American National Standard for Machine Tools -

Safety Requirements for Powder/Metal Compacting Presses

Secretariat and Accredited Standards Developer:
B11 Standards, Inc.
POB 690905
Houston, TX 77269

Approved: 11 December 2014

by the
American National Standards Institute

AMERICAN NATIONAL STANDARDS

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Published by: B11 Standards, Inc., POB 690905, Houston, TX 77269-0905, USA

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Foreword (This Foreword is not part of American National Standard ANSI B11.16-2014 MPIF #47).

The first standard for Metal Powder Compacting Presses was developed and approved by the Metal Powder Industries Federation (MPIF) in 1973 and published in 1974 as MPIF #47. It was subsequently revised in 1977. Recognizing the need for an ANSI safety standard for powder/metal compacting presses, the ANSI Accredited Standards Committee B11 on safety requirements for machines established Subcommittee B11.16 in 1985 to develop this document as an American National Standard. The first ANSI B11.16 (MPIF #47) standard was published in 1988, and revised in 2003.

Because of the substantial use of compacting presses in the powder metallurgy (PM) industry and the MPIF involvement in the original writing of MPIF #47, this standard consistently refers to "metal" powder compacting presses. However, it is recognized that these presses are used in the compaction of all types of powders, metallic and nonmetallic and that the use of compacting presses in nonmetallic and advanced particulate material industries will continue to grow. It is the intention of the writing subcommittee that this standard be applicable to all industries involved in powder compaction, regardless of the specified material utilized.

The primary objective of this standard is to eliminate injuries to personnel associated with presses used in the PM industry, and similar powder compacting industries, by establishing safety requirements for the construction, safeguarding, operation and maintenance of PM presses. To accomplish this objective, the B11.16 Subcommittee approached the safe operation of PM presses from four angles:

- Eliminating certain recognized construction hazards by design and establishing standard approaches to design so that machines available from competitive suppliers will have similar operating control characteristics.
- Minimizing the necessity of having the operator place hands, fingers, or other body parts within the point of operation through machine design, process design and application of administrative controls (procedures), thus minimizing the operator's exposure to point of operation hazards.
- Safeguarding the point of operation to protect personnel, should they inadvertently be exposed to hazards at the point of operation.
- Establishing guidelines for general training and specific job-related instruction for establishing safe practices and procedures for all personnel working on PM presses.

It is recognized that the words "safe" and "safety" are not absolutes. While the goal of this standard is to eliminate injuries, it is recognized that risk cannot be reduced to zero in any human activity. Safety is influenced by many factors, including attitude. This standard is not intended to replace good judgment. Operator skill, training, experience, and job organization are all safety factors that must be considered in proper compliance with written regulations or recommended practice. In order to achieve the above goals and to assist persons in the implementation of this standard, responsibilities have been assigned to the supplier (manufacturer, re-constructor, modifier), the user and the personnel (see flowchart in the introduction). To achieve uniform interpretation, it is imperative to read and understand the definitions (clause 3) used in this standard.

PM presses and associated equipment technologies are continuously evolving. 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 requirements or explanatory area of this standard, in no way infers acceptance or rejection of such technologies.

Effective Dates:

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 machinery and machinery systems within 30 months of the approval of this standard.

The committee recommends that users evaluate whether existing machinery and machinery systems have 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 to implement risk reduction measures (protective measures) for appropriate risk reduction.

DEVELOPMENT

The standard was processed by B11 Standards, Inc., as the ANSI-accredited Standards Developing Organization, and approved by the ANSI B11 Accredited Standards Committee and an MPIF review committee, for submittal to ANSI in accordance with the requirements of the Accredited B11 Operating Procedures. 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 Members:

Alan Metelsky, Chairman
Barry Boggs, Vice-Chairman
David Felinski, Secretary

Organizations Represented	Name of Representative	
	Delegate	Alternate
Aluminum Extruders Council	Melvin Mitchell	Scott Burkett
American Society of Safety Engineers	Bruce Main, PE, CSP	George Karosas, PE,CSP
Association For Manufacturing Technology	Russell Bensman	Alan Metelsky
The Boeing Company	Don Nelson	Will Wood
Canadian Standards Association	Elizabeth Rankin, CRSP	Walter Veugen
Deere & Co.	Gary Kopps	Scott Fowler
FDR Safety	Michael Taubitz	Flavius Brown
General Motors Corporation	Michael Douglas	Graham Parr
Komatsu America Industries	George Schreck	James Landowski
Metal Powder Industries Federation	Dennis R. Cloutier, CSP	Teresa Stillman
National Institute for Occupational Safety & Health	Richard Current, PE	James Harris, PhD, PE
Occupational Safety & Health Administration	Kenneth Stevanus	Robert Bell
Omron Scientific Technologies Incorporated	Frank Webster	Christopher Soranno
Packaging Machinery Manufacturers Institute	Charles Hayes	Maria Ferrante
Pilz Automation Safety, LP	Michael Beerman	Lee Burk
Precision Metalforming Association	James Barrett, Jr. PhD	Bill Gaskin
Presence-sensing Device Manufacturers Assn.	James V. Kirton	Michael Carlson
Property Casualty Insurers	Stanford Brubaker	John Russell, PE,CSP
Robotic Industries Association	Jeffrey Fryman	Claude Dinsmoor
Rockwell Automation	Patrick Barry	Michael Miller
Safe-T-Sense	Chris Gerges	Mark Witherspoon
Sick, Inc.	Chris Soranno	Mark Nehrkorn
Sheet Metal & AC Contractors National Assn.	Michael McCullion	Roy Brown
Toyota Motor Manufacturing North America	Barry Boggs	Todd Mills

At the time the standard was written by the B11.16 Subcommittee, the following companies of powder metal press builders, end-user parts manufacturers, and trade association personnel supported and comprised membership on the subcommittee:

Dennis R. Cloutier, CSP	Cloutier Consulting Services, LLC	Chairman
Teresa Stillman	Metal Powder Industries Federation	Secretary
Curt Brennen	Allegheny Electric Services, Inc.	
Ron Cejer	CIECO	
Lucas Crawford	Atlas Pressed Metals	
Ken Fetzer	Dorst America, Inc.	
Mathieu Jacques	Engineered Sintered Components	
Steve Jenkins, CSP	Engineered Sintered Components	
Rom Koubi	Proment, Inc.	
Orrie Manners	NetShape Technologies	
Don Powellson	GKN Sinter Metals	
Greg Shick	Gasbarre Products, Inc.	
Gary Todd	Cincinnati Incorporated	

Explanation of the format, and ANSI B11 conventions

This ANSI B11.16 – 2014 standard is divided into parts referred to as clauses. Major divisions of clauses are referred to as subclauses and, when referenced by other text in the standard, are denoted by the subclause number (e.g., see 5.1).

The standard uses a two-column format to provide supporting information for requirements. The material in the left column is confined to “Standard Requirements” only, and is so captioned. The right column, captioned "Explanatory Information" contains information that the writing Subcommittee believed would help to clarify the requirements contained in the standard. This column should not be construed as being a part of the requirements of this American National Standard.

As in all American National Standards, the term “SHALL” denotes a requirement that is to be strictly followed in order to conform to this standard; no deviation is permitted. The term “SHOULD” denotes a recommendation, a practice or condition among several alternatives, or a preferred method or course of action.

Similarly, the term “CAN” denotes a possibility, ability or capability, whether physical or causal, and the term “MAY” denotes a permissible course of action within the limits of the standard.

B11 conventions: Operating rules (safe practices) are not included in either column of this standard unless they are of such nature as to be vital safety requirements, equal in weight to other requirements, or guides to assist in compliance with the standard. The B11 standards use the term “OR” as an inclusive disjunction, meaning *one or the other or both*. The term “and/or” may be used in cases where it is important to emphasize both. A distinction between the terms “*individual*” and “*personnel*” is drawn. Individual includes personnel (employees, subcontractors, consultants, or other contract workers under the indirect control of the supplier or user) but also encompasses persons who are not under the direct or indirect control of the supplier or user (e.g., visitors, vendors, etc.).

Introduction

The primary purpose of every machine tool is to process parts. This is accomplished by the machine imparting process energy onto the workpiece. Inadvertent interference with, or accidental misdirection of the released energy during production, maintenance, commissioning and de-commissioning may result in injury. This standard recognizes that zero risk does not exist and cannot be attained. However, a good faith approach to risk assessment and risk reduction should achieve an acceptable risk level.

The primary purpose of the ANSI B11 series of machine tool safety standards is to devise and propose ways to minimize risks of the potential hazards. This can be accomplished either by an appropriate machine design or by restricting personnel or other individuals' access to hazard zones, and by devising work procedures to minimize personnel exposure to hazardous situations. This is the essence of the ANSI B11 series of safety standards.

Organization and Application of B11 Series of Documents

The B11 series of documents can be associated with the ISO "Type A-B-C" structure as described 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 ANSI B11.16 (MPIF #47) standard on PM compacting presses is a "Type-C" standard. The ANSI B11.0 standard on general safety requirements common to ANSI B11 machines is primarily a "Type-A" standard in that it applies to a broad array of machines and contains very general requirements. However, in many areas it also contains very specific requirements. B11.19, B11.20 and the B11 series Technical Reports are all typical "Type-B" documents addressing general safety elements that can be applied across a wide range of machinery (B11.19) or as a standard when combining machines (B11.20). The B11 series of Technical Reports are informative documents that may be generally applied to many machine tools, and as such would fall into the "Type-B" group.

The machine-specific (Type-C) B11 standards contain detailed safety requirements for a particular machine or group of machines (such as in the case of this standard). The B11.0 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 requirement generally takes precedence. Any deviation in conforming to a requirement of any standard should be carefully evaluated and based on a documented risk assessment.

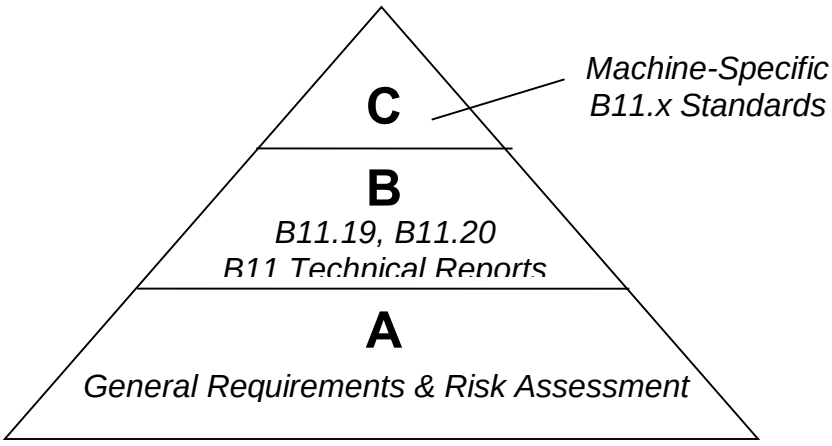

Figure 1 — Organization of the B11 Series of Documents

Figure 2 (following page) provides an overview of this standard and in particular the responsibilities of and requirements for the supplier and user, including the user personnel. Numbers in parentheses denote the particular clause or subclause of the standard. A solid line between a block showing reference standard(s) and a block showing a normative clause denotes part of the requirements. A dashed line denotes an informative reference.

Notes for Figure 2:

1) Scope – Provides the boundaries or limits of the standard (i.e., what is/is not included in the coverage or requirements).

2) Normative references – Other standards which in whole or in part provide additional requirements when referenced in the normative text (i.e., left-hand column of clauses 4 – 9) of this standard.

3) Definitions – Terms used in this standard in a unique or particular manner, together with their definitions (terms used in the same context as are generally understood and commonly used in everyday English are not defined).

4) Responsibility – The general responsibilities of the supplier (builder), user, and the user personnel are listed in clause 4 together with which of the remaining clauses they have primary responsibility.

5) Risk assessment process –Clause 5 presents the general approach to risk assessment (see B11.0 [B11.TR3] for further explanation of hazard/task identification and risk assessment/risk reduction).

6) Design and construction – Generally, the supplier will be responsible for the requirements of clause 6, understanding that the user may add to or modify these requirements through the purchase agreement.

7) Layout, installation, testing and start-up – Although the requirements of clause 7 are predominantly the responsibility of the user, the supplier will normally provide assistance either directly (providing personnel) or indirectly (instruction materials).

8) Safeguarding – This is normally a shared responsibility between the supplier and user but often, either the supplier or the user will provide and/or meet most or even all of the requirements of clause 8.

9) Setup, operation and maintenance – The user is generally responsible for the requirements of clause 9, with possible assistance from the supplier for training.

10) Training – The user is generally responsible for the requirements of clause 10, with possible assistance from the supplier for materials or the training itself.

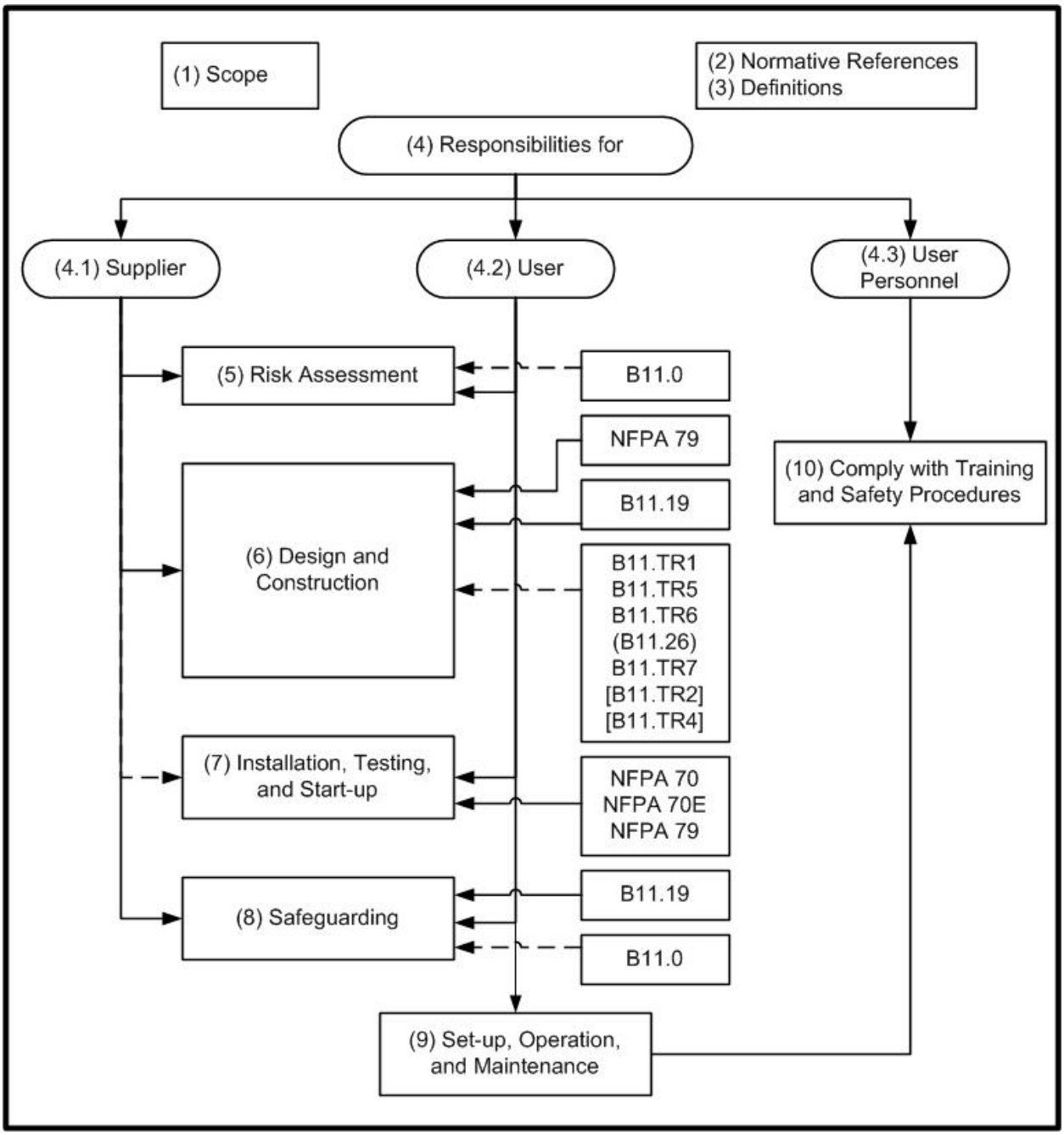

Figure 2 – Typical layout of B11 base standards showing the various responsibilities of the Supplier and User

Standard Requirements **Explanatory Information**

American National Standard for Machines –

Safety Requirements for Powder / Metal Compacting Presses

STANDARD REQUIREMENTS

EXPLANATORY INFORMATION
(Not part of American National Standard for Machines – Safety Requirements for Powder/Metal Compacting Presses, ANSI B11.16 (MPIF #47) 2014).

1 Scope and exclusions

1.1 Scope

The requirements of this standard apply to those mechanically, hydraulically or direct drive machines that are designed, modified, or converted for the purpose of compressing metallic or nonmetallic powders.

E1.1

PM presses are composed of a frame, tooling platens and upper or lower rams. Mechanical PM presses have fixed or moving die platens and utilize a single motion, multi-motion, rotary motion or sliding anvil motion. The tooling components are located in, or attached to the rams and are mechanically driven. Hydraulic PM presses contain all the components and motions of mechanical machines but are hydraulically driven. "Hybrid" PM presses may utilize any combination of mechanical, pneumatic, hydraulic, or servo power for driving the rams and have the same basic description as mechanical PM presses.

At the time of this revision, direct drive compacting presses are being introduced in the industry. These presses use electrically or hydraulically driven motors to control platen, ram (upper and lower) motion, and other motions.

These machines are commonly referred to as metal powder presses, powder metal presses, compacting presses, pill presses, rotary PM presses, PM briquetting presses, powder metal forging presses, metal powder sizing presses or metal powder coining presses. For the purpose of this standard, they shall be referred to as "PM presses."

PM presses include compacting and certain automatic isostatic, hydrostatic and high velocity PM presses for the initial consolidation of powder into a desired shape, as well as coining and sizing presses for repressing of previously compacted parts.

The unique characteristics that differentiate the PM press from other presses are how it is used to achieve the conversion from metallic and nonmetallic powder to the green part or to size, coin, or densify the previously compacted PM part.

This standard is written for the most common application of the compaction of powdered metal, including iron, brass, bronze, etc), ceramics and abrasive compositions such as brake pads and other friction materials. Other applications may benefit from applying this standard. Typical other applications include but are not limited to:

- food products;
- chemicals;
- pharmaceutical powders.

See Figures 2-11, Annex A.