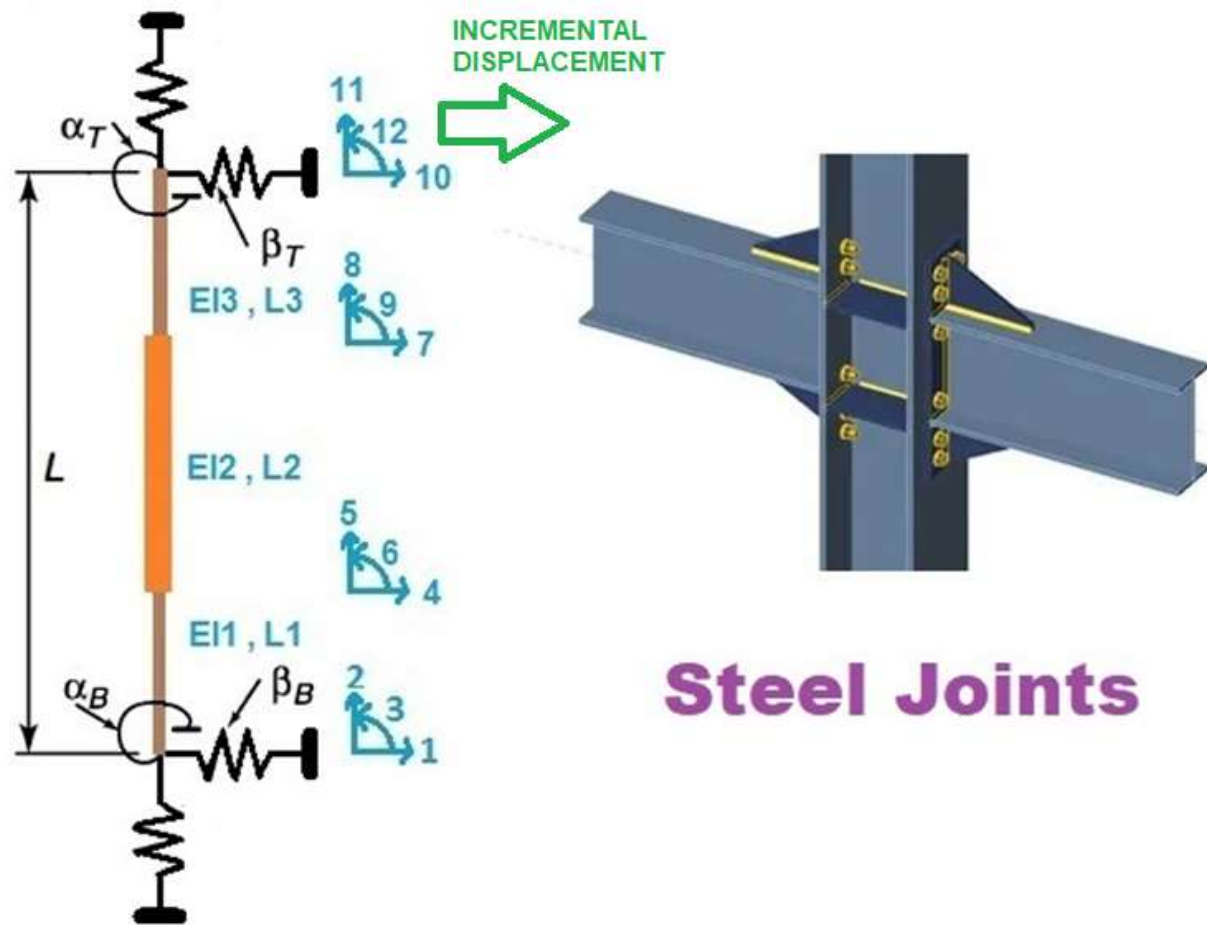


IN THE NAME OF ALLAH, THE MOST GRACIOUS, THE MOST MERCIFUL

PUSHOVER ANALYSIS OF STEEL COLUMNS WITH AXIAL AND ROTATIONAL SPRINGS FOR MODELING BEAM COLUMN JOINTS

WRITTEN BY SALAR DELAVAR GHASHGHAEI (QASHQAI)



Spyder (Python 3.12)

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C:\Users\Dell\Desktop\OPENSEES_FILES\CONCRETE_COLUMN_JOINTS_CONTACT\STEEL_COLUMN_JOINTS.py

STEEL_COLUMN_JOINTS.py

```
1  # #####
2  #                               IN THE NAME OF ALLAH #
3  #                               PUSHOVER ANALYSIS OF STEEL COLUMNS WITH AXIAL AND ROTATIONAL SPRINGS #
4  #                               FOR MODELING BEAM COLUMN JOINTS #
5  #                               ----- #
6  #                               THIS PROGRAM WRITTEN BY SALAR DELAVAR GHASHGHAEI (QASHQAI) #
7  #                               EMAIL: salar.d.ghashghaei@gmail.com #
8  #                               #####
9  #%%-----
10 # PAPER: Study on Structural Behaviour of Fully Bolted Beam Column Joints in Modular Steel Buildings
11 # https://link.springer.com/chapter/10.1007/978-3-031-12011-4\_63
12 # MASTER THESIS: MODELING OF INTERIOR BEAM-COLUMN JOINTS FOR NONLINEAR ANALYSIS OF REINFORCED CONCRETE FRAME:
13 # https://tspace.library.utoronto.ca/bitstream/1807/75836/3/Pan\_Zhongcheng\_201611\_MAS\_thesis.pdf
14 # YOUTUBE: Beam column joint modelling in ABAQUS
15 # https://www.youtube.com/watch?v=j33VlhZ9oZo
16 # YOUTUBE: ABAQUS Tutorial, Reinforced Concrete Beam-Column Joint Modeling, Analysis and behavior
17 # https://www.youtube.com/watch?v=AfeYRbJOfzw
18 #%%-----
19 # Load the image
20 def PLOT_IMAGE(image):
21     import matplotlib.pyplot as plt
22     import matplotlib.image as mpimg
23     image = mpimg.imread(image_path)
24
25     # Display the image
26     plt.figure(figsize=(12, 8))
27     plt.imshow(image)
28     plt.axis('off') # Hide axes
29     plt.show()
30
31 image_path = 'STEEL_COLUMN_JOINTS.jpg'
32 PLOT_IMAGE(image_path)
33 #%%-----
34
```

27 %

Steel Joints

INCREMENTAL DISPLACEMENT

Help Variable Explorer Debugger Plots Files

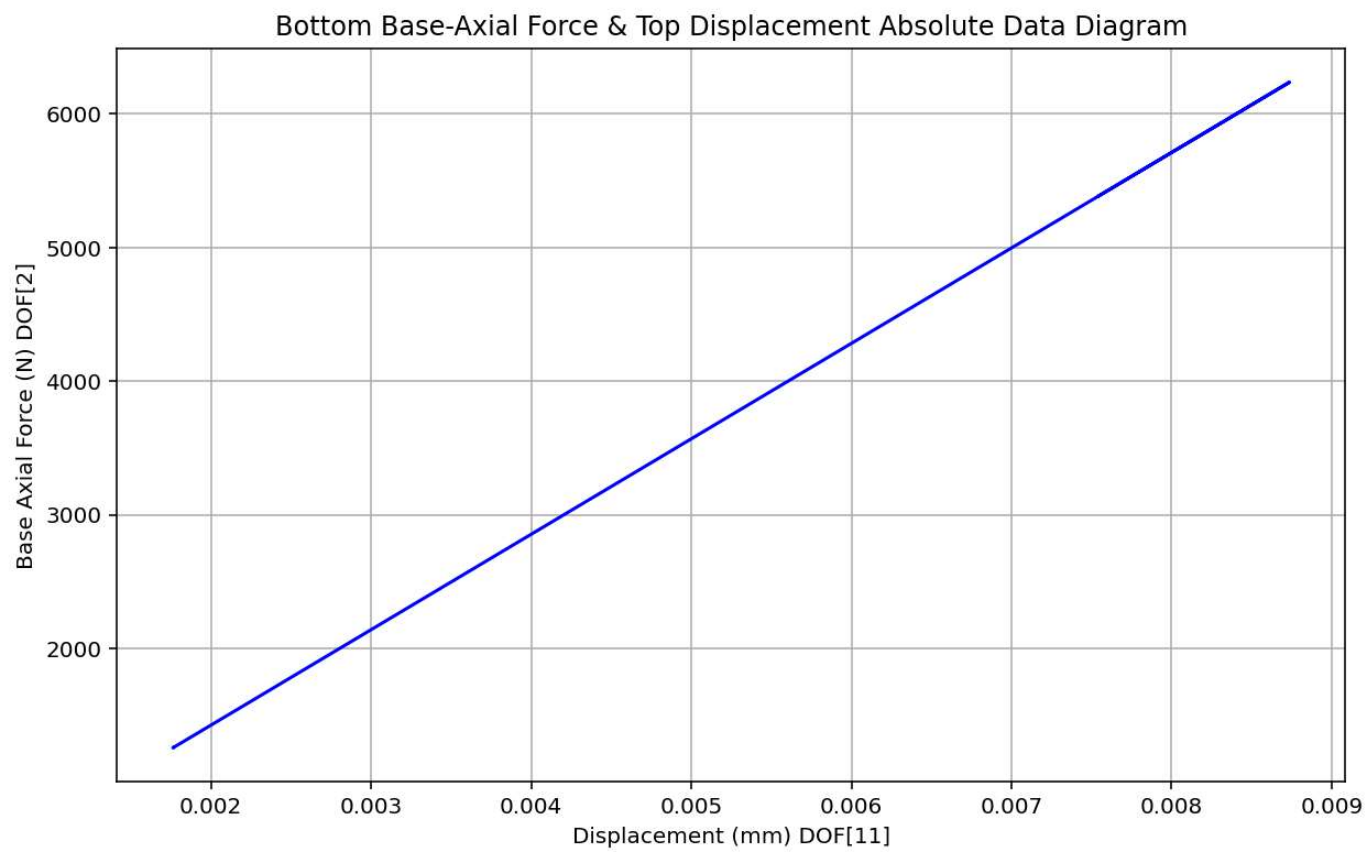
Console 1/A

```
WARNING ZeroLength::checkDirection - incorrect direction 10 is set to 0
WARNING ZeroLength::checkDirection - incorrect direction 11 is set to 0
WARNING: CTestNormUnbalance::test() - failed to converge after: 20000 iterations current Norm: 8.17039e-09 (max: 1e-10, Norm deltaX: 8.60982e-16)
NewtonRaphson::solveCurrentStep() -the ConvergenceTest object failed in test()
StaticAnalysis::analyze() - the Algorithm failed at step: 0 with domain at load factor -1077.83
```

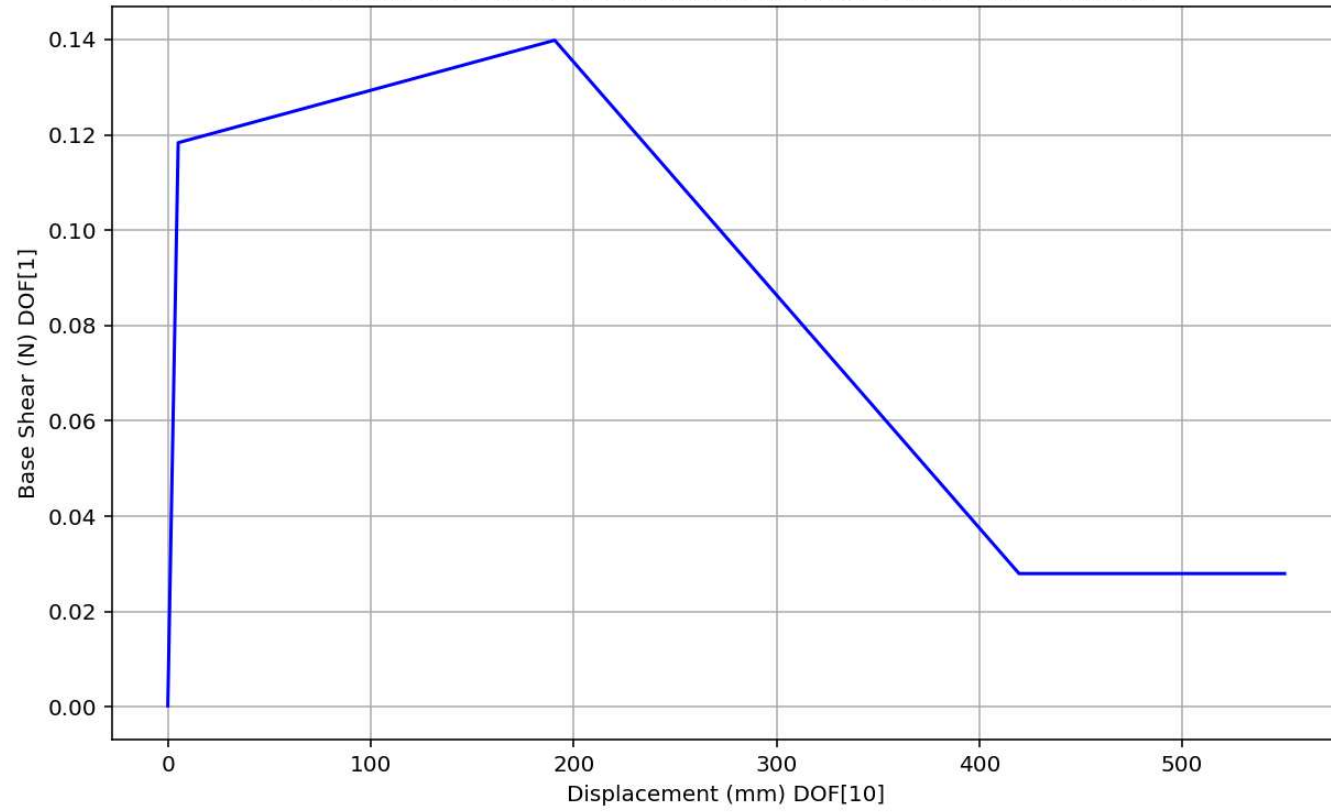
IPython Console History

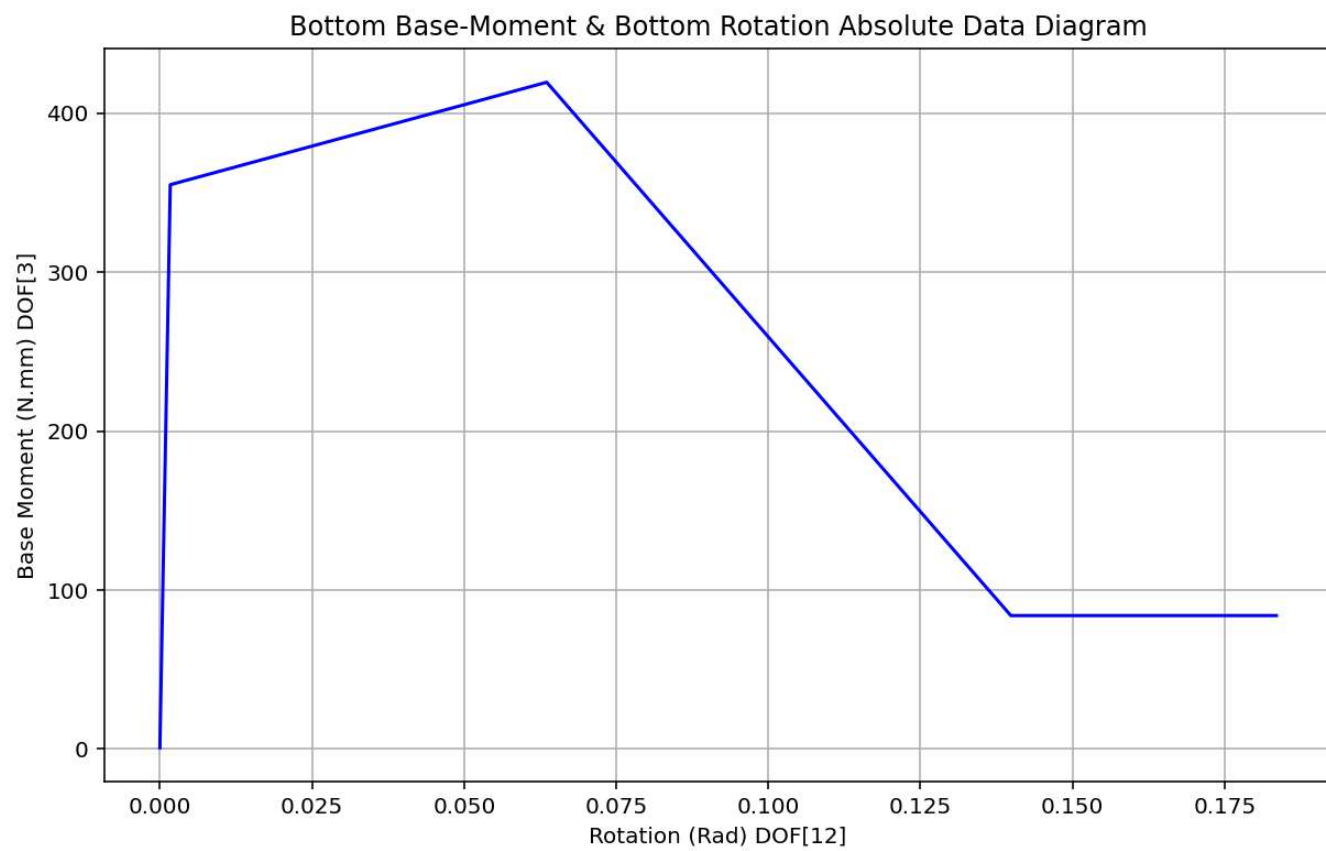
Save file

Inline Conda: anaconda3 (Python 3.12.7) LSP: Python Line 15, Col 31 UTF-8 CRLF RW Mem 36%



Bottom Base-Shear & Top Displacement Absolute Data Diagram





Bottom Base-Shear & Drift Absolute Data Diagram

