

Post-Tensioned Stress Ribbon Systems in Long Span Roofs

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1. Abstract

Cable systems have numerous advantages, such as: large column-free areas, and reduced materials consumption, which reduces the load and the cost. Nevertheless, they are rarely used in long span roofs due to large deflections, and the insufficient space for end supports, or/and back-stayed cables. This work suggests the use of post-tension stress ribbon system in long span roofs in order to reduce the pull-out forces, deflections and concrete stresses compared to a conventional cable system. A comparison is carried out through meticulous and accurate finite element simulations, using SAP2000, implemented for the new +200m roof of Västerås Travel Center (Sweden), which will become one of the longest cable suspended roofs in the world, if not the longest. Results confirm the suitability and superiority of stress ribbon systems as it reduces concrete stresses, deflections, pull-out forces and vertical reactions. These reductions are found highly correlated to the applied prestressing forces.

Keywords: cable suspended, stress ribbon, roof structure, post-tensioned concrete, SAP2000.

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