



An Analytical Model for Design of Reinforcement around Holes in Laminated Veneer Lumber (LVL) Beams

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Summary:

Openings are usually required to allow services like plumbing, sewage pipes and electrical wiring to run through beams. This prevents an extra depth of the floor/ceiling, while preserving architectural considerations. The introduction of large opening causes additional tension perpendicular to grain in timber beams. The low tensile strength perpendicular to grain of wood allows crack formation. Crack propagation around the hole considerably decreases the load-carrying capacity of the beam. However, in most cases, crack formation and propagation around the hole can be prevented by the use of an appropriate reinforcement. Screw, glued-in rods, and plywood are alternative options for the reinforcement. Design of the reinforcement requires that the working mechanism of the reinforcement is fully understood and properly addressed. In addition, reinforcement should be designed for actions produced in the section of the beam weakened by the hole. The current paper uses a simple truss model around the opening to calculate the tensile force in the reinforcement. Two simple formulations for design of the reinforcement are derived and compared with numerical and experimental results, showing an overall good correspondence. The proposed truss model can be considered for incorporation in future codes of practice.

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Resource Link

https://www.researchgate.net/profile/Massimo_Fragiacomo/publication/257895961_An_analytical_model_for_design_of_reinforcement_around_holes_in_Laminated_Veneer_Lumber_LVL_beams/links/542a93010cf27e39fa8eb0e1/An-analytical-model-for-design-of-reinforcement-around-holes-in-Laminated-Veneer-Lumber-LVL-beams.pdf