

## ADAPTING THE SIMPLE THROUGH GIRDER TO SIT IN NATURE, THE WUPPERTHAL FOOTBRIDGE

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### Summary

Some places are hard to get to and Wuppertal, a small town nestled deep within in the Cederberg Mountains, in South Africa is one of those places. Founded by German missionaries in 1830 the town is home to 1400 inhabitants and a growing tourist destination. An adjacent river, however, is a barrier during the wet seasons for farm children trying to reach the town's school. A permanent footbridge was therefore recently commissioned to replace temporary structures that have proved dangerous. This paper tells the story of the single span through girder footbridge. Designed to sit as a comfortable object in its natural surroundings the new footbridge is both functional and attractive. The tapering steel plated cross section presents a profiled elevation that splits to create an arched opening at the midspan of the bridge. To create this elegant form the design had to prevent the buckling of the unbraced top chord of the girder. This was achieved through an iterative study of various cross sections and the transitioning of the plate girder into a box section over the opening. Developing a three-dimensional CAD model of the bridge helped engineers conceive the slender form. The model was then exported to create the finite element plated model and then developed into full workshop drawings. The bridge is considered simple but striking in its appearance and this paper aims to highlight that standard solutions can be transformed where appropriate within limited means.

**Keywords:** Structural steel, through girder, buckling, aesthetics, innovative form, remote, rural.

### 1. Introduction

A trip to Wuppertal might start from Cape Town following the National Highway 7 north through the Cape Winelands and up to the Cederberg Mountains. Known for its un-spoilt beauty the twisted rock formations of the Cederberg attracts hikers seeking isolation and offers climbers' endless challenges. The area is also known for the world-famous healthy rooibos tea, found only in the Cederberg.



*Fig. 1. The small town of Wuppertal.*