# Vertical Forest Engineering: Applications of Vertical Forests with Self-Growing Connections in High-Rise Buildings

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***ABSTRACT***

*Living architecture is thriving. The integration of buildings with vegetation has become a necessity in many metropolitan areas of the world today, including Singapore, New York City, Shanghai and Milan, to name a few. It expands the potential of vertical and horizontal, exterior and interior, exposed and enclosed spaces in a building that can be used to accommodate plants. Green infrastructures have benefits both on urban and building scales. They can be categorized into green roofs and vertical greenery systems that can be divided further into green façade, green/living wall, green terraces, elevated forests and vertical forests. There are many design and planting considerations for architects, structural engineers and botanists when using living architectures to mimic natural systems, such as climatic and regional considerations, primary functions and design objectives, structural support systems, maintenance, irrigation and so on. Plants used for vertical greenery are more likely to be hardwood species to adjust solar radiation during cooling and heating periods, and also for aesthetic pleasure. Take Bosco Verticale, which is located in Milan, as an example to look into engineering methods when trees grow on balconies of high rise buildings. It could be concluded that planting restraint safety system and regular maintenance are necessary for trees growing in the sky. But the change of growing conditions causes various problems such as stability and growth of trees. Instead of using steel cages and bracings to prevent falling off of trees in the sky, the concept of self-growing connections is proposed to provide the stability of vertical forests. This paper is meant to generate awareness of the possibilities of the integration of greenery vertically with buildings, show application considerations, and inspire future developments in typologies and integration with forests.*