

Chapter 11

Sully-sur-Loire Suspension Bridge

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This chapter presents the forensic investigations conducted after the collapse of the Sully-sur-Loire suspension bridge that occurred in 1985 in France. The failure mechanism concluded by the experts is the rupture of a cable-threaded tie in conjunction with a rupture of an element of the rigidity beam. The threaded ties had geometric defects, which were at the origin of the ruptures in service. These defects were either the threads themselves, or cracks due to fatigue, or corrosion phenomena. A decision-making process based on the determination of steel resilience was then launched to manage the other old suspension bridges in France during cold winters.

11.1 Introduction

With a total length of 376 m, the Sully-sur-Loire Bridge had 4 spans, three of which had a span of around 100 m and the fourth 76.25 m. It had a structure common to most of the old suspension bridges over the Loire River (Figure 11.1), with multiple suspended spans and head cables. The supporting cables (4 in number per side, with a parabolic shape) and the head cables (six in number, with a straight shape: three upstream and three downstream) were interrupted at each pier and hooked by ties on movable saddles located at the head of the pylon.

On January 16, 1985, at 7:40 a.m., the Sully-sur-Loire Suspension Bridge suddenly collapsed into the bed of the Loire River (Figure 11.2). The intense cold that reigned that morning, around -23°C, was immediately considered to be one of the determining factors of this disaster. At the time of the accident, only 2 cars, one semi-trailer loaded with logs, and a cyclist were on the left bank side span of the bridge, which collapsed on the bank, out of the water. This particularly fortunate circumstance led to the absence of deaths and serious injuries.

Indeed, the four occupants of the cars and the lorry driver escaped almost unharmed; only the cyclist was injured. They were lucky enough to be on the beach side and thus avoided falling into the icy waters of the Loire River.

The weather services then declared it “one of the coldest winters in French meteorological history”. Temperatures dropped below - 20 °C in the region where the bridge was located, and the Loire River carried pieces of ice at that time.