



A Castellated Beam With and Without Stiffeners: A Review

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Abstract:- Now-a-days castellated beams are quite popular for their structural applications. To make them, engineers cut a zigzag pattern into the web of a hot rolled steel (HRS) I-section and then rejoin the cut portions, effectively increasing the beam's depth. The shapes of the openings created in the web portion can vary, ranging from sinusoidal to hexagonal, octagonal, diamond, or circular. By increasing the depth of the beam, its load-carrying capacity also increases. However, increasing the depth introduces various failure modes such as lateral torsional buckling, shear mechanisms, flexural mechanisms, and others. To mitigate these failure modes, studies emphasize the importance of using stiffeners in the web portion. Stiffeners come in various types, but their primary function is to reduce deflection and increase strength. Researchers have found that adding stiffeners across the web portion helps to reduce stress concentration near openings, thus enhancing the beam's overall performance and durability.

Keywords:- Castellated, Cellular beams, Web openings, Beam modification, Castellated beam geometry

1. INTRODUCTION:-

Numerous researchers have been studying steel structures since 1940 in an effort to find more advanced ways to achieve economy. In an effort to reduce the cost of steel structures, web-opening steel beams were first used in construction during World War II. One cannot always take full advantage of structural steel's high strength qualities. As a result, a variety of methods have been used to strengthen steel components without adding to their weight. As a result, web-opening steel beams, like castellated and cellular beams, have found widespread application. One of the biggest benefits of steel buildings is the integration of technical utilities, like water and ventilation pipes, through the web openings of the beam.

In contrast to the traditional method, which places the services beneath the beams, this lowers the building's height as there is less clear space between the ceiling and the floor. In this context, savings may reach 0.5 m per storey. This results in a more compact, economical, and justified construction method. The cost and structural behavior of the completed construction system are significantly impacted by the manufacturing process used to create the aforementioned perforated beams.

Although there are alternatives to solid web beams, such as stub girders, trusses, etc., steel beams with web openings are frequently used. Office buildings, parking garages, retail establishments, industrial halls, sports arenas, hospitals, and other locations have all made use of cellular beams. When utilized as floor beams, they offer long, clear spans and excellent flexibility for service incorporation.

This paper presents the behavior of steel beams with web openings subjected to different failure modes. In an effort to gather and assess the current body of knowledge regarding steel beams with web openings, this paper describes the current issue and makes recommendations for future research directions.