

and without TLCBD, and (b), (d) Primary structure displacement and acceleration response with and without TLCHBD.

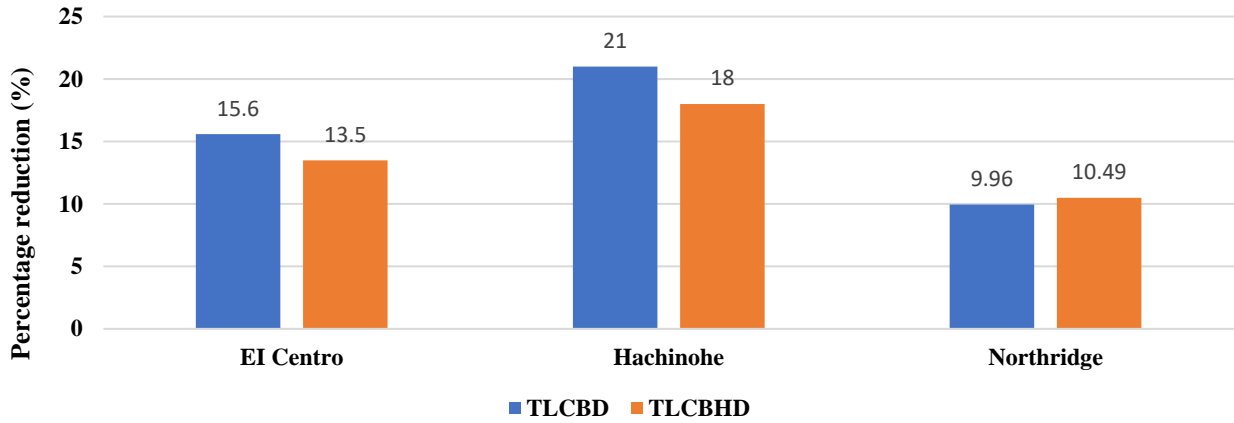


Figure 6. The peak displacement response reduction of primary structure with TLCBD and TLCHBD.

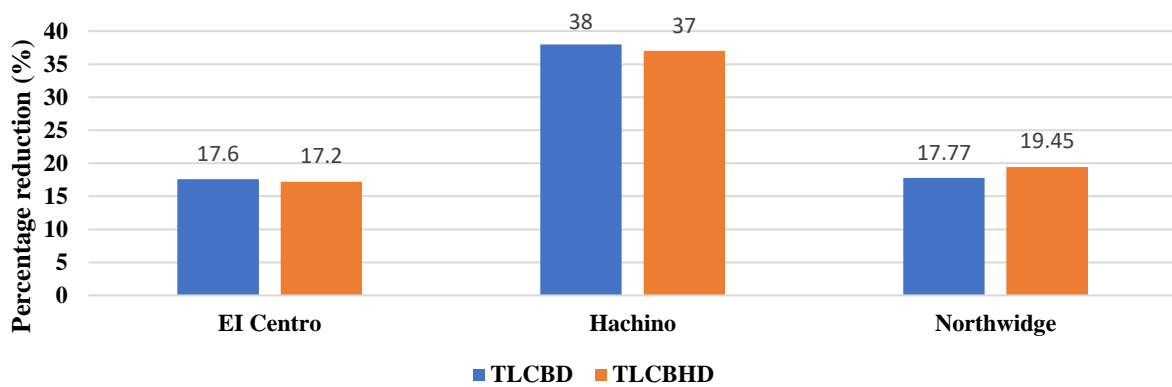


Figure 7. The root-mean-square (RMS) displacement response reduction of primary structure with TLCBD and TLCHBD.

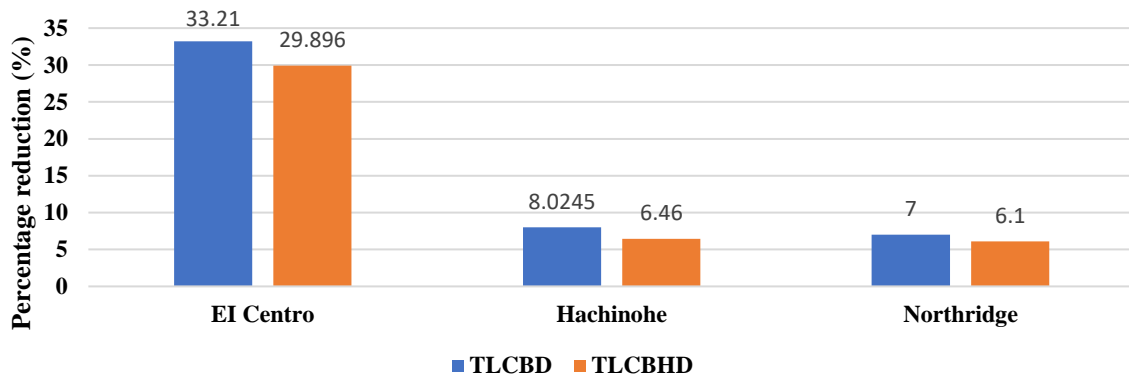


Figure 8. The peak acceleration response reduction of primary structure with TLCBD and TLCHBD.

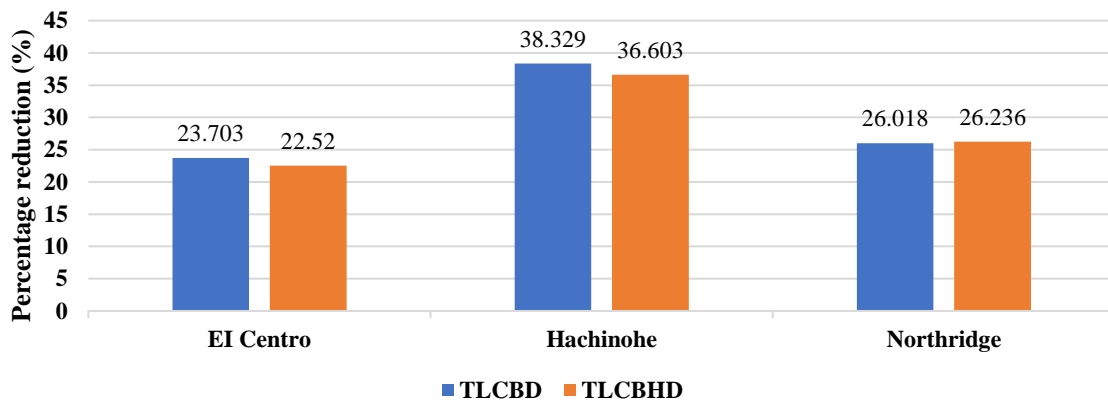


Figure 9. The root-mean-square (RMS) acceleration response reduction of primary structure with TLCBD and TLCHBD.

5. Conclusions

This paper presents a new modified type of tuned liquid column ball damper (TLCBD) termed as tuned liquid column hollow ball damper (TLCHBD). The equations of motion of TLCHBD attached with a single degree of freedom structure are derived through Lagrange's approach. Numerically, optimal tuning frequency and length ratio are determined for TLCHBD. It is observed that TLCHBD's performance is excellent using tuning frequency (0.97 to 1.05) and length ratio 0.9. Under harmonic excitation, the performance of TLCHBD is similar to TLCBD. TLCHBD reduced the peak response during response up to 60%. In the case of Northridge ground motion, the TLCHBD performed slightly well compared to TLCBD. The root-mean-square (RMS) displacement and acceleration responses reduction of both the damper is the same. The present study highlights that in the TLCHBD arrangement

the mass of the ball can be reduced up to 85 % without significantly compromising the performance compared to TLCBD.

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7. References

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