ANSI B11 – 2008

American National Standard for Machines

General Safety Requirements Common to ANSI B11 Machines

Secretariat and Standards Developing Organization

The Association for Manufacturing Technology
7901 Westpark Drive
McLean, VA 22102
Attn: Safety Department

Approved: August 4, 2008

American National Standards

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This standard is available from www.amtonline.org. Published by: AMT – The Association For Manufacturing Technology, 7901 Westpark Drive, McLean, VA 22102–4206, USA

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Foreword (This foreword is not part of the requirements of this B11 American National Standard on General Safety Requirements)

Overview

This American National Standard was promulgated by the B11 Accredited Standards Committee and its Secretariat, The Association for Manufacturing Technology (AMT) as a voluntary consensus standard to establish safety requirements for machine tools and machine tool systems. This standard specifies general safety requirements for the design, construction, operation and maintenance (including installation, dismantling and transport) of machine tools and machine tool systems. This standard also applies to devices that are integral to these machines.

This is the first edition of this American National Standard on General Safety Requirements (GSR). The B11 standards for machine tools were first approved beginning with safety requirements for power presses in 1922. Since that time, safety requirements for a variety of machine tools have been developed and continually updated and revised to become a series of some 30 B11 standards and technical reports. Maintaining these documents with consistent language proved a significant challenge. The long term objective of this new GSR standard reorganizes the B11 family of standards by gathering the requirements common to many or most of the B11 standards into this document while retaining the machine tool specific requirements in the machine-specific standards.

Objective

The objective of the B11 standards is to eliminate injuries to personnel from machine tools or machine tool systems by establishing requirements for the design, construction, reconstruction, modification, installation, set–up, operation and maintenance of same. This standard should be used by suppliers and users, as well as by the appropriate authority having jurisdiction. Responsibilities have been assigned to the supplier (i.e., manufacturer, the reconstructor, and the modifier), the user, and the user personnel to implement this standard. This standard is not intended to replace good judgment and personal responsibility. Operator skill, attitude, training and experience are safety factors that must be considered by the user.

The safeguarding of machines and machine tool systems is complicated by the wide variety of operations and operating conditions, due to the variations in size, speed, and type of machine or machine tool used; the size, thickness, and kind of pieces to be worked; the required accuracy of the finished work; the skill of operators; the length of run; and the method of feeding, including part and scrap removal. Because of these varying factors in the operations and in the workplace, a wide variety of safeguarding methods has been covered in this standard as well as the ANSI B11 machine-specific standards.

Harmonization

This standard has been harmonized with international (ISO) and European (EN) standards by the introduction of hazard identification and risk assessment as the principal method for analyzing hazards to personnel to achieve a level of acceptable risk. This standard integrates the requirements of ANSI / ISO 12100 parts 1 and 2, and ISO 14121, as well as U.S. standards. Suppliers meeting the requirements of this ANSI B11 General Safety Requirements standard may simultaneously meet the requirements of these three ISO standards.

This document contains references to federal Occupational Safety and Health Administration (OSHA) standards. OSHA standards represent the minimum level of regulatory compliance requirements within the United States. Federal OSHA-approved individual state safety and health programs (e.g., California OSHA, known as Cal-OSHA) have standards that may exceed these minimum requirements. Accordingly, care must be exercised to ensure that the appropriate standards are being used.

General

"Safe" is the state of being protected from recognized hazards that are likely to cause serious physical harm. There is no such thing as being absolutely safe, that is, a complete absence of risk. In turn, there is no machine tool that is absolutely safe. All machines contain hazards, and some level of residual risk. However, the risk associated with those hazards should be reduced to an acceptable level.

This standard guides machine tool suppliers and users through a risk assessment process designed to ensure that reasonably foreseeable hazards are identified, and corresponding risks are reduced to an acceptable level. In this standard, the terms "acceptable" and "tolerable" are used as synonyms. Although engineers have long applied an informal risk assessment framework, this standard introduces a formal method to conduct and document the risk assessment process.

This standard identifies some preparations that need to be made before a risk assessment begins, and presents the basic risk assessment process in a step by step approach to assist in achieving this goal.

The outcome of completing the risk assessment process should be:

- Machines/machine tools with risks reduced to an acceptable level;
- Awareness devices, warning labels, instruction manual(s), and information for operation and maintenance;
- Documentation of the risk assessment.

This standard reflects the most commonly used and time-tested state of the art at the time of its approval. The inclusion or omission of language relative to any evolving technology, either in the normative or informative areas of this standard, in no way infers acceptance or rejection of such technologies.

The presentation style used in this standard mixes both informative and explanatory text with normative requirements and was chosen to enhance the readability of the information. The distinction between these texts is illustrated as follows:

Normative requirements

The normative requirements appear aligned to the left margin. To meet the requirements of this standard, machine tool suppliers and users must conform to these normative requirements. These requirements typically use the verb "shall."

Informative text.

The informative or explanatory text in this standard appears indented, in italics, in a reduced font size and colored blue (for those with electronic or color printed versions), all of which are in an effort to provide a visual signal to the reader that this is informative text, not normative text, and is not to be considered part of the requirements of this standard; this text is advisory only. The suppliers, the users and the machine tools themselves are not required to conform to the informative text. The ANSI B11 machine-specific standards all use a two-column format, and the informative text appears as the right hand column and is titled "Explanatory Information." This standard uses the single column format common to many international standards. The informative text is included in this manner to enhance readability.

Effective Date

The following information on effective dates is informative guidance only, and not a normative part of this standard. The subcommittee recognizes that some period of time after the approval date on the title page of this document is necessary for suppliers and users to develop new designs, and/or modify existing designs or manufacturing processes in order to incorporate the new and/or revised requirements of this standard into their product development or production system.

The committee recommends that suppliers complete and implement design changes for new machine tools and machine tool systems within 30 months of the approval of this standard.

The committee recommends that users should evaluate whether an existing machine tool and machine tool system has acceptable risk within 30 months of the approval date of this standard using generally recognized risk assessment methods. If the risk assessment shows that modification(s) is necessary, refer to the

requirements of this standard or the machine-specific standard to implement protective measures for appropriate risk reduction.

Suggestions for improvement of this standard are welcome. They should be sent to AMT-The Association For Manufacturing Technology, 7901 Westpark Drive, McLean, VA 22102 - Attention: AMT-B11 Secretariat. This standard was prepared by the B11 (General Safety Requirements) Subcommittee, processed and submitted for ANSI approval by the B11 Accredited Standards Committee on Safety Standards for Machine Tools. Committee approval of this standard does not necessarily imply that all committee members voted for its approval. At the time this standard was approved as an American National Standard, the ANSI B11 Accredited Standards Committee was composed of the following member organizations:

John W. Russell, PE, CSP Chairman
Gary D. Kopps, Vice-Chairman
David A. Felinski, Secretariat

Organizations Represented	Name of Representative	
	Delegate	Alternate
Aerospace Industries Association of America	Willard J. Wood	Lance E. Chandler, PE
Aluminum Extruders Council	Melvin Mitchell	Douglas Hart
American Society of Safety Engineers	Bruce W. Main, PE	George Karosas, PE, CSP
Association For Manufacturing Technology	Russell A. Bensman	Alan Metelsky
Automotive Industry Action Group	Nancy Malo	David Lalain
The Boeing Company	Don R. Nelson	Joe Oberuc
Canadian Standards Association	Elizabeth Rankin	Thomas Eastwood
Can Manufacturers Institute	Geoffrey Cullen	Jennifer Day
General Motors Corporation	Michael Douglas	Michael Taubitz
John Deere	Gary D. Kopps	Scott Fowler
Metal Building Manufacturers Association	Charles M. Stockinger	Charles E. Praeger
Metal Powder Industries Federation	Dennis R. Cloutier, CSP	Teresa F. Stillman
National Institute for Occupational Safety & Health	Richard S. Current, PE	James R. Harris, PE
Occupational Safety & Health Administration	Kenneth Stevanus	Robert Bell
OMRON - Scientific Technologies Incorporated	Frank Webster	Christopher Soranno
Packaging Machinery Manufacturers Institute	Charles F. Hayes	Maria Ferrante
Pilz Automation Safety, LP	Roberta Nelson Shea	Craig Torrance / Lee Burk
Precision Metalforming Association	William E. Gaskin	Christen A. Carmigiano
Presence Sensing Device Manufacturers Association	James V. Kirton	Michael S. Carlson
Property Casualty Insurers	John W. Russell, PE, CSP	Keith Lessner
Robotic Industries Association	Jeff Fryman	Gilbert Dominguez
Rockwell Automation	Steven Dukich	Michael B. Miller
Sheet Metal & Air Conditioning Contractors Natl. Assn.	Michael McCullion	Roy Brown
System Safety Society	John Etherton, PhD, PE	Rod Simmons, PhD
Tooling and Manufacturing Association	Daniel Kiraly	
Toyota Motor Manufacturing North America	Barry Boggs	Todd Mills

At the time this standard was approved, the **B11 General Safety Requirements Subcommittee** had the following members who participated in the development of this standard:

Name	Company
Bruce Main, Chairman	design safety engineering
Dave Felinski, Secretary	Association for Manufacturing Technology
Mike Carlson	Banner Engineering
Dennis Cloutier	Cloutier Consulting
Howard DeWees	SICK
Mike Douglas	General Motors Corporation
Tom Doyle	Industrial Safety Integration
John Etherton	Center for Safer Solutions
Alan Metelsky	The Gleason Works
Greg Motorojescu	MAG Powertrain
Don Nelson	The Boeing Company
Roberta Nelson Shea	Robotic Industries Association
Mike Taubitz	General Motors Corporation
Craig Torrance	Pilz Automation Safety

Will Wood	The Boeing Company

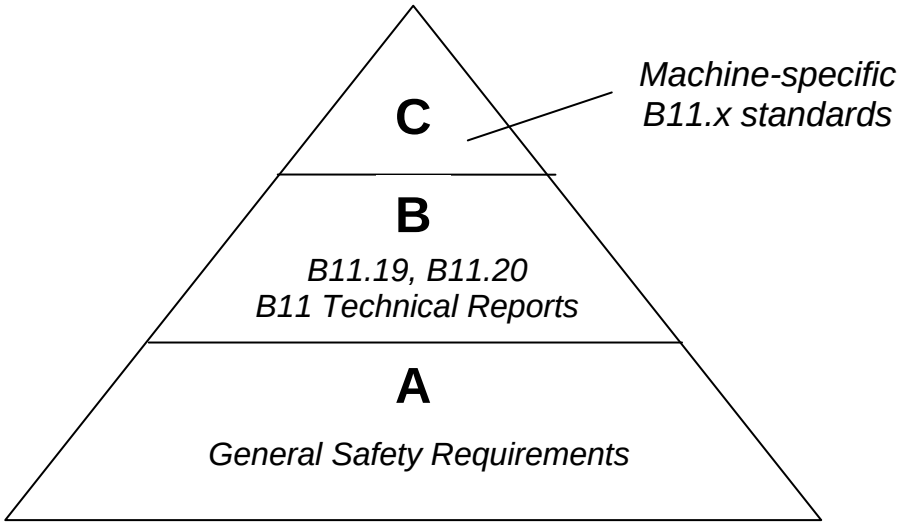
Introduction

Organization and Application of B11 Documents

The B11 standards and technical reports can be associated with the ISO "A-B-C level" structure as described immediately below, and as shown in the figure below.

- **Type-A standards** (basis standards) give basic concepts, principles for design, and general aspects that can be applied to machinery;
- **Type-B standards** (generic safety standards) deal with one or more safety aspects or one or more types of safeguards that can be used across a wide range of machinery:
- **Type-C standards** (machinery safety standards) deal with detailed safety requirements for a particular machine or group of machines**.**

This B11 standard on general safety requirements common to ANSI B11 machines falls in between an "A level" and "B Level" standard in that it applies to a broad array of machines and contains very general requirements, but in many areas it also contains general requirements and even very specific requirements. B11.19, B11.20 and the B11 series Technical Reports are all typical B level documents addressing safety elements that can be used across a wide range of machinery. The machine-specific (C Level) B11 standards contain detailed safety requirements for a particular machine or group of machines (see the list of machine-specific standards at 7.15). The B11 (GSR) and the machine-specific B11 standards are intended to be used concurrently by the supplier and user of machines. When a type-C standard deviates from one or more provisions dealt with by this standard or by a type-B standard, the type-C standard takes precedence.



Organization of the B11 Series of Documents

The B11 (GSR) standard is primarily written for machines that fall within the scope of the machine-specific B11 standards as listed in subclause 7.15. However, the standard may also be applied to machines based on the reader's definition or application within the context of the risk assessment, for example:

- machines that do not fall within the scope of a machine-specific B11 standard;
- machines that are specifically excluded from a machine-specific B11 standard; or
- machines that fall within the scope of another machine-specific standard.

This standard is intended for readers with differing levels of familiarity with B11 series of standards and the risk assessment process. Readers new to these standards may benefit from starting with the B11 and then reading the applicable machine-specific B11.x standard, B11.19, and other relevant or appropriate standards and technical reports. More experienced users may find efficiencies in beginning with the machine-specific B11.x standard and then reviewing portions of the B11 as necessary. The requirements of this ANSI standard are grouped according to those that apply to the supplier (i.e., manufacturer, rebuilder, modifier) and user. Some are shared between the supplier and user and are so indicated. The following Table provides an overview of the organization of B11 as compared with that of the machine-specific B11.x standards.

Table: Comparison of Clause Structure between GSR and Machine-specific B11 Standards

Clause	B11 (GSR) Title B11.X Title	B11 (GSR) Content B11.X Content
1	GSR Scope	Scope of the GSR standard. Provides the boundaries or limits of the standard (i.e., what is or is not included).
	B11.X Scope	Scope of the B11.X standard. Provides the boundaries or limits of the standard (i.e., what is or is not included).
2	GSR References	List of normative and informative references used in the GSR which, in whole or in part, provide additional requirements when referenced in the normative text.
	B11.X References	List of normative and informative references used in the B11.X standard which, in whole or in part, provide additional requirements when referenced in the normative text of the standard.
3	GSR Definitions	The GSR draws the common terms from the machine-specific B11 standards into one location. Terms that are generally understood and commonly used in everyday English are not defined.
	B11.X Definitions	Terms that apply to a specific machine tool and are not already included in clause 3 of the GSR appear in clause 3 of the machine-specific B11 standards.
4	GSR Responsibilities	The general responsibilities of machine tool suppliers, integrators, users and personnel are listed to more clearly define who is responsible for what. The common responsibilities appear in the GSR.
	B11.X Responsibilities	The machine-specific B11 standards list any additional or special responsibilities associated with the specific machine tool.
5	GSR Requirements	The GSR explicitly states the fundamental machine tool requirement that suppliers and users must achieve acceptable risk. Note that this requirement does not limit new technology or new application of existing technology.
	B11.X Hazard Control	The machine-specific B11 standards list any additional or special requirements associated with the specific machine tool.
6	GSR Risk assessment process	The GSR describes the risk assessment process which has been required in the B11 community since 2000 when ANSI B11.TR3 was first published. Although clause 6 is intended to require a shared responsibility between supplier and user, the requirements of this clause may fall on either entity. When possible, the user should participate in the supplier's risk assessment of the machine design.
	B11.X Design and Construction	Clause 6 addresses requirements for design and construction for the specific machine tool. The supplier is responsible for the requirements for design and construction with the understanding that the user or other entities assume this responsibility when modifying a machine.
7	GSR Risk reduction	Common risk reduction requirements for many machine tools appear in GSR clause 7. This clause is intended to be used with clauses 6-10 in the machine-specific B11.X standards. If a conflict occurs between the clause 7 GSR standard requirements, the requirements of the machine-specific standard apply.
	B11.X Installation, testing and start-up	In the machine-specific B11 standards, clause 7 contains requirements for installing, testing and starting-up specific machine tools. The requirements for installation, testing and start-up are predominantly the responsibility of the user. The supplier will normally provide assistance either directly (providing personnel) or indirectly (instruction materials).
8	GSR Info for maint. & use	The GSR clause addresses requirements for manuals and warnings.
	B11.X Safeguarding	Clause 8 in the machine-specific B11 standards presents requirements for safeguarding that are appropriate for the specific machine tool. Safeguarding is normally a shared responsibility between the supplier and user. This clause will frequently reference ANSI B11.19 on safeguarding performance criteria.
9	GSR Training	The GSR clause addresses the common training requirements for machine tools.
	B11.X Operation and maintenance	Clause 9 of the machine-specific B11 standards contains requirements for operation and maintenance of the specific machine tool. The user is normally responsible for the requirements of operation and maintenance, with possible assistance from the supplier for training.
10	GSR	(None)
	B11.X Other	Some machine-specific B11 standards have one or more additional clauses that address topics related to the specific machine tool.
Annex(es)	Informative or Normative	The GSR and machine-specific B11 standards typically have multiple informative (and infrequently, normative) annexes that describe special topics in greater detail.

1 Scope

This standard applies to new, modified or rebuilt power driven machines, not portable by hand, used to shape and/or form metal or other materials by cutting, impact, pressure, electrical or other processing techniques, or a combination of these processes.

This can be a single machine, a machine tool or a machine tool system(s).

Informative Note 1: *To improve readability, the terms "machine," "machine tool" or "machine tool system(s)" are used interchangeably throughout the document, either in singular or plural form.*

Informative Note 2: *See 7.15 for a list of example machine tools.*

Other industry sectors may benefit from applying this standard. Where a machine-specific standard exists and the requirements of that standard conflict with the requirements in this standard, the requirements of the machine-specific standard shall apply.

Informative Note: *For example, ANSI/RIA R15.06 on safety requirements for robots and robotic systems is a "C-level standard" that would take precedence over the requirements in this standard.*

2 Normative References

The following standards contain provisions which constitute additional requirements of this American National Standard and are incorporated into this standard by reference. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. See Annex H for a list of informative references.

ANSI B11.1—2008 *Safety Requirements for Mechanical Power Presses*

ANSI B11.2—1995 (R2005) *Hydraulic Power Presses -- Safety Requirements for Construction, Care and Use*

ANSI B11.3—2002 (R2007) *Safety Requirements for Power Press Brakes*

ANSI B11.4—2003 (R2008) *Safety Requirements for Shears*

ANSI B11.5—1998 (R2008) *Iron Workers -- Safety Requirements for Construction, Care and Use*

ANSI B11.6—2001 (R2007) *Safety Requirements for Manual Turning Machines*

ANSI B11.7—1995 (R2005) *Cold Headers and Cold Formers -- Safety Requirements for Construction, Care and Use*

ANSI B11.8—2001 (R2007) *Safety Requirements for Manual Milling, Drilling, and Boring Machines*

ANSI B11.9—1975 (R2005) *Grinding Machines -- Safety Requirements for Construction, Care and Use*

ANSI B11.10—2003 *Safety Requirements for Metal Sawing Machines*

ANSI B11.11—2001 (R2007) *Safety Requirements for Gear & Spline Cutting Machines*

ANSI B11.12—2005 *Safety Requirements for Roll Forming and Roll Bending Machines*

ANSI B11.13—1992 (R2007) *Safety Requirements for Single or Multiple Spindle Automatic Bar and Chucking Machines*

ANSI B11.15—2001 (R2007) *Safety Requirements for Pipe, Tube and Shape Bending Machines*

ANSI B11.16—2003 (MPIF #47) *Safety Requirements for Metal Powder Compacting Presses*

ANSI B11.17—2004 *Safety Requirements for Horizontal Hydraulic Extrusion Presses*

ANSI B11.18—2006 *Safety Requirements for Machines Processing or Slitting Coiled or Non-Coiled Metal (includes the requirements from the 1996 B11.14, which has been withdrawn)*

ANSI B11.19—2003 *Performance Criteria for Safeguarding*

ANSI B11.20—2004 *Safety Requirements for Integrated Manufacturing Systems*

ANSI B11.21—2006 *Safety Requirements for Machine Tools Using a Laser for Processing Materials*

ANSI B11.22—2002 (R2007) *Safety Requirements for Numerically Controlled Turning Machines*

ANSI B11.23—2002 (R2007) *Safety Requirements for Machining Centers*

ANSI B11.24—2002 (R2007) *Safety Requirements for Transfer Machines*

ANSI / RIA R15.06-1999 *Safety Requirements for Industrial Robots and Robot Systems*

NFPA 70-2005 *National Electrical Code*

NFPA 79-2007 *Electrical Standard for Industrial Machinery*

NFPA 70E-2004 *Standard for Electrical Safety in the Workplaces*

ANSI / ASSE Z244.1-2003 *Control of Hazardous Energy – Lockout/Tagout and Alternative Methods*

NFPA T2.25.R2-2003 *Pneumatic fluid power – System standard for industrial machinery*

NFPA T2.24.1 R1-2000 *Hydraulic fluid power – Systems standard for industrial machinery*

ANSI A1264.1-2002 *Safety Requirements for Industrial Fixed Stairs, Floor and Wall Openings, and Industrial Railings and Toe Boards*

ANSI A14.3-2002 *American National Standard for Safety Requirements for Fixed Ladders*

ANSI Z535.1-2006 *American National Standard for Safety Color Code*

ANSI Z535.2-2007 *American National Standard for Environmental and Facility Safety Signs*

ANSI Z535.3-2007 *American National Standard for Safety Symbols*

ANSI Z535.4-2007 *American National Standard for Product Safety Signs and Labels*

ANSI Z535.6-2006 *American National Standard for Product Safety Information in Product Manuals, Instructions and Other Collateral Material*

ANSI / ASME B20.1-2006 *Safety Standards for Conveyors and Related Equipment*

ANSI Z136.1-2007 *Standard for Safe Use of Lasers*

3 Definitions

3.1 acceptable risk: Risk that is accepted for a given task (hazardous situation) or hazard. For the purpose of this standard the terms “acceptable risk” and “tolerable risk” are considered to be synonymous.

Informative Note 1: *The expression “acceptable risk” refers to the level at which further risk reduction will not result in significant reduction in risk; or additional expenditure of resources will not result in significant advantages of increased safety.*

Informative Note 2: *The user and supplier may have different level(s) of acceptable risk.*

Informative Note 3: *A similar phrasing used in some ISO standards is “has the risk been adequately reduced.”*

3.2 accumulator: A vessel containing fluid under pressure used as a source of stored energy.

3.3 actuating control [actuating means]**:** An operator control used to initiate machine [slide] motion. Also referred to as: ***foot control; hand control; pedal; presence sensing device initiation; treadle bar; two-hand control;*** or ***two-hand trip*****.**

3.4 affected person: An individual who operates, services and/or maintains a machine, or others who are in proximity to the machine.