1. Summary

1.1 Motivation/purpose/aims/hypothesis:

As per the authors, understanding of building collapse due to earthquakes are not very understood. An example of a building model that experiences nonlinear response and collapse when excited at its base by a sequence of simultaneous horizontal and vertical displacement pulses is given. This paper provides an alternate approach to simulate collapse better.

1.2 Contribution

This research contributes to better understanding of building collapse, via mathematical methods. Using details of the building and simulating a collapse, allows researchers to understand how building designs can be improved and from where collapse begins. The paper highlights beam shearing as the most likely reason for collapse.

1.3 Methodology

A one-dimensional structural model is a fixed-base shear beam of height H_b and with piecewise constant varying stiffness, determined from ambient vibration tests of the VN7SH. Material details were also taken. Shearing mathematical model is made, stress and wave motion applied and all factors calculated via various equations. Results obtained displayed as graphs and discussed later.

1.4 Conclusion

Results show that, for the example considered, for downward vertical pulses, the collapse began at the first element (counted from the base upward), and then extended to the elements above it. For upward vertical pulses, the collapse was initiated at the elements at mid-height. The collapse was initiated sooner in the case of downward vertical pulses as compared to the case of upward vertical pulses. The collapsing mechanism in this building model can be viewed as occurring due to the creation of plastic hinges at the top and bottom of the columns, which eventually allows the columns to collapse toward the horizontal (collapsed) direction, equal to $\pm \pi/2$.

2. Limitations

2.1 First Limitation/Critique

Study did not utilize any 3D-visualization techniques. Using 3D-visualization will make understanding clearer and will also reduce the need to use many 2D graphs.

2.2 Second Limitation/Critique

Study only utilized one mathematical method and did not make clear by how much the model is realistically accurate. Some points were made but very sparsely.

3. Synthesis / Future Scopes

Rocking input motions will be added in for future work. Model improvements will also be made to better the study.