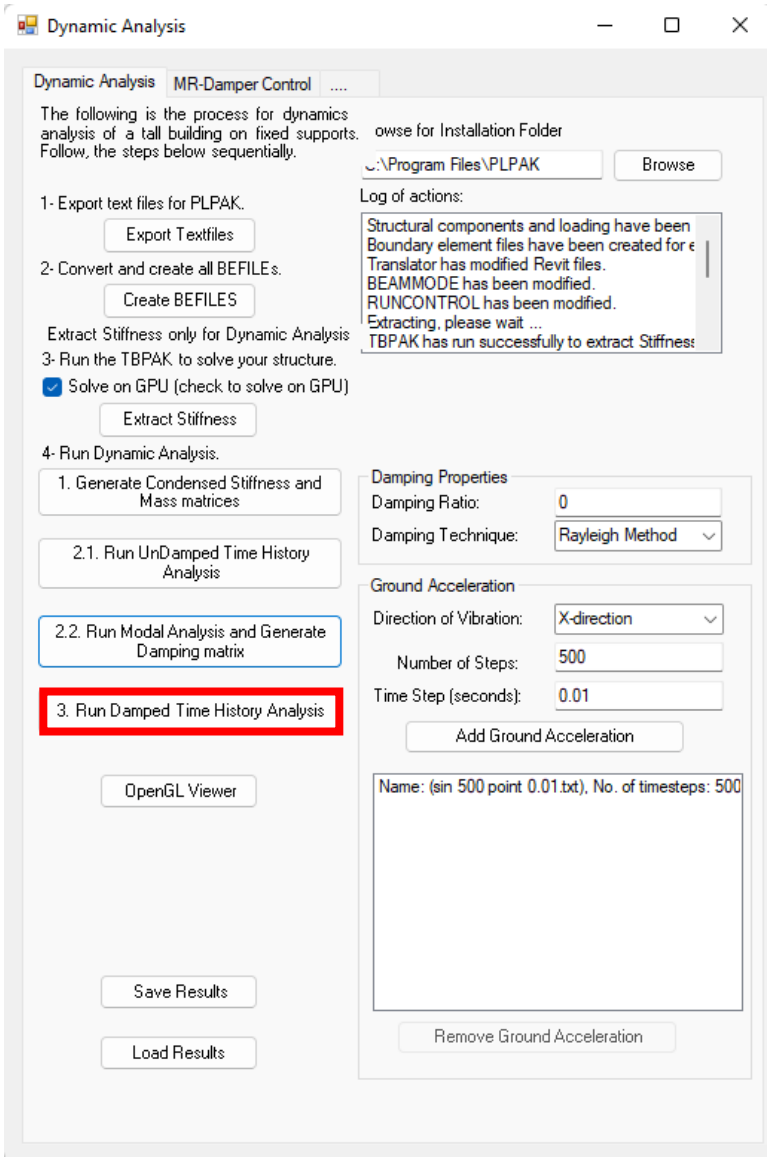


Figure 9 Running damped time history analysis button

11 Open GL

The user can use OpenGL viewer to display the structure 3D VIEW and toggle drawing mode as shown in Figure 10 and Figure 11 respectively

- The user should load FG from PLPAK installation folder as shown in Figure 12
- The user can display toggle mode by click on toggle drawing mode as shown in Figure 11
- The user can display time history text file “Y-HT1.txt" file from dynamic folder as shown in Figure 13
- The user should load time history file “Y-HT1.txt" file from dynamic folder as shown in Figure 14 and Figure 15 to display structure time history response.
- The user should load mode file “Mode.txt" file from dynamic folder to display structure mode shapes as shown in Figure 14 and Figure 16

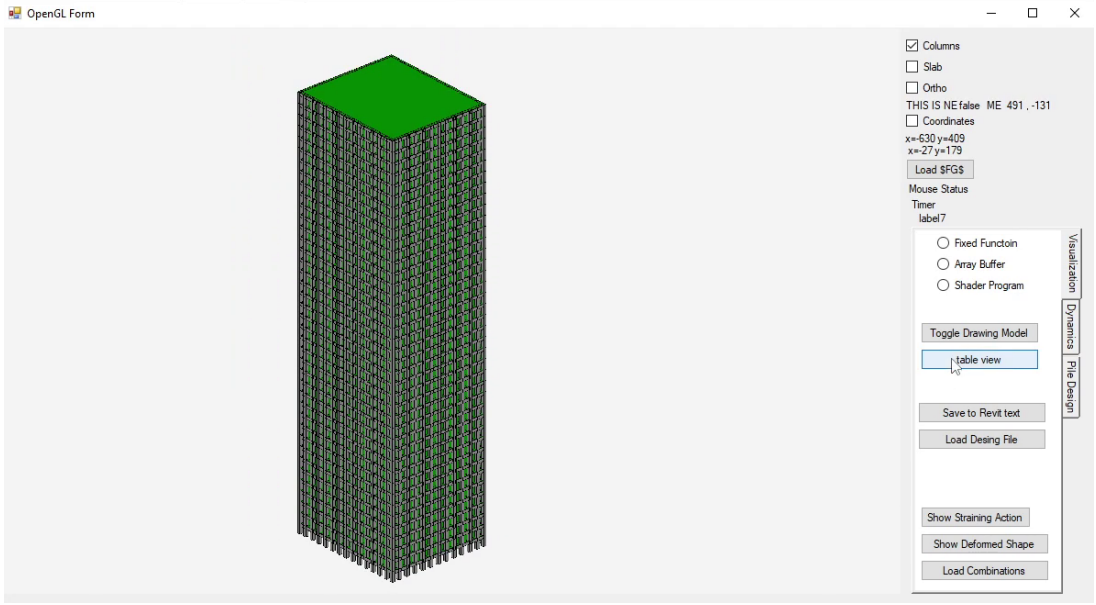


Figure 10 3D extruded view of model

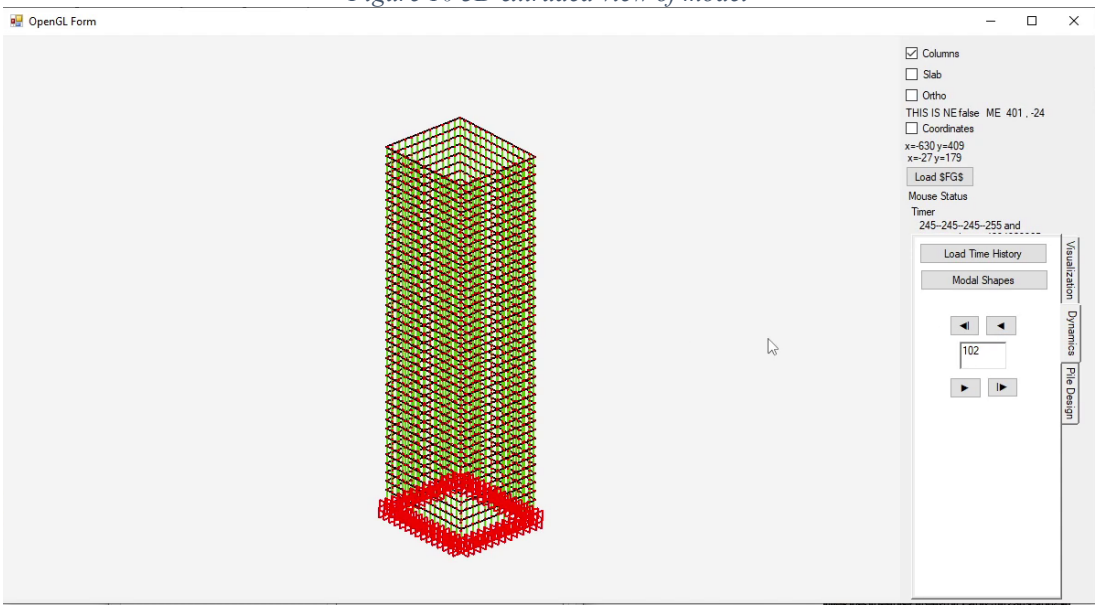


Figure 11 Toggle drawing model

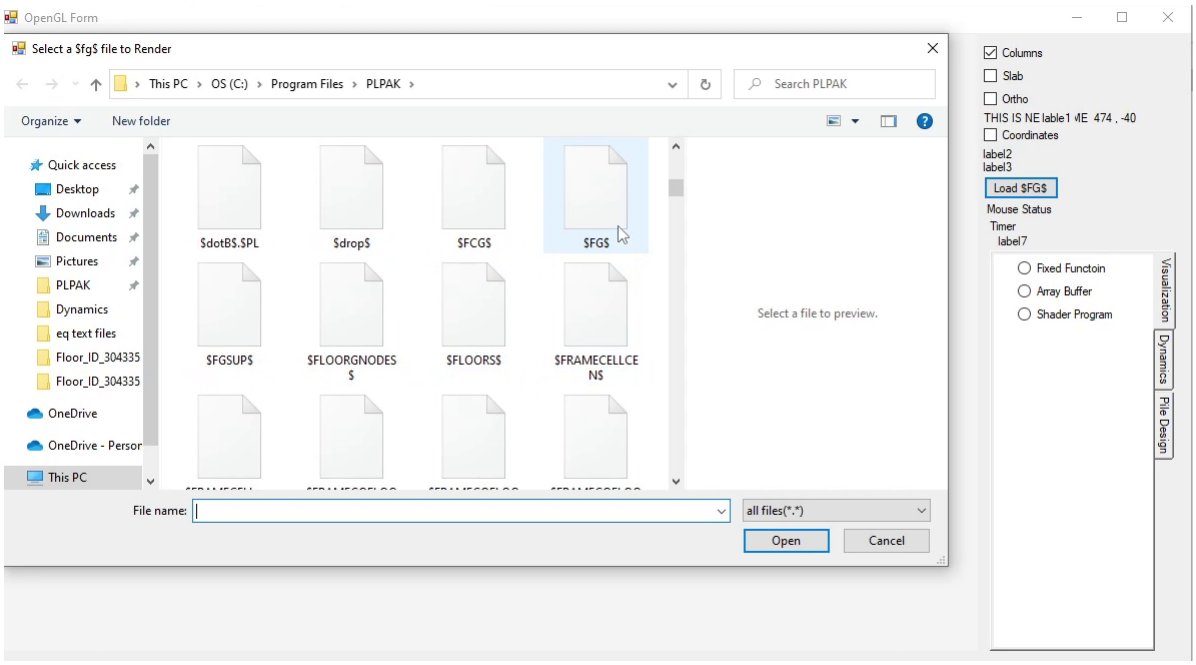
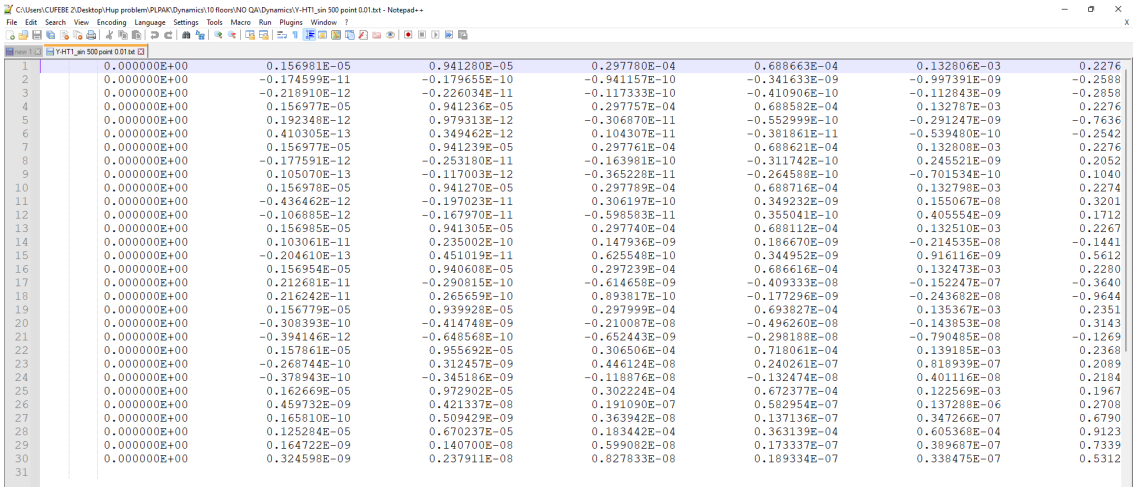


Figure 12 Selection of FG text file from PLPAK installation folder



0.000000E+00	0.156981E-05	0.941280E-05	0.297780E-04	0.688663E-04	0.132806E-03	0.2276
0.000000E+00	-0.174599E-11	-0.179655E-10	-0.941157E-10	-0.341633E-09	-0.997391E-09	-0.2588
0.000000E+00	-0.218910E-12	-0.226034E-11	-0.117333E-10	-0.410906E-10	-0.112843E-09	-0.2858
0.000000E+00	0.156977E-05	0.941236E-05	0.297757E-04	0.688582E-04	0.132787E-03	0.2276
0.000000E+00	0.192348E-12	0.979313E-12	-0.306870E-11	-0.552999E-10	-0.291247E-09	-0.7636
0.000000E+00	0.410305E-13	0.349462E-12	0.104307E-11	-0.381861E-11	-0.539480E-10	-0.2542
0.000000E+00	0.156977E-05	0.941239E-05	0.297761E-04	0.688621E-04	0.132808E-03	0.2276
0.000000E+00	-0.177591E-12	-0.253180E-11	-0.163981E-10	-0.311742E-10	0.245521E-09	0.2052
0.000000E+00	0.105070E-13	-0.117003E-12	-0.365228E-11	-0.264588E-10	-0.701534E-10	0.1040
0.000000E+00	0.156978E-05	0.941270E-05	0.297789E-04	0.688716E-04	0.132798E-03	0.2274
0.000000E+00	-0.436462E-12	-0.197023E-11	0.306197E-10	0.349232E-09	0.155067E-08	0.3201
0.000000E+00	-0.106885E-12	-0.167970E-11	-0.598583E-11	0.355041E-10	0.405554E-09	0.1712
0.000000E+00	0.156985E-05	0.941305E-05	0.297740E-04	0.688112E-04	0.132510E-03	0.2267
0.000000E+00	0.103061E-11	0.235002E-10	0.147936E-09	0.186670E-09	-0.214535E-08	-0.1441
0.000000E+00	-0.204610E-13	0.451019E-11	0.625548E-10	0.344952E-09	0.916116E-09	0.5612
0.000000E+00	0.156954E-05	0.940608E-05	0.297239E-04	0.686616E-04	0.132473E-03	0.2280
0.000000E+00	0.212681E-11	-0.290815E-10	-0.614658E-09	-0.409333E-08	-0.152247E-07	-0.3640
0.000000E+00	0.216242E-11	0.265659E-10	0.893817E-10	-0.177296E-09	-0.243682E-08	-0.9644
0.000000E+00	0.156779E-05	0.939928E-05	0.297999E-04	0.693827E-04	0.135367E-03	0.2351
0.000000E+00	-0.308393E-10	-0.414748E-09	-0.210087E-08	-0.496260E-08	-0.143853E-08	0.3143
0.000000E+00	-0.394146E-12	-0.648568E-10	-0.652443E-09	-0.298188E-08	-0.790485E-08	-0.1269
0.000000E+00	0.157861E-05	0.955692E-05	0.306506E-04	0.718061E-04	0.139185E-03	0.2368
0.000000E+00	-0.268744E-10	0.312457E-09	0.446124E-08	0.240261E-07	0.818939E-07	0.2089
0.000000E+00	-0.378943E-10	-0.345186E-09	-0.118076E-08	-0.132474E-08	0.401116E-08	0.2184
0.000000E+00	0.162669E-05	0.972902E-05	0.302224E-04	0.672377E-04	0.122569E-03	0.1967
0.000000E+00	0.459732E-09	0.421337E-08	0.191090E-07	0.582954E-07	0.137288E-06	0.2708
0.000000E+00	0.165810E-10	0.509429E-09	0.363942E-08	0.137136E-07	0.347266E-07	0.6790
0.000000E+00	0.125284E-05	0.670237E-05	0.183442E-04	0.363139E-04	0.605368E-04	0.9123
0.000000E+00	0.164722E-09	0.140700E-08	0.599082E-08	0.173337E-07	0.389687E-07	0.7339
0.000000E+00	0.324598E-09	0.237911E-08	0.827833E-08	0.189334E-07	0.338475E-07	0.5312

Figure 13 "Y-HT1" text file

Name	Date modified	Type	Size
A	6/21/2022 11:14 PM	File	21 KB
CMATRIX	6/21/2022 11:13 PM	File	24 KB
DampingParameters	6/21/2022 11:11 PM	File	1 KB
F-HT1	6/21/2022 11:14 PM	File	337 KB
FT	6/21/2022 11:14 PM	File	191 KB
K-COND	6/21/2022 11:14 PM	File	517,496 KB
KM	6/21/2022 11:14 PM	File	17 KB
M-COND	6/21/2022 11:14 PM	File	427,486 KB
Mode	6/21/2022 11:14 PM	File	74 KB
TH-DAT_sin 500 point 0.01.txt	6/21/2022 11:13 PM	TXT File	6 KB
XM	6/21/2022 11:14 PM	File	17 KB
XM1	6/21/2022 11:06 PM	File	0 KB
Y-HB	6/21/2022 11:10 PM	File	0 KB
Y-HT1_sin 500 point 0.01.txt	6/21/2022 11:14 PM	TXT File	337 KB

Figure 14 Dynamics created folder

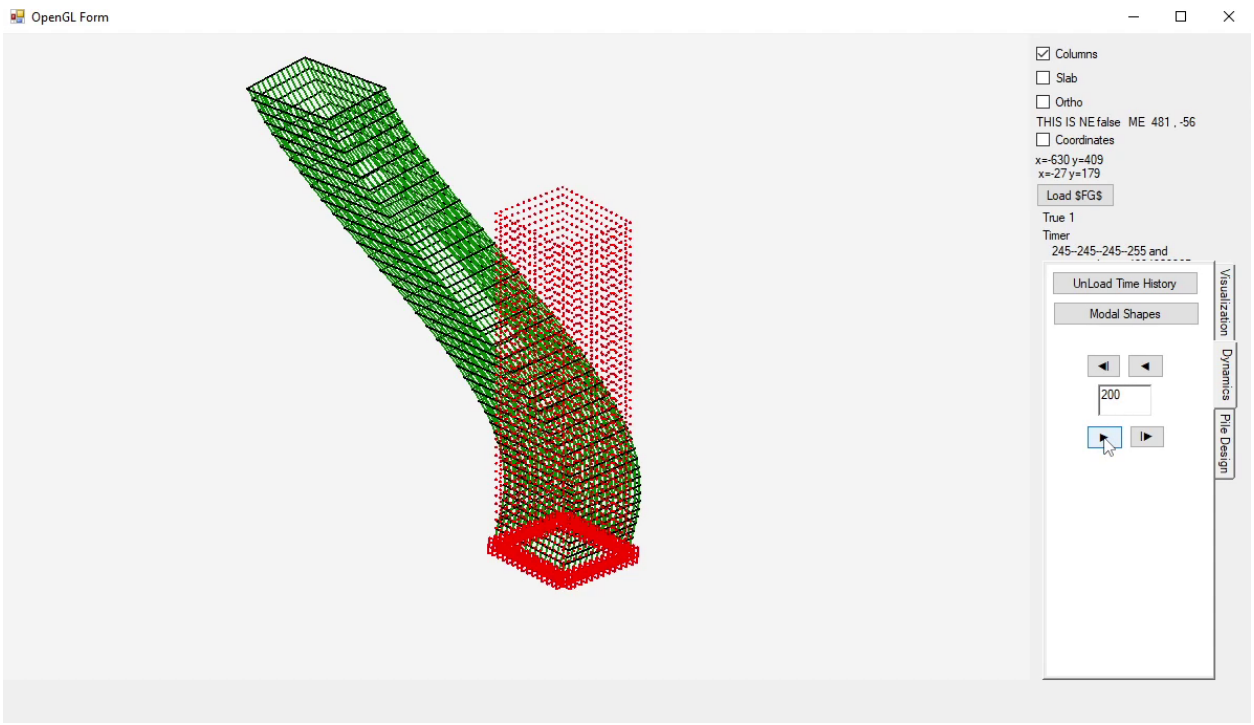


Figure 15 Structure time history displacement

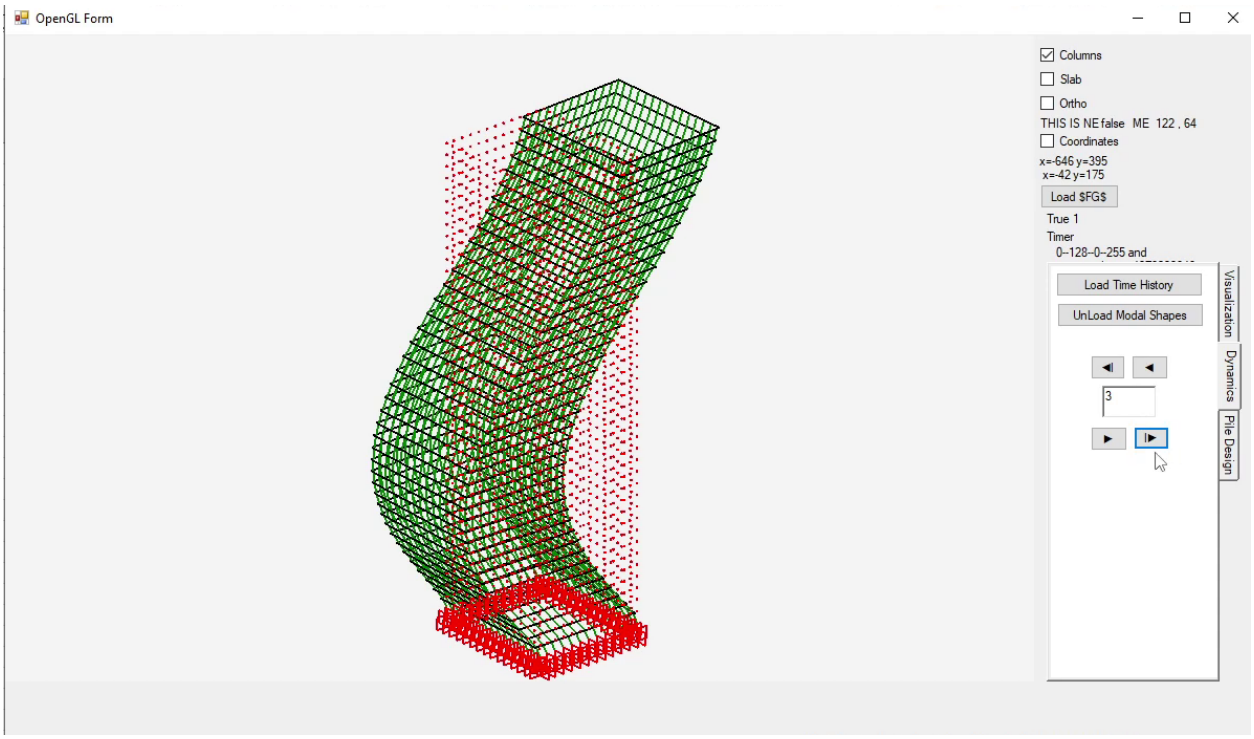


Figure 16 Structure mode shape

Getting Help

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