

RISK ASSESSMENT FOR MAINTENANCE WORK

Bruce W. Main, PE CSP

Dennis R. Cloutier, CSP

Fred A. Manuele, PE CSP

Donald S. Blosswick, PhD, PE CPE

EXECUTIVE SUMMARY

At 1:00 P.M. on 1 February 1999 an explosion at the Ford Motor Company Rouge Plant in Dearborn, Michigan sent a fireball a quarter mile into the sky above the powerhouse that generated electricity for the 1,100-acre facility. The incident caused the death of six workers, injured more than two-dozen and caused more than \$1 billion in losses, making it one of the most expensive industrial accidents in U.S. history.

This incident, as with many others, occurred during maintenance work. Maintenance work takes place in all industries usually by skilled trades with specialized training and experience on equipment and facility repair. Yet maintenance workers are often seriously injured at far greater rates relative to other operations. This high incident rate is due partly to the high-risk nature of their work.

Risk Assessment for Maintenance Work explores the challenges of evaluating the risk associated with maintenance work and contains a wealth of data for maintenance workers, supervisors and management to apply in managing maintenance safety. This book presents the results from a survey conducted to learn more about how to improve safety in maintenance operations, including implementing risk assessment methods. The purpose of the survey was to:

- obtain ideas, thoughts and comments on how to improve maintenance risk assessment and maintenance safety,
- obtain data on the practical constraints and specific needs affecting hazard analysis and risk assessment for maintenance activities,
- solicit feedback on risk assessment methods with potential application to maintenance work, and
- identify high risk tasks for maintenance work.

Maintenance work is often hazardous, in part because the safety of personnel performing maintenance work may not be adequately considered in the design of equipment or facilities. In some instances maintenance personnel are required to disable or defeat protective devices such as guards in order to perform their tasks. In other situations time pressures loom large and quick decisions and actions are required. Although there are many ideas and opinions concerning the problems and solutions of maintenance safety and risk assessment, there are very little useful data. What data exist are injury and fatality records that often do not provide sufficient detail to shed light on methods to improve maintenance safety.

The survey was conducted via focus groups and posting on the Internet. The survey results appear to have value in advancing the knowledge and understanding of the underlying maintenance safety issues and risk assessment. The results indicate the following:

- Maintenance personnel widely recognize the need for better equipment and facility designs to accommodate maintenance work.
- Maintenance workers need, and are asking for, more and better training, including training on risk assessment.
- Maintenance personnel seek help in identifying hazards. The survey identified methods to assist in this regard.
- An on-equipment checklist concept suggested by a respondent appears to have value to identifying hazards and assisting in risk assessment prior to work.
- Several high risk tasks were identified. The list should be disseminated and refined for individual facilities.
- Maintenance risk assessment appears to be a valuable method to improve maintenance safety.

Maintenance Risk Assessment Study

- The proposed risk assessment model received very favorable comments from the respondents.
- Equipment and facility designers need to:
 - involve maintenance personnel in design development,
 - identify maintenance tasks and associated hazards early in the process,
 - better understand and include provisions for maintenance work in their designs, and
 - consider identifying hazards and hazard areas on the equipment.
- Time pressures increase some risks.
- Better planning and scheduling may help improve maintenance safety.

Several implications can be drawn from the maintenance safety and risk assessment study. Highlights include the following:

- The primary needs for maintenance safety include better equipment and facility designs and improved training. All personnel involved in developing and using equipment need to work to improve the design process, the resulting designs and the work methods used therein.
- Maintenance personnel seek help in identifying hazards. Several methods are discussed including an equipment hazard checklist, high-risk task lists and a Maintenance Safety Flow Chart.
- The Maintenance Safety Flow Chart presents a simple, easy to use approach to identify high-risk tasks based on three filtering questions pertaining to training, hazard identification and risk level. Respondents were generally very supportive of this approach.
- The study results have specific implications for maintenance personnel, supervisors and managers, risk assessment specialists, design engineers, and equipment manufacturers as noted herein. Each will likely use the results in different ways.
- The study results provide a benchmark and direction for continuous improvement efforts for organizations with maintenance concerns.

Risk assessment for maintenance applications appears to be a valuable method to improve maintenance safety through:

- better understanding of the tasks and hazards
- identifying more hazards
- reducing risks
- facilitating and improving communications
- improving the ability to plan and schedule maintenance work based on better understanding

There is a need to deploy maintenance risk assessment on an increasing scale. Although initial efforts in any one company may center around smaller pilot studies, the lessons learned appear to be sufficiently valuable that the maintenance risk assessment process should proceed swiftly.

The complexity of maintenance tasks and hazards make risk reduction challenging. Although there is great promise in risk assessment for maintenance applications, it represents only part of the complete solution to improving maintenance safety. Maintenance risk assessment is only a tool that will be part of the solution to reducing maintenance injuries. This book comprises one step toward reducing risks to an acceptable level. Efforts in maintenance risk assessment and other aspects of maintenance safety should continue.

ACKNOWLEDGEMENT

This study was made possible by a grant from The Ford Motor Company, The United Auto Workers, and MIOSHA.