

## Ed Sheeran Mathematics Tour

### PROJECT TEAM

Architects: **Mark Cunniffe Ltd and WonderWorks**  
Structural Engineer: **Cundall**  
Steelwork Contractor: **Stage One Creative Services Ltd**  
Main Contractor: **Stage One Creative Services Ltd**  
Client: **1325 Productions**



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The Ed Sheeran Mathematics tour is the first known tour to use a temporary demountable self-supporting cable structure. As such, this structure had to be able to be easily transported, unloaded and erected in just 3 days within different stadia in the UK and around the world.

The touring structure consists of six 30m-tall steel truss masts, positioned around the central stage, supporting a 60m-span cable net constructed of 22mm diameter galvanized steel spiral strand cable. This, in turn, is used to suspend the central 21m-diameter, 45t circular transparent LED screen over the stage, as well as 10t of audio systems. Additional audio systems and double-sided LED screens shaped like plectrums, both weighing 22t, are suspended from the top of each mast.

All the production items are suspended from the top of the steel truss mast or the central cable net, which supports them via pure tension. The central cable net is horizontally restrained by the back-stay cables, which also act in tension and are anchored to the base frame, where ballast is provided

to prevent any uplift. The masts restrain the central cable net vertically and, acting in compression, provide a way to transfer the gravity loads to the ground. The mast supporting steel base frames are designed to safely spread the loads on the field of play and transfer the horizontal base reactions to the field cover in friction, effectively closing the 'circle' of the load path.

The tension forces in the back-stay cables and the radial cables connected to the top of the masts are constantly recorded using load-monitoring pins. All the values are accessible in real time from control boxes located at the base of the masts, or on a cloud platform, for comparison against those predicted in the 3D finite element analysis.

The entire structure was trial erected and load tested one month prior to the start of the tour. This provided an opportunity to hone the erection process down to 15 hours for 180t of steelwork, and to check that the structural behaviour was as expected.

Two sets of steelwork were designed, detailed and fabricated in six months, comprising 360t of steelwork in total. After one season of touring, comprising 52 gigs and 11 builds of each system, remedial inspection revealed no structural issues and only minor cosmetic repairs were required. The systems are currently in their second season of touring the world.

### Judges' comment

This is a very good example of how structural steelwork can provide a temporary demountable structure. By adopting techniques typically used in other areas of construction, the team has developed an easily deployable structure capable of accommodating the variable constraints of multiple locations.