



## PROJECT PROFILE

# Victory Theatre

Chandelier Wire Rope Failure Investigation and Replacement | Evansville, IN



### CLIENT

Evansville-Vanderburgh County Building Authority

### BACKGROUND

In late September 2018, a 1/8-inch-diameter wire rope hoist cable failed during lowering of one chandelier above the seating area at Victory Theatre in Evansville, Indiana. No one was injured, but the failure caused the historic chandelier to fall and suffer damage. Ten similar chandeliers with similar cable supports remained above the seating area of the theatre.

The Evansville-Vanderburgh County Building Authority retained WJE to investigate the cause of the wire rope hoist failure. Additionally, WJE was tasked with determining if similar mechanisms for failure could occur at the remaining historic chandeliers and making recommendations for mitigating the risk of failure.

### SOLUTION

WJE's investigation included inspection of the remaining ten chandelier hoist cables and preliminary field load testing of one wire rope hoist cable. Testing consisted of loading the loop of the chandelier hoist cable with a load of 500 pounds, which considered the weight of the chandelier and dynamic demands of the chandelier during lowering and raising operation. The existing cable and its end connection sustained the 500-pound test load for the duration of the test; however, after unloading, the change in the measured length of the cable tail suggested that the tail slipped in the compression sleeve during load testing.

WJE then proceeded with examination of the failed wire rope hoist cable with an optical stereomicroscope and a scanning electron microscope. WJE's observations and laboratory evaluation indicated the cable failed when its end pulled out of the compression sleeve that had secured the end of the cable. This mechanism was consistent with the field load testing results. Thus, WJE concluded the hoist cable compression sleeves in their current configuration were unreliable to support the dynamic cable loading that occurs from lowering and raising the chandeliers. WJE recommended replacement of all eleven wire rope hoist cables. WJE designed, fabricated, and proof-tested the replacement cables prior to installation by a local contractor.

