

## DYNAMIC TESTING OF FULL-SCALE IRANIAN VISCOUS DAMPERS

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Located at the Science and Technology Park of University of Tehran, Behsazan Larzeh Davam Co. has developed a patented technology to systematically design and manufacture linear and nonlinear fluid viscous dampers in Iran. Designing and manufacturing of a fluid viscous damper is a multidisciplinary task which calls for significant expertise in different branches of science including, structural dynamics, fluid and solid mechanics, Computational Fluid Dynamics (CFD), etc. In this study, experimental results of three full-scale viscous dampers are presented and performances of the manufactured viscous dampers are discussed. All prototype specimens have been designed and manufactured by Behsazan Larzeh Davam Co. The main characteristics of the considered viscous dampers are shown in Figure 1.

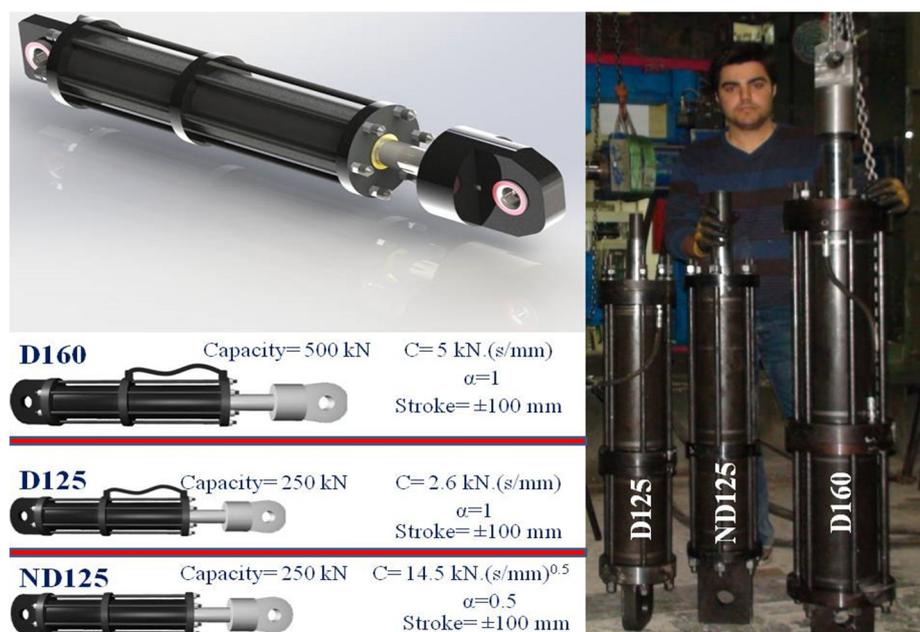


Figure 1. Details of the tested full-scale prototype specimens.

The viscous dampers have been tested in the International Institute of Earthquake Engineering and Seismology (IIEES) of Iran using a 500 kN dynamic actuator and a unique rocking set-up, as shown in Figure 2. The set-up is designed to directly transfer displacements of the actuator to the damper while preventing its out-of-plane motions.

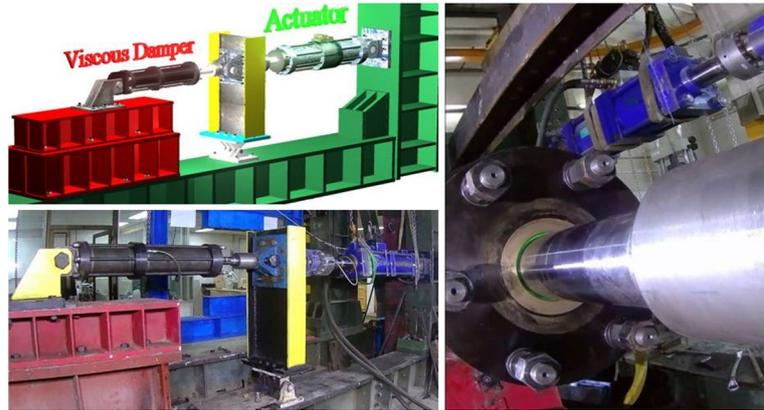


Figure 2. Adopted set-up for dynamic testing of viscous dampers.

Figure 3 illustrates obtained results from the D125 specimen. From the carried out tests, it turned out that all of the tested dampers have quite stable cyclic behaviours under different amplitudes and frequencies and they could easily satisfy ASCE7's acceptance criteria (ASCE 7, 2016). Moreover, using a case study, contribution of viscous dampers to seismic behaviour of structural and non-structural elements is investigated. As expected and already seen in earlier studies (Seleemah and Constantinou, 1997), viscous dampers can greatly alleviate different seismic-induced responses including inelastic demands and story accelerations. Finally, using finite element simulations, beneficial effect of viscous dampers on out-of-plane behaviour of non-structural masonry walls are also examined.

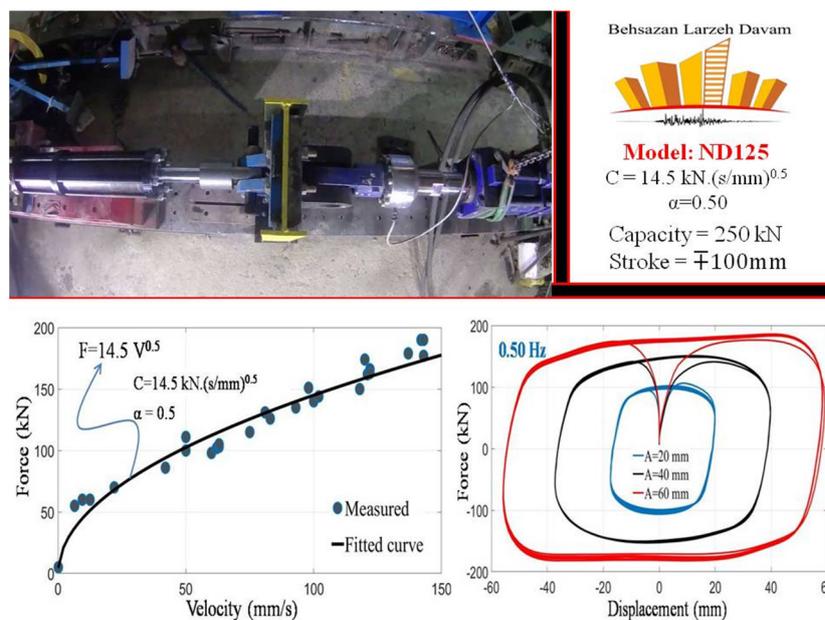


Figure 3. Behaviour of the nonlinear ND125 viscous damper.

## REFERENCES

- ASCE 7 (2016). *Minimum Design Loads and Associated Criteria for Buildings and Other Structures*. American Society of Civil Engineers, Reston, Virginia.
- Seleemah, A.A. and Constantinou, M.C. (1997). *Investigation of Seismic Response of Buildings with Linear and Nonlinear Fluid Viscous Dampers*. Technical Report NCEER-97-0004. National Center for Earthquake Engineering Research, State University of New York at Buffalo, Buffalo, NY.