

Health & Safety Laboratory

An agency of the Health & Safety Executive



HEALTH & SAFETY  
LABORATORY

Using our brains to save and improve the lives of workers

# Investigating Tower Crane Failures



## The Client

Health and Safety Executive

## The Problem

Each year we are asked by HSE to provide forensic support to over 200 serious industrial accident investigations. Some of these investigations arise from the failure of the many different types of crane in use on industrial sites in the UK and, of these, the collapse of tower cranes is probably the most catastrophic.

## What we did

The collapse of two tower cranes in less than four months at sites in south London and Liverpool, tragically took the lives of two workers and one member of the public. The same company supplied both cranes, and HSE took the precaution of prohibiting the use of cranes of this type until their safety could be independently demonstrated. HSL was called to the scene at an early stage in both investigations. At one location, our mechanical engineers and specialist photographers spent seven days on site, carrying out a detailed examination of the collapsed structure and observing recovery operations. The jib slewing rig and sections of the mast were brought to HSL for further examination, a major logistical exercise involving a fleet of seven lorries. Although the mechanism of failure was quickly diagnosed, it became necessary to carry out full-scale loading tests in order to validate the proposed failure scenario. A crane test rig was therefore constructed on one of HSL's outdoor test pads to replicate the upper part of the tower crane assembly and a series of load tests were carried out. In addition, a series of cyclic load tests were carried out in the laboratory using a servo-hydraulic test machine. At the other incident the HSL team was on site for nine days. Here the recovery operation was hampered by high winds and the need to free some of the evidence from concrete that had set after the collapse. In this case the laboratory examination was less protracted and, by eliminating a number of potential scenarios, the failure was attributed to wind loading.



## Outcome/Benefits

Understanding the cause of accidents is key to preventing their recurrence. Both investigations led to a better understanding of the behaviour of tower cranes under load and indicated the need for additional research. In addition, the construction industry has been reminded of the requirement for regular inspection of tower cranes by a competent authority.