Creazione di un Ambiente Domestico Sicuro

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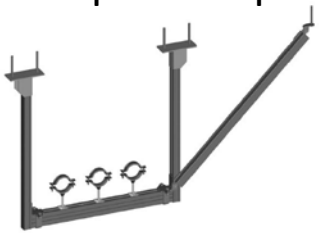
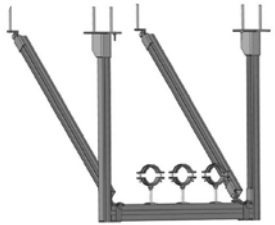
Daniele Perrone – Università del Salento

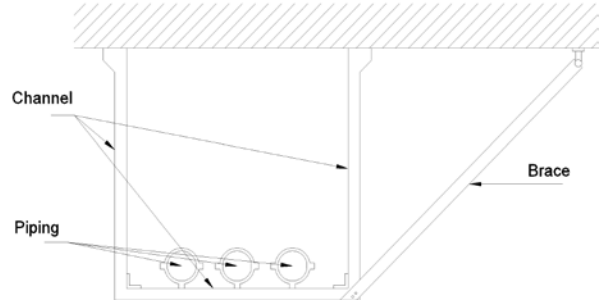
Sviluppo di un dispositivo innovativo per la protezione sismica di impianti sospesi

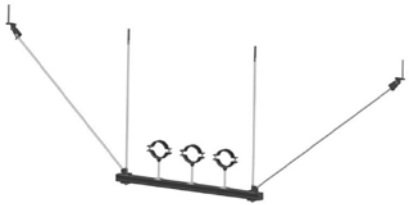
CURRENT PRACTICE FOR SUSPENDED PIPING

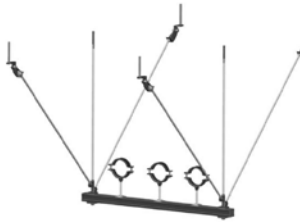
- Seismic design aims to increase lateral stiffness, usually through the implementation of trapeze restraints or sway bracing.
- The distribution of the restraints is based on tributary seismic mass per support and prescriptive requirements.

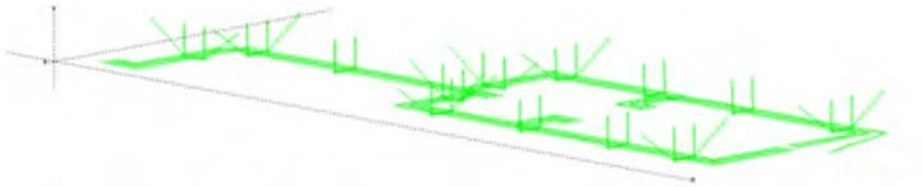






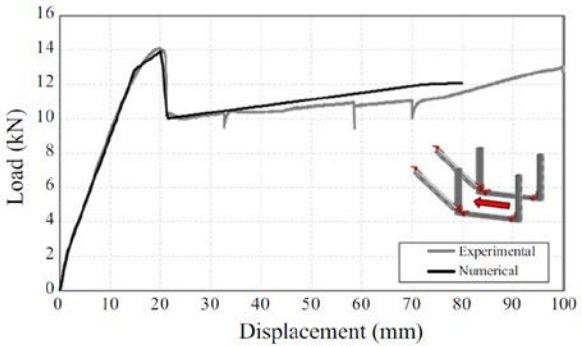






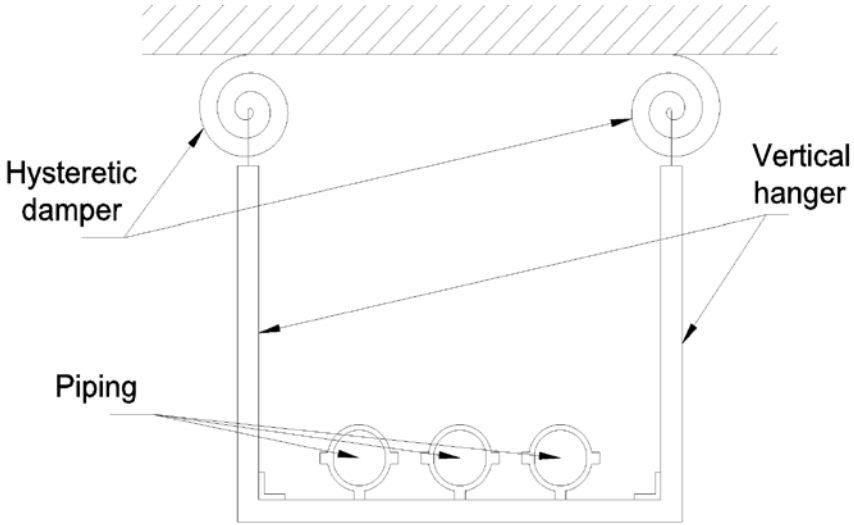
PROBLEMS FOR SUSPENDED PIPING

- Large lateral stiffness differences between piping lines and seismic restraints.
- Nonlinear behavior generated by the inelastic response of connection elements.
- Residual displacements and induced damage on the seismic restraints.
- Lack of space for anchoring points or supporting elements in congested layouts.



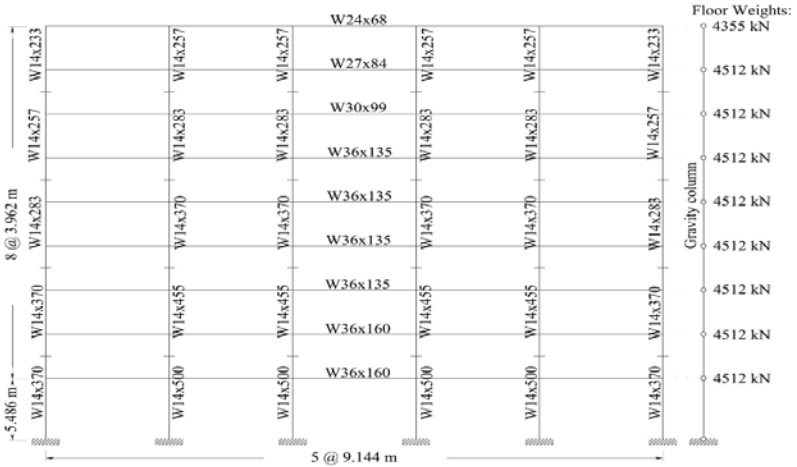
BRACELESS SEISMIC RESTRAINT

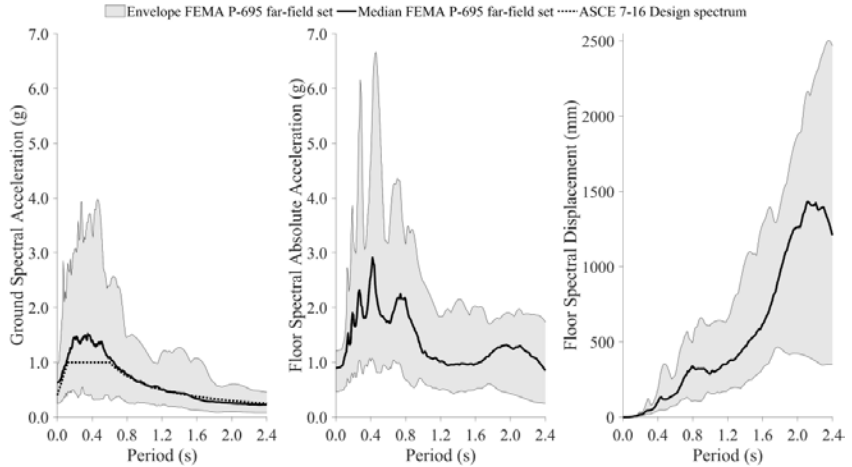
- The seismic response is controlled through supplemental damping.
- Inelastic response generated by a hysteretic damper.
- There is no need of bracing elements, smaller area for installation.
- Small, if any, induced seismic damage on the restraint elements.
- Residual displacements can be easily recentered.



APPLICATION EXAMPLE: CASE STUDY

- A transverse restraint was assumed at the top floor of a nine-story moment-resisting steel frame.
- The floor motions were obtained from nonlinear time-history analyses using the FEMA P695 far-field ground motion set scaled to two intensity levels.





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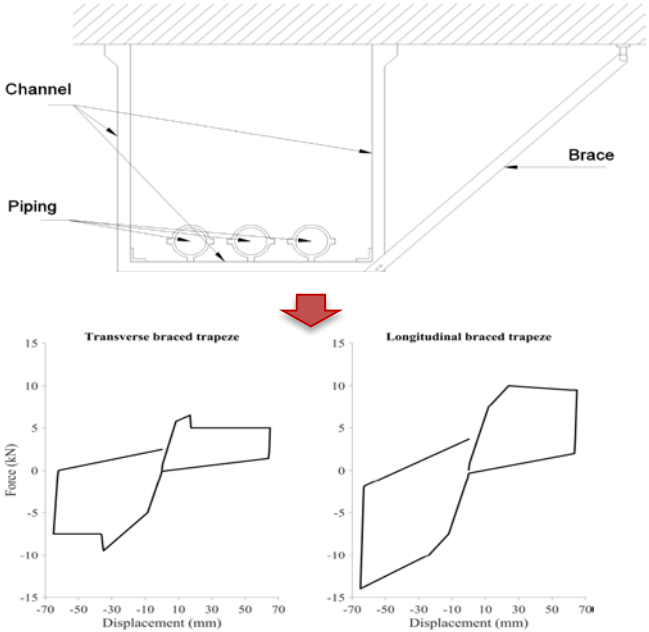
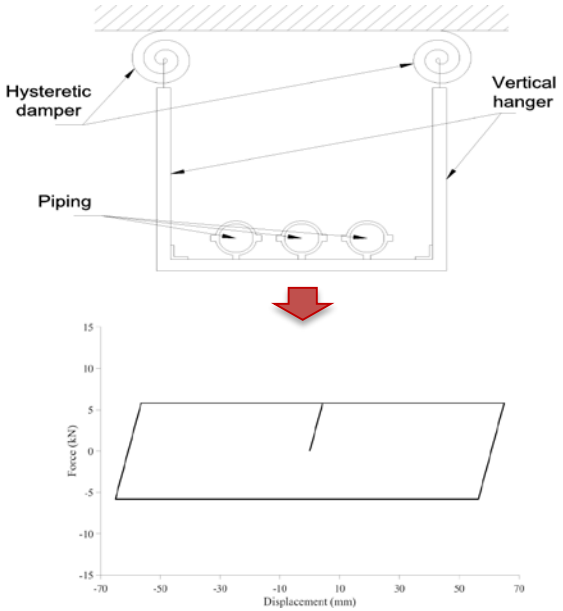
APPLICATION EXAMPLE: CASE STUDY

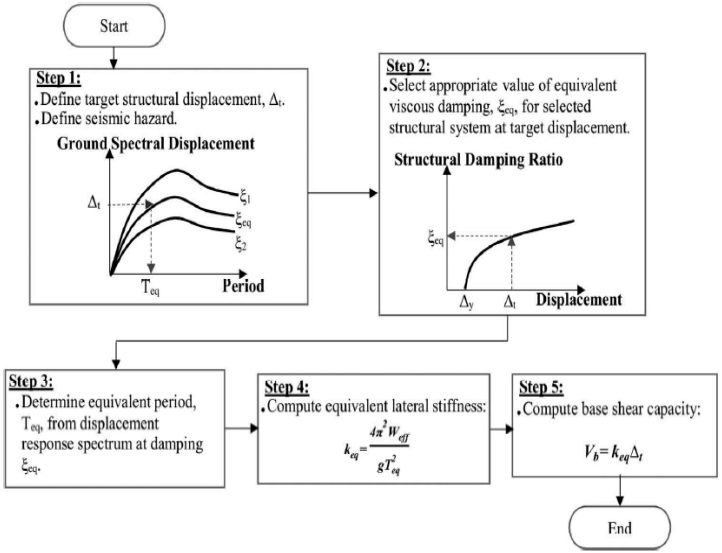
- The seismic design of both restraints was conducted following **a direct displacement-based design method**.

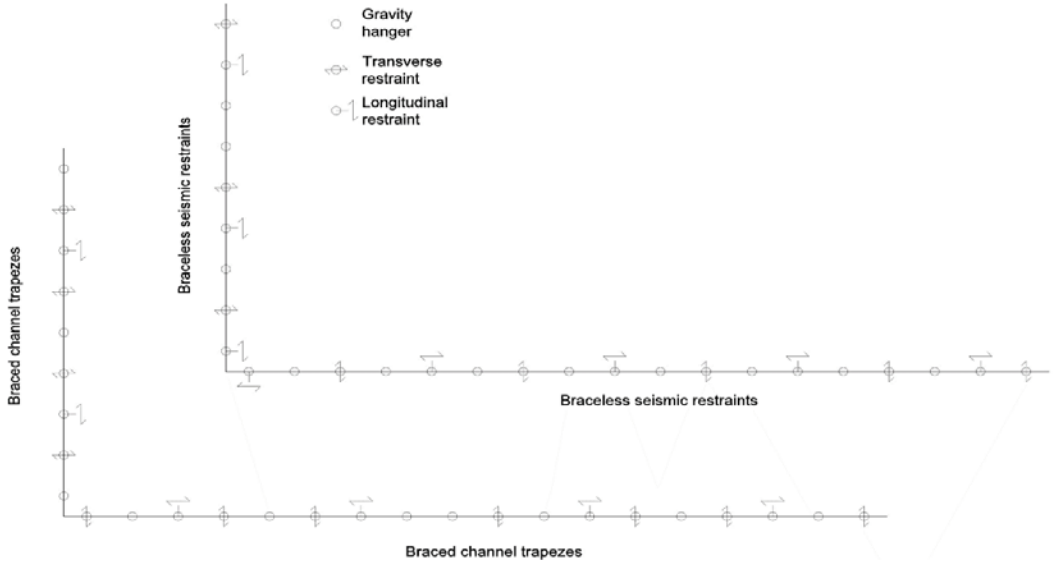




APPLICATION EXAMPLE: CASE STUDY

- Knowing the target displacement, the equivalent viscous damping, and the equivalent stiffness, the tributary mass can be computed.





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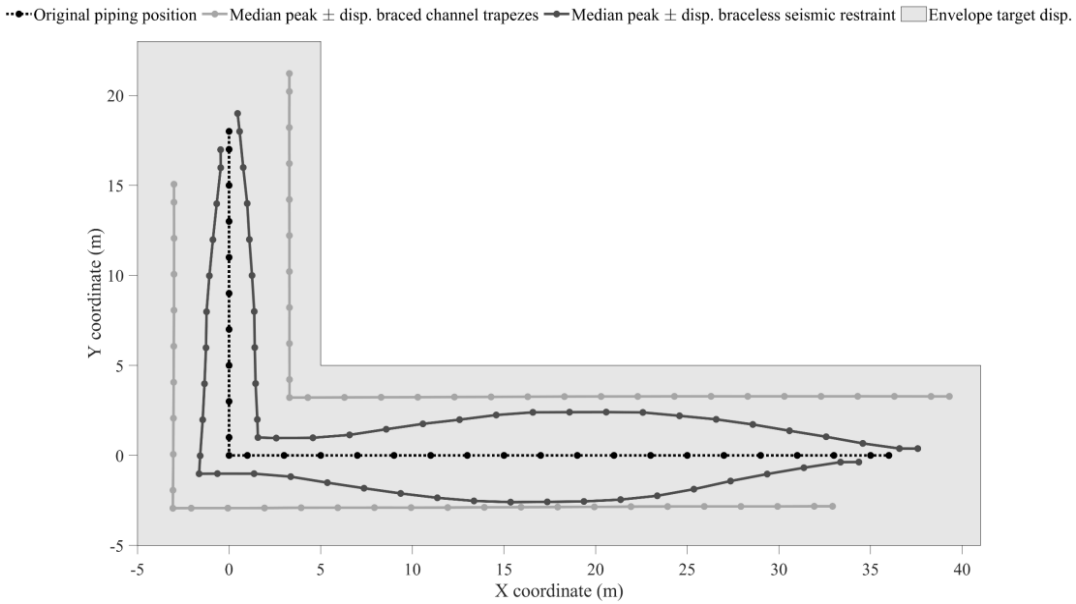
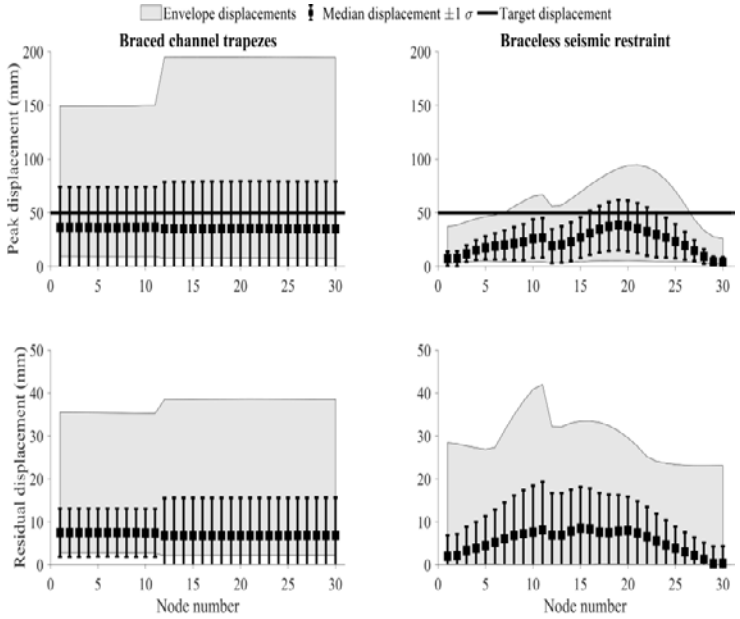
APPLICATION EXAMPLE: NLTH

- Results





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