



**Politecnico
di Torino**

Honors Thesis

Master's Degree Architecture for Sustainability.

Abstract

Adaptive Retrofit Guidelines for Traditional Lebanese Houses: A Balance Between Energy, Comfort, and Built Identity

As our world faces rapid environmental, societal and technological shifts, architecture must evolve in parallel - not only in form and function, but in responsibility. Traditional Lebanese houses - built from locally sourced materials - are culturally significant and structurally resilient yet often fall short of modern thermal comfort standards. In light of rising climate goals and energy efficiency demands, our tangible heritage has more chances of being preserved instead of demolished, if it follows responsible adaptation that enables these structures to serve as durable and sustainable homes. This thesis examines a typical two-story Central Hall House from the 19th century, located in Lebanon's mountainous Csa climate zone. Using a mixed-methods approach -combining interviews, spatial observations, climatic analysis and energy simulations- the study assesses the building's thermal performance under existing and retrofitted scenarios. The results establish a comprehensive guideline that ranges from low- to high-impact retrofit strategies correlated with progressive improvements in both thermal comfort and energy efficiency. The findings demonstrate that vernacular typologies can be effectively adapted through flexible, climate-responsive design, offering a framework of retrofit strategies that align with varying levels of intervention and occupant preferences.





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