



## Small-Scale Experimental Study on Fire Protection of Bridge Cables with Epoxy-Based Intumescent Coatings

Tolstrup, Jonas; Giuliani, Luisa; Jomaas, Grunde

*Published in:*  
NFSD Nordic Fire & Safety Days 2019

*Publication date:*  
2019

*Document Version*  
Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

*Citation (APA):*  
Tolstrup, J., Giuliani, L., & Jomaas, G. (2019). Small-Scale Experimental Study on Fire Protection of Bridge Cables with Epoxy-Based Intumescent Coatings. In *NFSD Nordic Fire & Safety Days 2019 : Book of abstracts* (pp. 9-9). RISE Research Institutes of Sweden AB .

---

### General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

# Small-Scale Experimental Study on Fire Protection of Bridge Cables with Epoxy-Based Intumescent Coatings

Tolstrup, Jonas  
Buildings, East Denmark  
COWI A/S  
Kongens Lyngby, Denmark  
jntl@cowi.com

Giuliani, Luisa  
Dept. Civil Engineering  
Technical University of Denmark  
Kongens Lyngby, Denmark  
lugi@byg.dtu.dk

Jomaas, Grunde  
School of Engineering  
The University of Edinburgh  
Edinburgh, United Kingdom  
grunde.jomaas@ed.ac.uk

**Keywords:** (5 key words)

epoxy coating  
bridge cable  
fire safety  
small-scale experiments

Based on these findings, it cannot be concluded whether or not epoxy-based intumescent coatings are a viable solution for fire protection of bridge cables. Still, they provide a good foundation for more focused, in-depth future studies.

## Abstract

To assess the viability of epoxy-based intumescent coatings as a passive fire protection on bridge cable, two sets of experiments were carried out with two types of epoxy-based intumescent coatings (anonymized as Coating A and Coating B).

In the first set of experiments, small steel plates were exposed to various constant heat fluxes in a mass loss cone heater. The initial heating rates were similar to those experienced in a UL1709 hydrocarbon fire. In addition to experiments on samples with just the two types of coating, different configurations with an elastomer membrane, typically used in dehumidifying systems on bridge cables, were also part of the experimental matrix.

A second set of experiments were carried out in an electric oven, where three types of steel profiles were subject to four different heating rates in order to assess the thermal resistance for different scenarios.

The samples were evaluated both visually and quantitatively at the end of each experiment. Visual observations included char structure formation, porosity and expansion ratio. Secondly, the performance of the coatings subject to heating in the electric oven was evaluated by the thermal resistance measure from the Eurocode. An efficiency metric was used to compare the heating of the protected steel substrate with that of an unprotected substrate.

Results from the experiments in the mass loss cone heater showed a dependency between the heat flux and the efficiency of Coating A and a critical heat flux needed to achieve a char formation. For Coating B, a full expansion was never reached.

For the experiments in the electric oven, the thermal resistance was determined, and it was found that the thermal resistance increased with higher heating rates and that the duration the transient phase was reduced. The latter is defined as the phase in which the intumescent process and the carbon binder combustion occurs.