Analysis of the Florida International University Pedestrian Bridge Collapse

Vojtěch Kolínský, Jan Žitný

FINLEY Engineering Group International, Prague, Czechia

Contact: vojtech.kolinsky@finleyengineeringgroup.com

Abstract

The paper describes the investigation process of the collapse of the pedestrian bridge in Miami, Florida (USA). The main span concrete truss structure with a length of 174-foot (53 m) collapsed during construction onto the active highway beneath which had fatal consequences. FINLEY was approached to conduct an independent analysis of the bridge structure for one of the subcontractors involved with the project. As part of an analysis of the bridge behavior, detailed calculation models were developed, and advanced method of structural analysis were used. Finite element method (FEM) brick model of the entire span was created and the stresses at the failure area were investigated in detail. Computation FEM models were supplemented and verified by the strut and tie modelling (STM). The construction process and transport of the bridge span was also simulated. The analysis shows the issues and risks associated with the design of structures with a non-transparent flow of internal forces and demonstrates the need for a detailed assessment of joints and critical areas during all phases of the construction process. The results of the analysis were subsequently confirmed by later published investigation report of the US National Transportation Safety Board.

Keywords: pedestrian bridge; collapse; concrete; truss; crack; brick; FEM, node capacity.

1 Introduction

On Thursday, March 15, 2018, a partially constructed pedestrian bridge crossing an eight-lane roadway in Miami, Florida, experienced a catastrophic structural failure in the nodal connection between truss members and the bridge deck. The 174-foot-long bridge span fell about 18.5 feet onto SW 8th Street, see Figure 1. Eight vehicles located below the bridge were fully or partially crushed. One bridge worker and five vehicle occupants died, another ten people were injured [1].

Figure 1. Prior and after collapse [1]