

Structural Behaviour of Castellated Beam: A Review

Muthukkumaran C¹, Karthikeyan S², Satheesh Kumar K R P³

Post Graduate Student, M.E Structural Engineering, Department of Civil Engineering¹

Assistant Professor, M.E Structural Engineering, Department of Civil Engineering^{2,3}

Kumaraguru College of Technology, Coimbatore, Tamil Nadu, India

Abstract: *The use of castellated beams has gained popularity due to their excellent performance in terms of strength, stiffness, and economy. Castellated beams are fabricated by cutting I-sections or H-sections along the web in the desired shape and re-joining the two halves on one another through welding in order to improve the beam's overall depth. Most often, hexagonal, circular, diamond, and sinusoidal shapes are used for the web opening. This pattern increases the surface area and reduces the weight of the beam without compromising its structural integrity. The idea incorporates the technique of offering the best section in accordance with the most essential need. This paper presents an overview of the behavior of castellated steel beams with several shape openings having an I-shaped cross-section, modeling is conducted using the finite element software package ANSYS14 and ABAQUS. With uniform distributed load and simply support conditions, an analysis is conducted. The investigation of various failure patterns and the deflection at the middle of the beam are done.*

Keywords: Castellated beam, Web opening, ANSYS and ABAQUS, Failure patterns

REFERENCES

- [1]. Weidlich, C. M., Sotelino, E. D., & Cardoso, D. C. (2021). An application of the direct strength method to the design of castellated beams subject to flexure. *Engineering Structures*, 243, 112646.
- [2]. Kamable, A. S. (2019). Use of Castellated Beam as a PEB Component. *JournalNX*, 19-24.
- [3]. Frans, R., Parung, H., Sandy, D., & Tonapa, S. (2017). Numerical modelling of hexagonal castellated beam under monotonic loading. *Procedia engineering*, 171, 781-788.
- [4]. Shaikh, A. S., & Autade, P. B. (2016). Structural analysis and design of castellated beam in cantilever action. *Int. Res. J. Eng. Technol*, 3(8), 163-170.
- [5]. Kim, B., Li, L. Y., & Edmonds, A. (2016). Analytical solutions of lateral-torsional buckling of castellated beams. *International Journal of Structural Stability and Dynamics*, 16(08), 1550044.
- [6]. Jamadar, A. M., & Kumbhar, P. D. (2015). Parametric study of castellated beam with circular and diamond shaped openings. *International Research Journal of Engineering and Technology*, 2(2), 715-722.
- [7]. Kumbhar, P. D., & Jamadar, A. M. (2015). Optimization of opening size for castellated beam with sinusoidal openings. *Iran University of Science & Technology*, 5(3), 301-313.
- [8]. Jamadar, A. M., & Kumbhar, P. D. (2014). Finite element analysis of castellated beam: A review. *International Journal of Innovative Research in Advanced Engineering (IJIRAE)*, 1(9), 125-129.
- [9]. P. D., Gupta, L. M., & Deshpande, N. V. (2014). Analysis and design of cellular beam and its verification. *IERI Procedia*, 7, 120-127.
- [10]. Erdal, F., & Saka, M. P. (2013). Ultimate load carrying capacity of optimally designed steel cellular beams. *Journal of constructional steel research*, 80, 355-368.
- [11]. Anupriya, B., & Jagadeesan, K. (2013). Strength study on castellated beam. *International Journal of Engineering Research & Technology*, 2(12), 3853-3859.
- [12]. MR, W., AV, S., & Auti, V. A. (2012). Parametric study of castellated beam with varying depth of web opening. *International journal of scientific and Research publications*, 287.

- [13]. Wakchaure, M. R., & Sagade, A. V. (2012). Finite element analysis of castellated steel beam. International Journal of Engineering and Innovative Technology, 2(1), 365-370.
- [14]. Ellobody, E. (2012). Nonlinear analysis of cellular steel beams under combined buckling modes. Thin-walled structures, 52, 66-79.
- [15]. Soltani, M. R., Bouchaïr, A., & Mimoune, M. (2012). Nonlinear FE analysis of the ultimate behavior of steel castellated beams. Journal of constructional steel research, 70, 101-114.
- [16]. Kerdal, D., & Nethercot, D. A. (1984). Failure modes for castellated beams. Journal of constructional steel research, 4(4), 295-315.