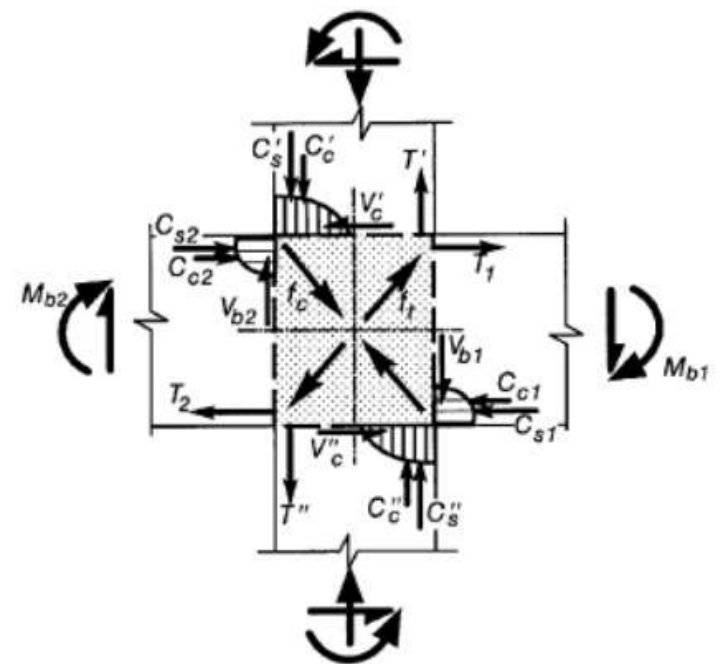
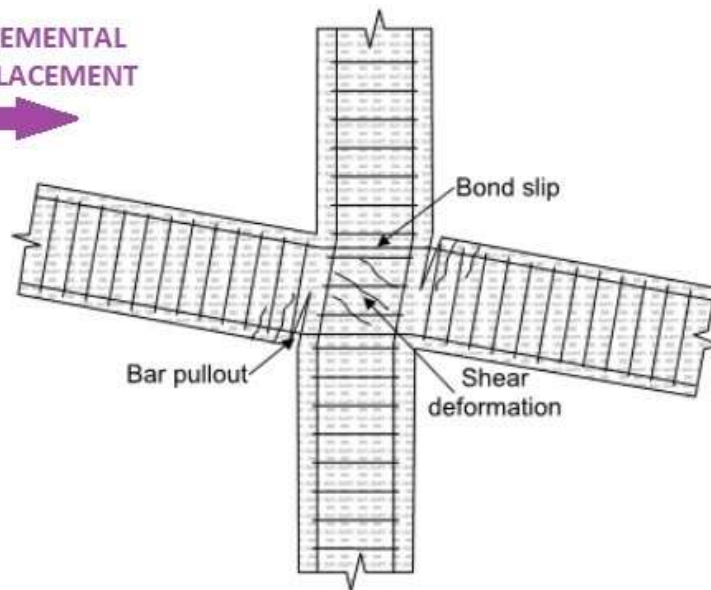
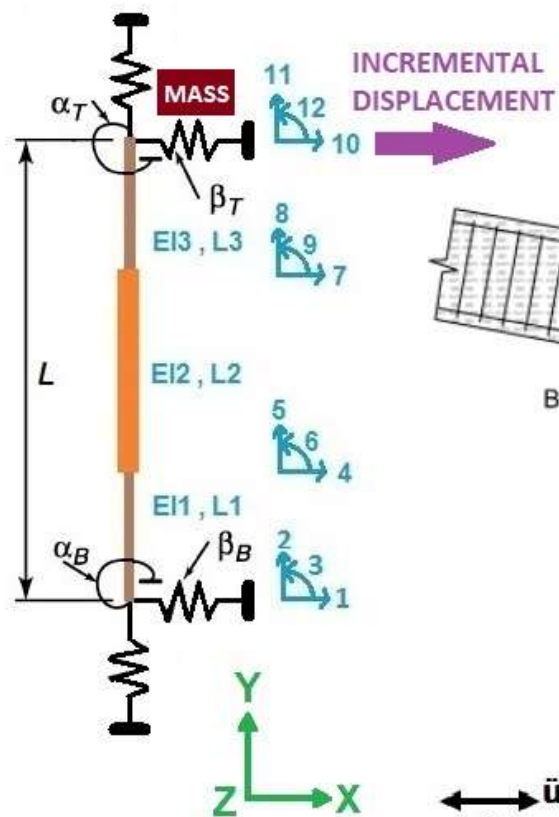


IN THE NAME OF ALLAH

# **PUSHOVER ANALYSIS OF CONCRETE COLUMNS WITH AXIAL AND ROTATIONAL SPRINGS FOR MODELING BEAM COLUMN JOINTS**

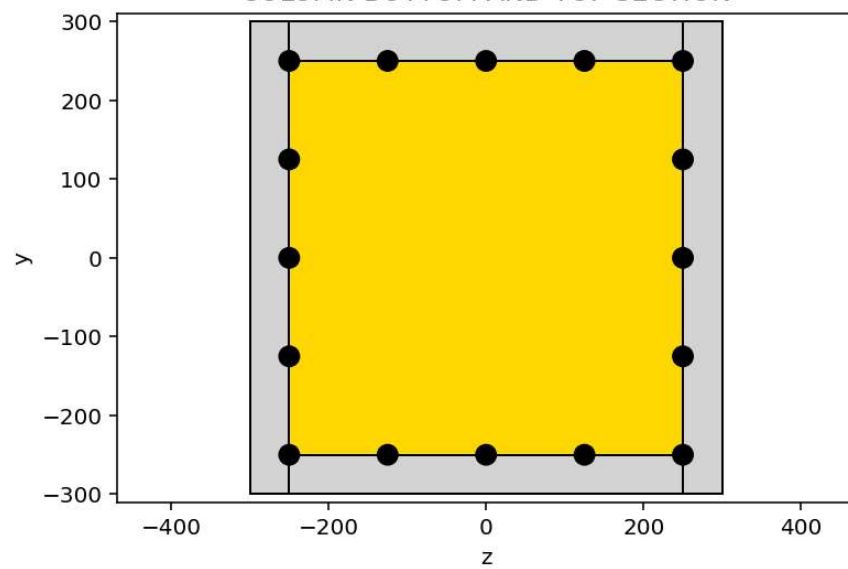
THIS PROGRAM WRITTEN BY SALAR DELAVAR GHASHGHAEE (QASHQAI)



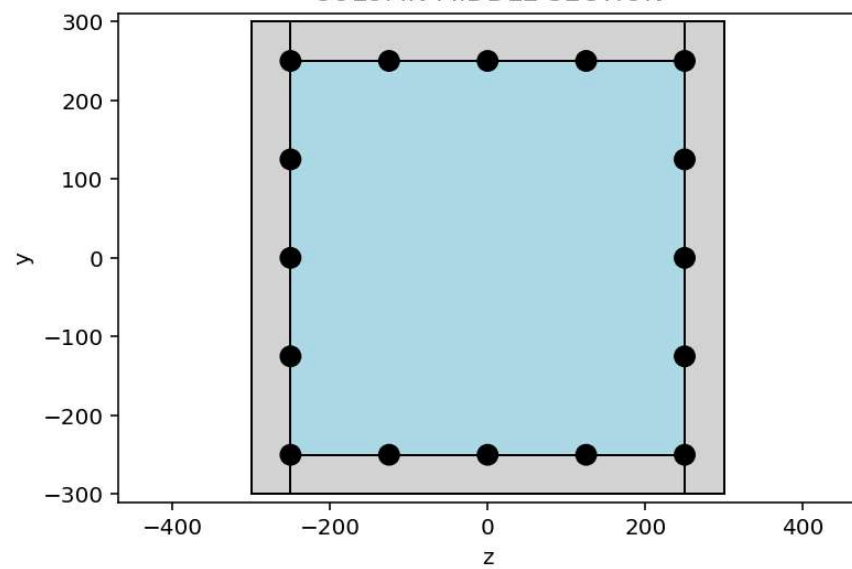
## Concrete Joints



COLUMN BOTTOM AND TOP SECTION



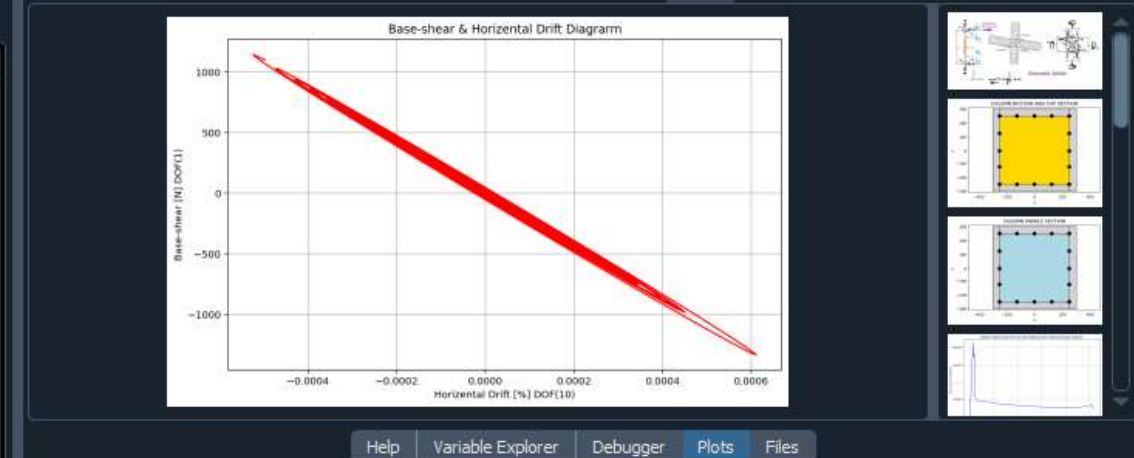
COLUMN MIDDLE SECTION



C:\Users\ DELL\Desktop\OPENSEES\_FILES\COLUMN\_JOINT...OPENSEES\_COLUMN\_JOINT\_SPRINGS\_CONCRETE\_CONTACT.py >>

```
OPENSEES_COLUMN_JO...ONCRETE_CONTACT.py X
563 REBAR_DIA = 25 # [mm] Steel Rebar Diameter
564
565 ### DEFINE LOAD PROPERTIES:
566 PX = 100.0 # [N] HORIZONTAL FORCE - DOF[10]
567 PY = 0.0 # [N] VERTICAL FORCE - DOF[11]
568 MZ = 0.0 # [N.mm] MOMENT FORCE - DOF[12]
569 MAX_DISP = 520 # [mm] MAXIMUM DISPLACEMENT - DOF[10]
570 DISP_INCR = 0.01 # [mm] EACH DISPLACEMENT INCREMENT - DOF[10]
571
572
573 ### PUSHOVER DIRECTION:
574 # [1]: X-DIRECTION - HORIZONTAL DISPLACEMENT
575 # [2]: Y-DIRECTION - VERTICAL DISPLACEMENT
576 # [3]: Z-DIRECTION - ROTATION
577 KIND = 1
578
579 ### CONTACT:
580 CONTACT = True # True: HAVE CONTACT - False: DO NOT HAVE CONTACT
581 CONTACT_DISP = 450 # [mm] CONTACT MAXIMUM DISPLACEMENT - DOF[10]
582
583 ### ANALYSIS TOLANCE AND ITERATIONS
584 MAX_ITERATIONS = 5000 # Maximum number of iterations
585 MAX_TOLERANCE = 1.0e-10 # Specified tolerance for convergence
586
587
588 starttime = time.process_time()
589
590 ### RUN THE ANALYSIS:
591 DATA = PUSHOVER_ANALYSIS(COL, PX, PY, MZ, MAX_DISP, DISP_INCR, Bcol, Hcol,
592 displacements_x, displacements_y, drift, rotations, base_shears, base_axia
593
594 totaltime = time.process_time() - starttime
595 print(f'\nTotal time (s): {totaltime:.4f} \n\n')
596 #%%-----
```

32 %

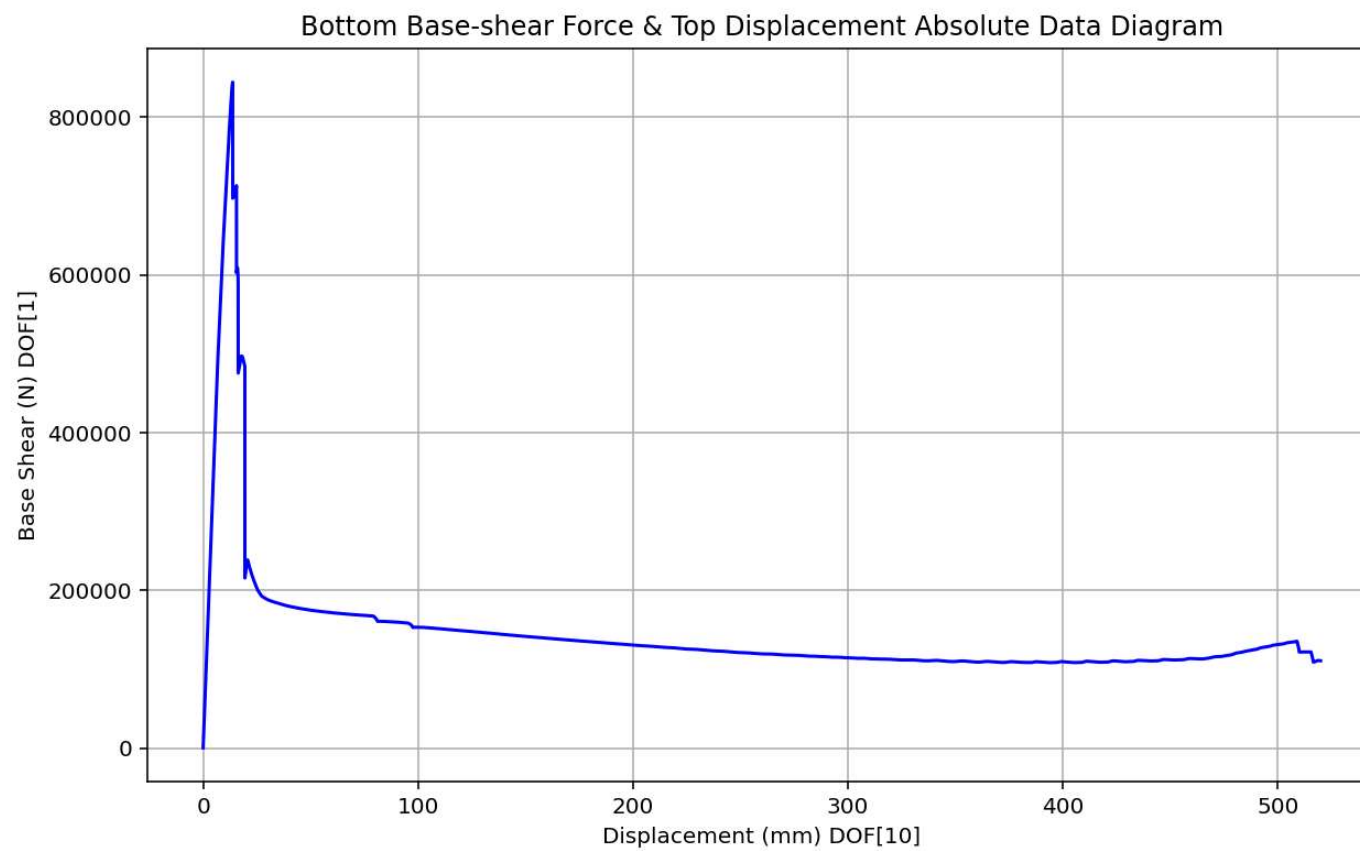


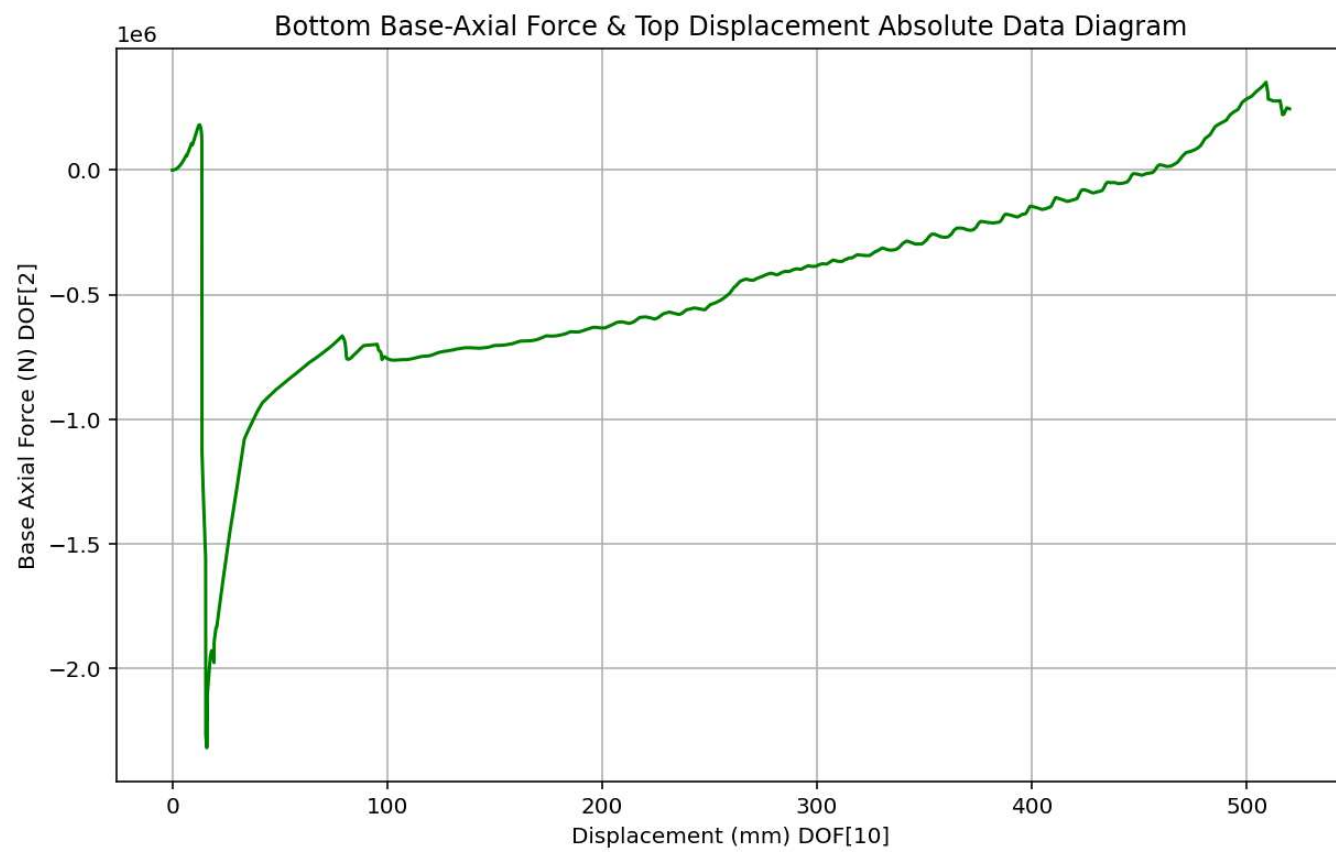
```
Console 1/A X
AcceleratedNewton::solveCurrentStep() -The ConvergenceTest object failed in test()
StaticAnalysis::analyze() - the Algorithm failed at step: 0 with domain at load factor 1.56881e+08
OpenSees > analyze failed, returned: -3 error flag
NormDispIncr KrylovNewton 0
IN STEP 45000 CONTACT DONE!
Pushover Done.

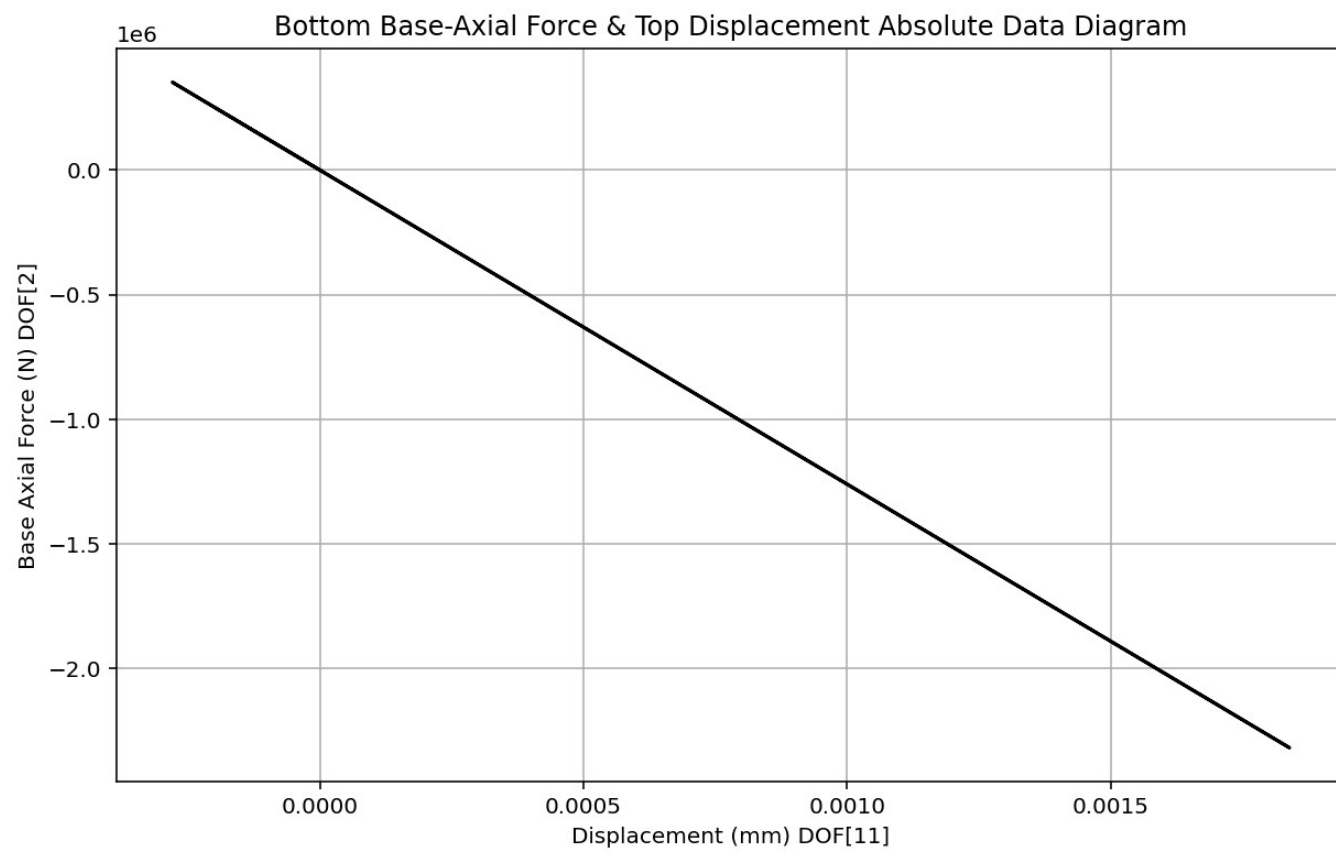
Total time (s): 415.6719

Model Built
```

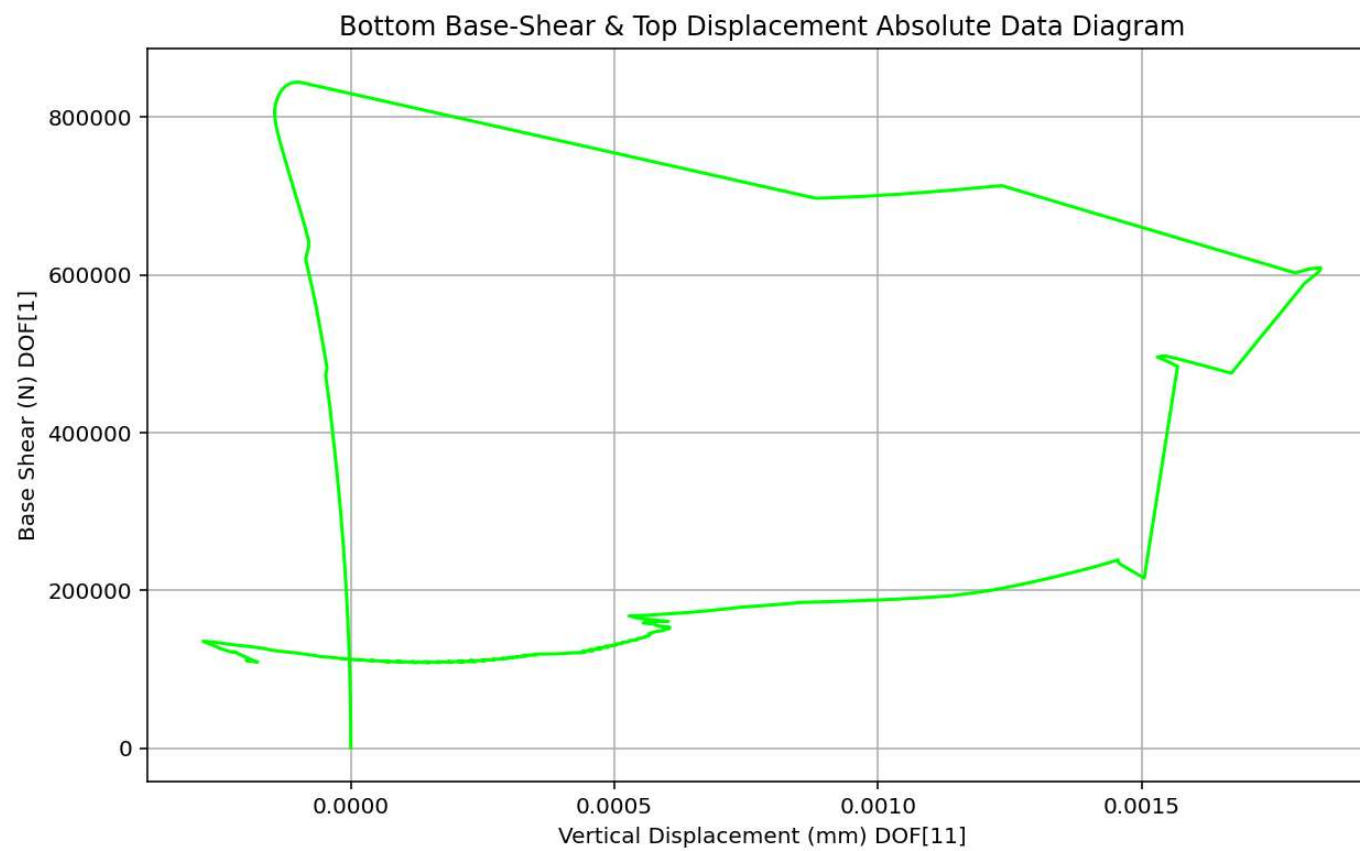
# **PUSHOVER ANALYSIS OF CONCRETE COLUMNS WITH AXIAL AND ROTATIONAL SPRINGS FOR MODELING BEAM COLUMN JOINTS**

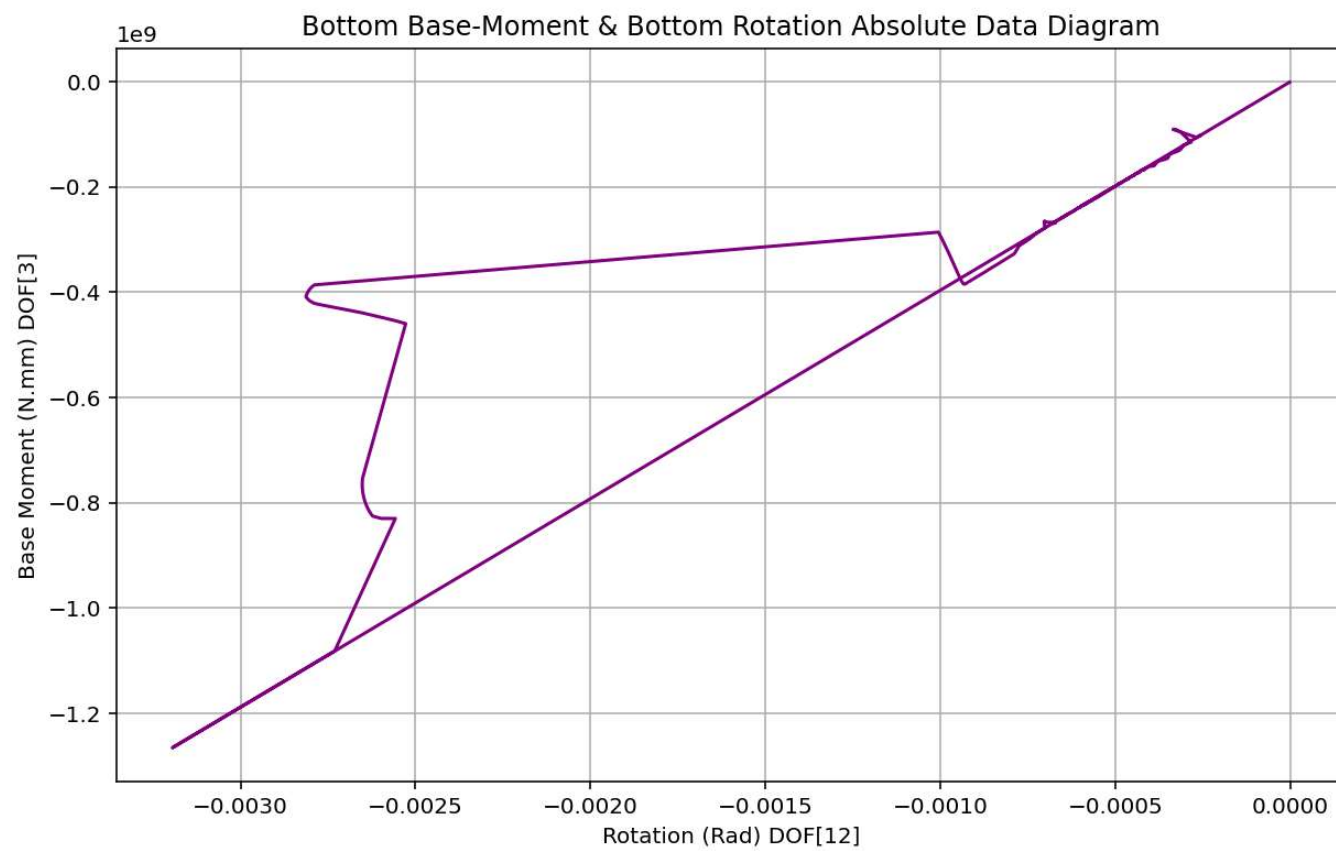




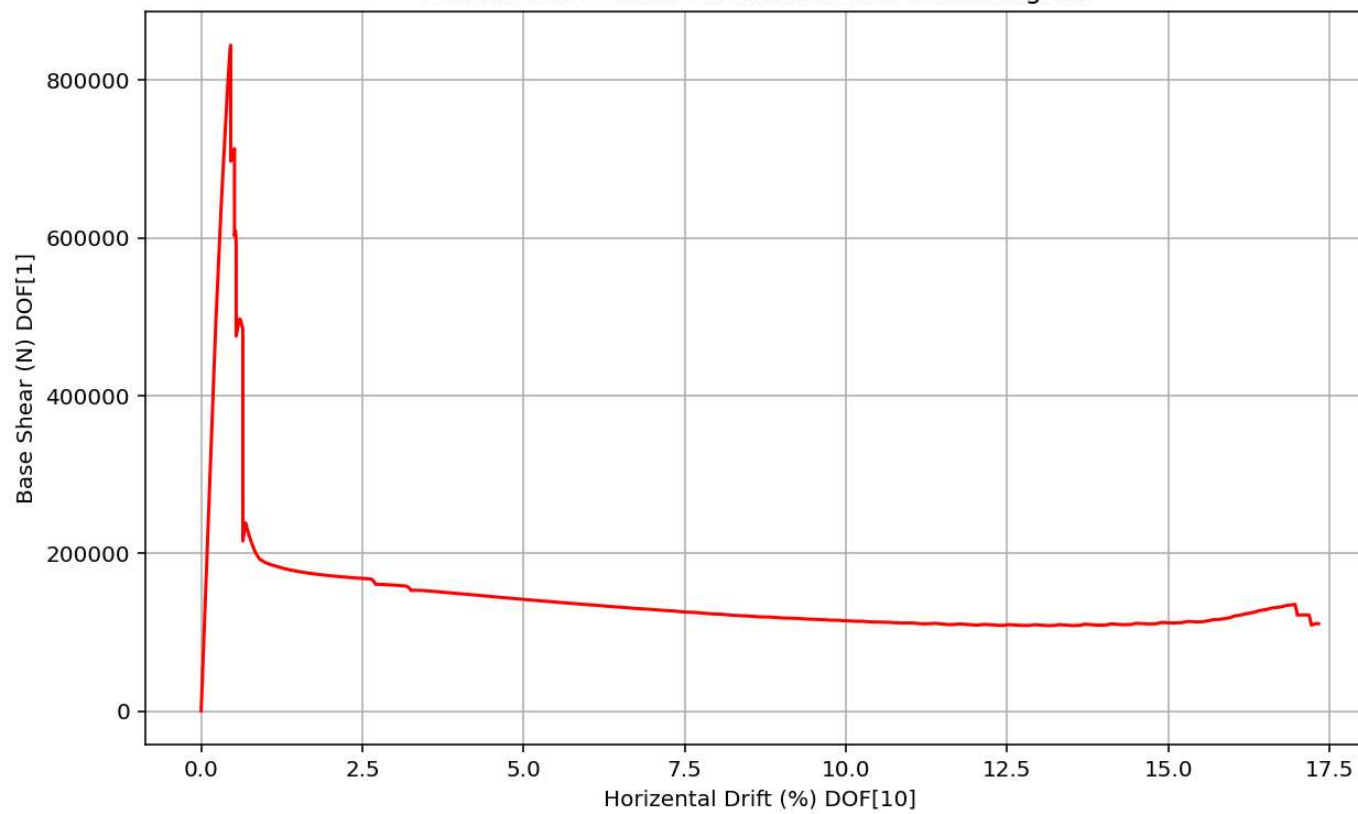






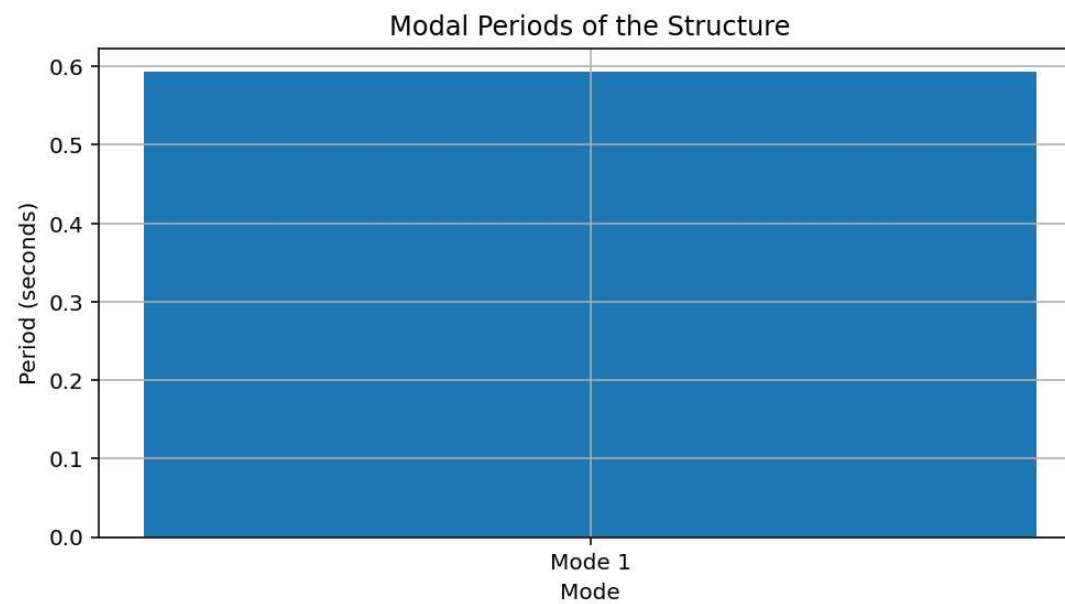


Bottom Base-Shear & Drift Absolute Data Diagram



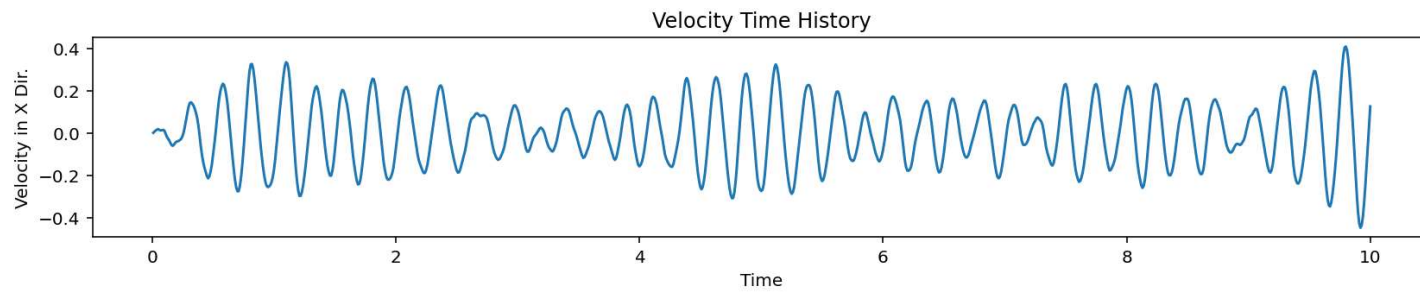
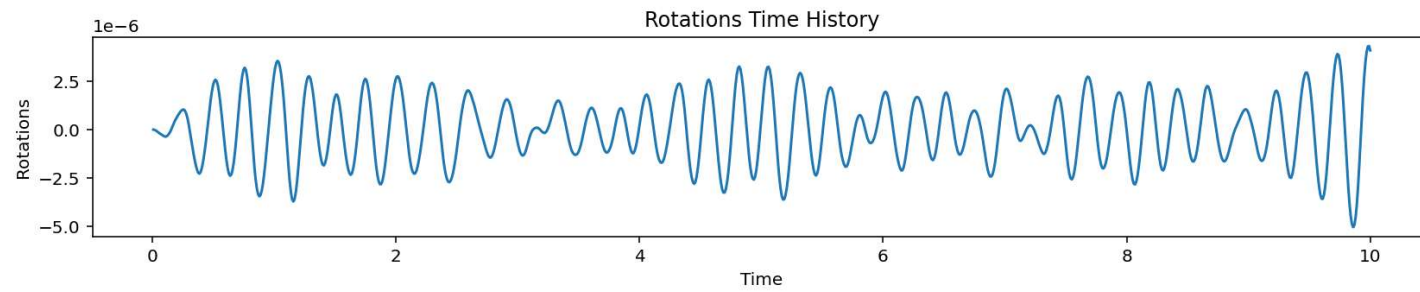
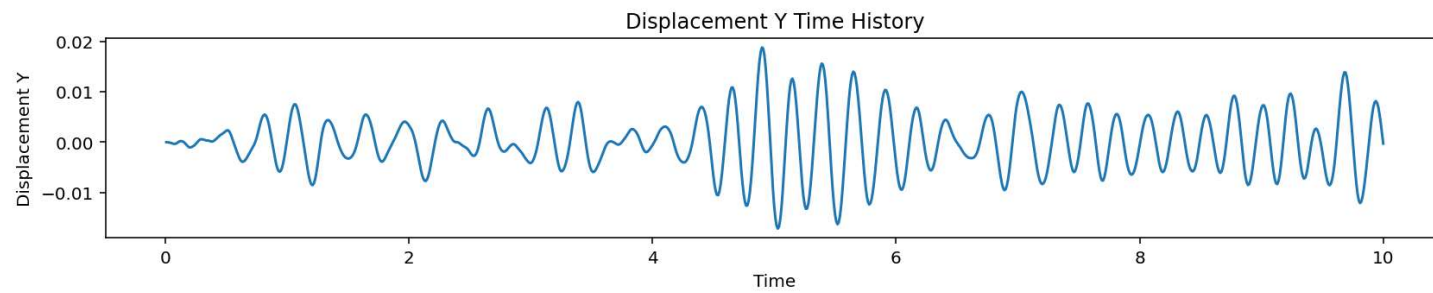
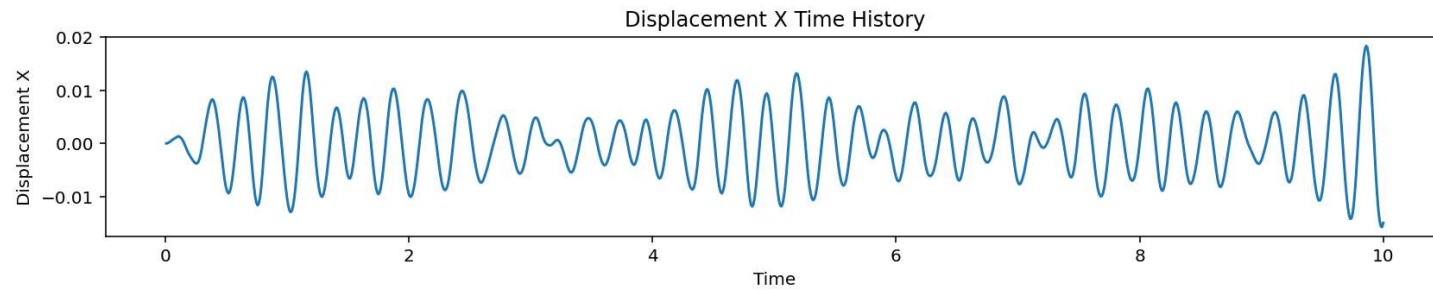


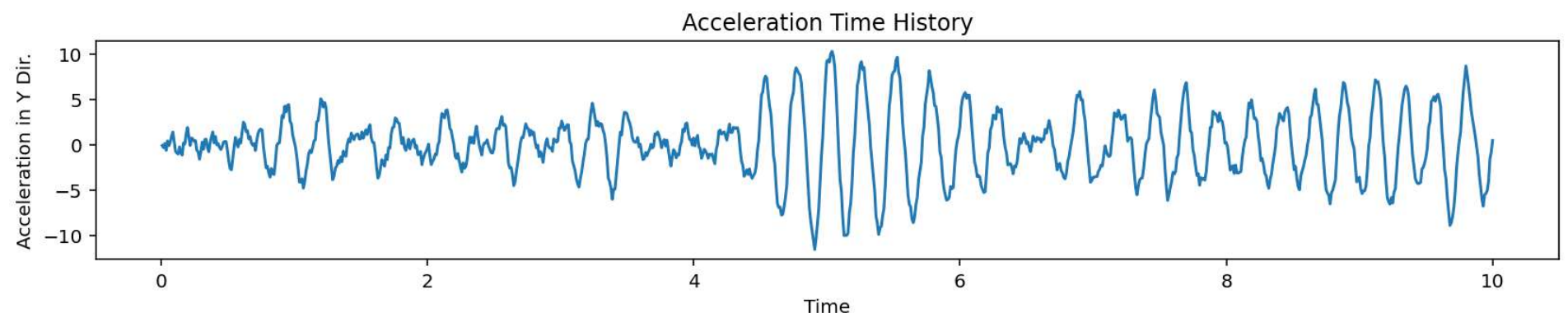
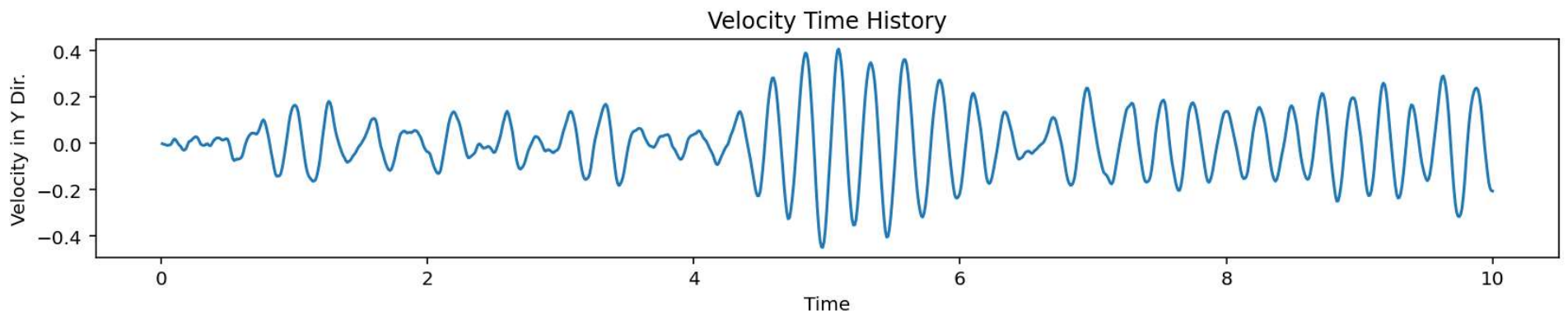
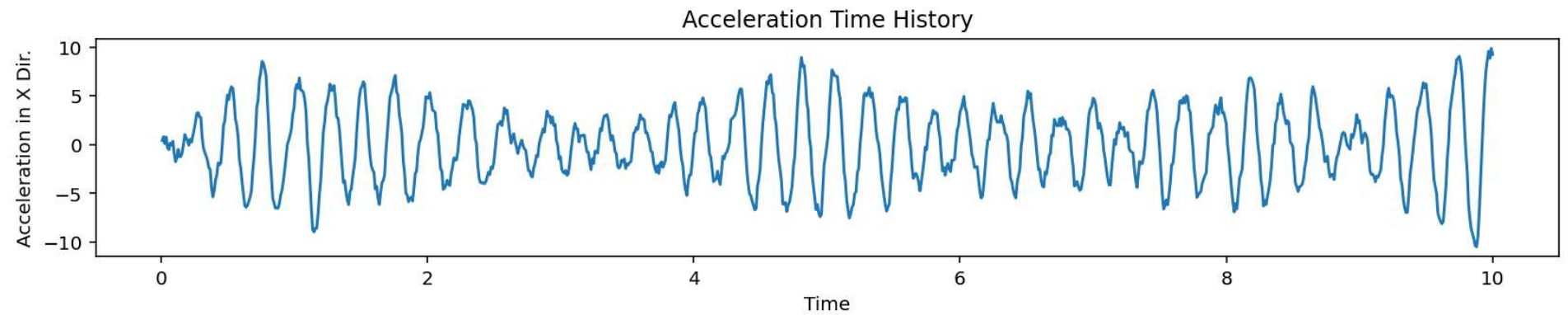
# **DYNAMIC ANALYSIS OF CONCRETE COLUMNS WITH AXIAL AND ROTATIONAL SPRINGS FOR MODELING BEAM COLUMN JOINTS**



Period: 0.12475926338077073 (s)

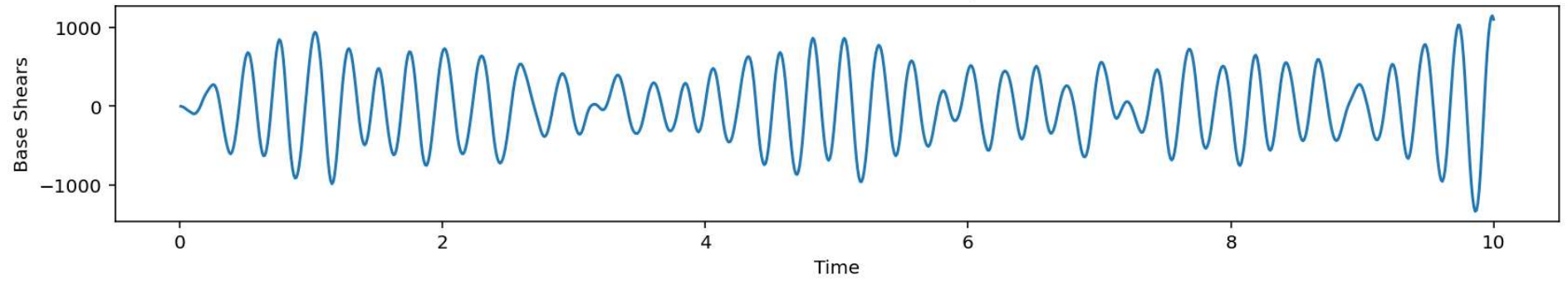
Natural Frequency: 8.015436873396377 (Hz)



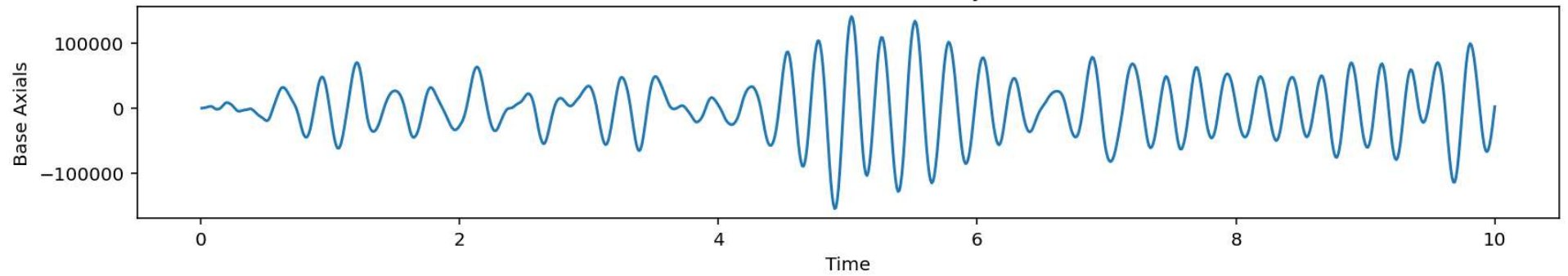




Base Shears Time History



Base Axials Time History



Base Moments Time History

