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## Forensic investigation on crane accidents

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**Abstract:** Crane accidents often result in the significant loss of assets and human lives. Forensic investigation on crane accidents is necessary to determine the root causes of the accidents and relevant liabilities of parties involved, and to recommend effective measures to prevent recurrence of similar accidents. Forensic investigation should meet the requirements of high professional standards in providing technical support to all kinds of litigations. This article reviews common failure modes and root causes of crane accidents, and presents investigation methodologies. Some typical crane accident cases (mobile crane toppling, hoist wire rope breakage and boom/jib collapse of tower crane) are studied and discussed to demonstrate the investigation practice.

**Keywords:** accidents; corrosion; crane; failure analysis; fatigue; forensic investigation; fracture; stability; structural integrity; welding; wire rope.

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**Biographic note:** George Y.H. Yu received his PhD in Materials Science and MEng in Mechanical Engineering from National University of Singapore. He has more than 30 years of experience related to forensic investigation, failure analysis, condition assessment and inspection, including 18 years of experience in Singapore Productivity and Standards Board and TUV SUD PSB as Assistant Vice President and Senior Principal Consultant. As expert witness, he had been engaged in a number of litigation cases including public hearing, arbitration and court hearing by governmental and private organisations. As principal investigator, he accomplished more than 1000 cases of failure analysis and accident investigation on roller coaster, train, turbine, aircraft, crane, hovercraft, submarine, ship, automotive, heat exchanger, electrical power, building and structures, electronic devices, oil and gas pipelines, etc.

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### 1 Introduction

Cranes are essential and widely used equipment for lifting and transferring goods in various industries. Tower cranes, mobile cranes, gantry cranes and overhead lifting facilities are being deployed in the construction, manufacturing and marine industry. On the one hand, the use of cranes can help raise productivity; on the other hand, these cranes are massive equipment and often involved in complex operations. Any crane accidents could result in catastrophic impacts on the safety of workers and the public. It is