# OPTIMAL SHEAR WALL HEIGHT FOR LATERAL LOAD RESISTANCE IN WALL-FRAME STRUCTURES

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| **ABSTRACT**  Concrete shear walls are commonly used due to their advantages in reducing lateral displacement and enhancing seismic performance. These walls are subjected to gravity and lateral loads, as well as overturning moments and shear forces. They have a high stiffness that limits the lateral displacement of the building [1, 2]. The height and location of shear walls play a significant role in controlling the building response, reliability, and overall construction cost. Therefore, these walls need to be optimized [3, 4]. This study uses a continuous model to analyze the optimal height of the shear wall in long-walled frame buildings [5]. The model is based on hyperbolic functions that require high computational accuracy for large values of variables. The optimal height is determined by minimizing the top deflection of the structure and avoiding negative moments and shear forces in the wall. The optimal height is always between the inflection point and the zero wall cut-off point in the corresponding full-height wall structure. This result facilitates the search for the optimal height of the wall. The optimal height also corresponds to zero shear force at the top of the wall, which is a simpler criterion for finding the height of the shear wall.  **References:**  [1] Nollet, M.J., *Behaviour of wall-frame structures: a study of the interactive behaviour of continuous and discontinuous wall-frame structures,* PhD Thesis, McGill University, Title of Institue, 1991, 252, Montreal, Canada.  [2] Nollet, M. J., & Smith, B. S., (1998). Stiffened-story wall-frame tall building structure. Computers & structures, 66(2-3), 225-240.  [3] Aydin, A.C., & Bayrak, B., (2021). Design and performance parameters of shear walls: a review. Architecture, *Civil Engineering, Environment*, 14(4), 69-94.  [4] Abualreesh, A.M., Tuken, A., Albidah, A., & Siddiqui, N.A., (2022). Reliability-based optimization of shear walls in RC shear wall-frame buildings subjected to earthquake loading. *Case Studies in Construction Materials*, 16, p.e00978.  [5] Bhatta, B. D., Vimalanandan, G., & Senthilselvan, S., (2017). Analytical study on effect of curtailed shear wall on seismic performance of high rise building. *International Journal of Civil Engineering and Technology*, 8(2), 511-519. |

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