# COST ANALYSIS OF THREE DIFFERENT ROOF SYSTEMS IN THREE DIFFERENT SPANS IN THE DESIGN OF A STEEL STRUCTURE'S ROOF

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| **ABSTRACT** The primary objective of this study is to conduct a comprehensive cost analysis of three distinct roofing systems (beam, truss, lattice truss) within varying spans (10m, 20m, 30m.) for the design of a steel structures. By examining the cost implications of three different roofing systems across various spans, this study seeks to identify the roofing system that offers the highest level of cost-efficiency for each specific span. Three distinct roofing systems (beam, truss, lattice truss) within varying spans (10m, 20m, 30m.) are modeled in SAP2000 package program. Safe and low-cost solutions were investigated for each model. In the final solution, the amount of steel per square meter for each model was evaluated. The most economical roof system varies for each span. The system has the lowest steel usage per unit area is the 'beam' roof system for a 10-meter span, the 'truss beam' system for a 20-meter span, and the 'lattice truss' system for a 30-meter span. In all systems, as the span increases, the steel cost per unit area increases. While this increase rate is approximately proportional to the span in the ‘beam’ roof system, while the rate of increase gradually decreasing in the ‘truss’ roof system and ‘lattice truss’ roof system. This study will help engineers and decision makers make informed choices about the choice of roof systems during the design phase of steel structures. This study will also provide us the evaluation of the economic feasibility of each roofing system according to the different spans. **References:**  İpekçi, Z., & Kavraz, M. (2020). Çelik Düzlemsel Kafes Kirişlerde Kafes Tipi ve Yüksekliğinin, Ağırlık ve Maliyete Etkileri Üzerine Bir Çalışma. *Düzce Üniversitesi Bilim ve Teknoloji Dergisi*, 9(2021): 114-129, 16. Jost, E, W., Moore, D, G., & Saldana, C. (2021). Evolution of global and local deformation in additively manufactured octet truss lattice structures. *Additive Manufacturing Letters*, 1(2021) 100010. Deren, H., Uzgider, E., Piroğlu, F., & Çağlayan, Ö. (2012). *Çelik yapılar* (4 edition). İstanbul, Turquie: Çağlayan Kitabevi.  Daloğlu, A., Pul, S., & Özgan, K. (2021). *Çelik yapılar* (1 edition). Trabzon, Turquie: KTÜ Matbaası. İpekçi Z., *Çelik Düzlemsel Kafes Kirişlerde Kafes Tipi ve Yüksekliğinin, Ağırlık ve Maliyete Etkileri Üzerine Bir Çalışma*, Yüksek Lisans Tezi, Karadeniz teknik üniversitesi, Fen Bilimleri enstitüsü, 2020, 138, Trabzon. Albaş O., *Çelik kafes kirişli sistemlerde aşık+kafes kiriş optimizasyon*, Yüksek Lisans Tezi, İstanbul teknik üniversitesi, Fen Bilimleri enstitüsü, 1999, 78, İstanbul. |

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