

# ANSI Technical Report

*Risk Assessment and Risk Reduction –  
A Guide to Estimate, Evaluate and Reduce  
Risks Associated with Machine Tools*

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ANSI B11.TR3-2000



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Technical Report – Risk Assessment & Risk Reduction... A Guide to Estimate, Evaluate and Reduce Risks Associated with Machine Tools	B11.TR3—2000	

*(R19XX) date indicates B11 ASC (Accredited Standards Committee) reaffirmation of existing standard)*

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**ANSI B11.TR3-2000**

**ANSI Technical Report  
for Machine Tools —**

**Risk Assessment and Risk Reduction —  
A Guide to Estimate, Evaluate and Reduce  
Risks Associated with Machine Tools**

Secretariat:

**AMT - The Association For Manufacturing Technology  
Technology Department  
7901 Westpark Drive  
McLean, VA 22102**

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## **ABSTRACT**

This technical report is part of the ANSI B11 series of technical reports and standards pertaining to the design, construction, care and use of machine tools. This technical report defines a method for conducting a risk assessment and risk reduction for machine tools, provides some guidance in the selection of appropriate protective measures (safeguarding) to achieve tolerable risk, and describes the risk assessment and risk reduction responsibilities of both the machine tool supplier and user. This method requires gathering the appropriate information, determining the limits of the machine, identifying tasks and hazards over the lifecycle of the machine using a task-based approach, estimating risk associated with the task-hazard combinations, reducing risk according to a prioritized procedure, and documenting the results. The risk reduction process is not completed until tolerable risk is achieved. Flowcharts illustrate the process. Examples of tasks and hazards are included in the document. This technical report explicitly recognizes that zero risk is virtually unattainable. It is intended for use on all new or modified machines and equipment designs and processes. The user may also utilize it to assist with risk assessment and risk reduction for existing tasks and hazards.

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## **FOREWORD**

The B11 Accredited Standards Committee (Machine Tool Safety Standards) of the American National Standards Institute formed a subcommittee to develop a technical report to provide guidance for the application of risk assessment principles to machine tools during the design and construction, installation, use and care phases. The B11.TR3 Subcommittee operates under the auspices of the ANSI B11 ASC and its accredited Standards Developing Organization – The Association For Manufacturing Technology.

There are four annexes at the end of this technical report that are used for clarification, illustration and general information. Annex A lists several example hazards and hazardous situations; Annex B contains a sample test form; Annex C presents a flowchart depicting how B11.TR3 and the B11 series of machine tool safety standards are integrated; and Annex D is a report of the results from a field test using a late draft of this document and conducted to test its functionality.

Publication of this ANSI Technical Report has been approved and recommended to ANSI for registration by The Association For Manufacturing Technology, an ANSI-Accredited Standards Developing Organization. This document is registered as a Technical Report in the B11 series of publications according to the *Procedures for the Registration of ANSI Technical Reports* and the ANSI B11 ASC Operating Procedures. This document is not an American National Standard and the material contained herein is not normative in nature.

Comments on the content of this document or suggestions for improvement are welcome. They should be sent to: AMT, 7901 Westpark Dr., McLean, VA 22102-4206, Attention: Safety Director.

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## **INTRODUCTION**

The purpose of the ANSI B11 series of machine tool safety standards is to devise and propose ways to minimize risks associated with existing and potential hazards. This can be accomplished by an appropriate machine design, by restricting personnel access to hazardous areas or by devising work procedures to minimize personnel exposure to hazardous situations.

This technical report provides guidance for machine suppliers and users to analyze and reduce risks associated with hazards generated by machines and associated equipment where it is possible for persons to come in contact with or otherwise be affected by these hazards. Its use is intended for all new or modified machines and equipment designs and processes, but the user may also use it to assist with risk assessment and risk reduction for existing tasks and hazards – appreciating that many engineered safeguards are often not feasible to retrofit existing equipment.

This technical report recognizes that zero risk does not exist and cannot be attained. However, a good faith approach to risk assessment and risk reduction as described in this guide should achieve a tolerable risk level.

Traditional hazard analysis has long advocated the identification and evaluation of all hazards, but no methodology has existed within the B11 series of machine tool safety standards to accommodate hazard analysis associated with reasonably anticipated tasks, such as unplanned maintenance, jam clearing, or minor tool changes. The process described in this guide proactively recognizes risks associated with all equipment tasks so that safety related designs and modifications are made while providing for improved productivity and maintainability.

Because these tasks can be so diverse, the risk assessment process can best be conducted using a team of knowledgeable and affected persons.



# Risk assessment and reduction – A guide to estimate, evaluate and reduce risks associated with machine tools

## 1 Scope

This ANSI Technical Report provides the procedures and methods to assess the risks associated with the design, construction, care and use of machine tools as included in the B11 series of machine tool safety standards. It serves as a guideline for suppliers and users of machine tools, providing a framework and procedure to identify tasks and hazards, and to estimate, evaluate, reduce and document the risks associated with these hazards under the various conditions of use of that machine or system.

## 2 References

- ANSI/B11.TR 1: 1994, *Ergonomic Guidelines for the Design, Installation, and Use of Machine Tools*  
IEC 812: 1985, Analysis techniques for system reliability – Procedure for failure mode and effects analysis (FMEA)  
IEC 1025: 1990, Fault tree analysis (FTA)  
ISO 14121: 1999, *Safety of machinery – Principles for risk assessment*  
MIL STD 882D: 2000, *Systems safety program requirements*  
ANSI/RIA R15.06: 1999, *Industrial robots and robot systems – Safety requirements*

## 3 Definitions

- 3.1 design:** To plan and develop the [machine] to meet the intended purpose and function during its lifecycle.
- 3.2 guard:** Barrier that prevents entry into a hazard area.
- 3.3 harm:** Physical injury or damage to health of people.  
NOTE: This may be a result of direct interaction with the [machine], or indirectly as a result of damage to property or to the environment.
- 3.4 hazard:** A potential source of harm.
- 3.5 hazard area (zone):** An area or space that poses an immediate or impending hazard.
- 3.6 hazardous situation:** A circumstance in which a person is exposed to a hazard(s).  
NOTE: A hazardous situation is also referred to as a task/hazard pair (combination).
- 3.7 intended use (of a machine):** The use for which a machine is suited according to the information provided by the supplier or which is deemed usual according to its design, construction and function.  
NOTE: Intended use also involves compliance with the supplier's instructions, which should take into account reasonably foreseeable misuse. The intended use may be determined by the user.
- 3.8 lifecycle (of a machine):** The phases of a machine including:
- design and construction;
  - transport and commissioning; re-assembly, installation, initial adjustment, relocation;
  - use, (e.g., setting, teaching/programming or process changeover, operation), and care (cleaning, trouble shooting [fault finding], maintenance [planned and unplanned]);
  - de-commissioning, dismantling and, as far as safety is concerned, disposal.