Dynamic Evaluation of Hybrid Timber-Steel Moment-Frame Structure Using Resilient Slip Friction Connections

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Format:	Conference Paper
Material:	Steel-Timber Composite
Application:	Frames
Topic:	Connections
	Seismic
	Mechanical Properties
Keywords:	Resilient Slip Friction Joint
	Damping
	Base Shear
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	Self-Centering
	Moment-Resisting
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Research Status:	Complete
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Summary:

This study introduces a new resilient slip friction joint for framed hybrid structures. The proposed connection has a self-centring behaviour in addition to damping characteristic. This innovative Resilient Slip Friction (RSF) joint is replaced with the conventional beam to column connections. The RSF joint provides energy dissipation...

Seismic Resilient Structures with Cross Laminated Timber (CLT) Walls Coupled with Innovative Resilient Slip Friction (RSF) Joints

https://research.thinkwood.com/en/permalink/catalogue1478

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Year of Publication:	2017
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Material:	CLT (Cross-Laminated Timber)
Application:	Hybrid Building Systems
Topic:	Design and Systems
	Seismic
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Keywords:	Timber-Steel Hybrid
	Lateral Load Resisting System
	Resilient Slip Friction Joint
	Self-Centering
	Energy Dissipation
	Numerical Model
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Summary:

There is an increasing public pressure to have damage avoidant structural systems in order to minimize the destruction after severe earthquakes with no post-event maintenance. This study presents and investigates a hybrid steel-timber damage avoidant Lateral Load Resisting System (LLRS) using Cross Laminated Timber (CLT) walls coupled with innovative Resilient Slip Friction (RSF) joints and boundary steel columns. RSF joints are used as ductile links between the adjacent walls or between the walls and the columns. These joints are capable to provide a self-centring behaviour (the main deficiency of conventional friction joints) in addition to a high rate of energy dissipation all in one compact device. One significant advantage of this system is that there are practically no bending stresses in the CLT panels which considerably increases the allowable capacity of the system. A numerical model for a four story prototype building containing the proposed concept is developed and subjected to time-history simulations. The results confirm that this system can be considered as the new generation of resilient LLRSs for different types of structures.

Online Access:	Free

Resource Link

http://db.nzsee.org.nz/2017/O5C.5_Hashemi.pdf

Seismic Resistant Cross Laminated Timber Structures Using an Innovative Resilient Friction Damping System

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Year of Publication:	2017
Country of Publication:	New Zealand
Format:	Conference Paper
Material:	CLT (Cross-Laminated Timber)
Application:	Hybrid Building Systems
Topic:	Connections
	Seismic
	Mechanical Properties
Keywords:	Resilient Slip Friction Joint
	Energy Dissipation
	Self-Centering
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Summary:

Multi-storey timber structures are becoming progressively desirable owing to their aesthetic and environmental benefits and to the high strength to weight ratio of timber. A recent trend in timber building industry is toward cross laminated timber (CLT) panelized structures. The shake table tests within the SOFIE project have shown that the CLT buildings constructed with traditional methods can experience high damage especially at the connections which generally consist of hold-down brackets and shear connectors with mechanical fasteners such as nails or bolts. Thus, current construction methods are not recognised as reliable in seismic prone areas. The main objective of this project is to develop a new low damage structural concept using innovative resilient slip friction (RSF) damping devices. The component test results demonstrate the capacity of this novel joint for dissipating earthquake energy as well as self-centring to minimize the damage and the residual drift after a severe event. The application of RSF joints as holddown connectors for walls were investigated through numerical studies. Moreover, a core wall system comprised of cross laminated timber and RSF connectors is subjected to time-history earthquake simulations. The numerical results exhibit no residual displacement alongside a significant reduction in peak acceleration which can be attributed to significant amount of dissipated seismic energy over the RSF joints within the system.

Online Access: Free

Resource Link

http://www.nzsee.org.nz/db/2016/Papers/O-28%20Hashemi.pdf