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*ANSI/SPI B151.2-1999*

American National Standard

# *for Plastic Film Casting Machinery – Manufacture, Care and Use*

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**ANSI/SPI B151.2-1999**
Revision and redesignation of
ANSI B151.2-1982 (R1988)

# American National Standard for Plastic Film Casting Machinery – Manufacture, Care and Use

Sponsor

**The Society of the Plastics Industry, Inc.**

Approved August 11, 1999

**American National Standards Institute, Inc.**

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**Foreword** (This foreword is not part of American National Standard ANSI/SPI B151.2-1999.)

This standard is a revision of *American National Standard for Plastic Film Casting Machinery - Manufacture, Care and Use*, ANSI B151.2-1982.

The standard was revised because:

1) The scope needed to be expanded and the titles modified

2) Some illustrations required modification to conform to the text and some illustrations were deleted to permit design freedom

3) Additional definitions were required

4) Some paragraphs required modification and some paragraphs were added to conform more closely to changes in technology

5) Some paragraphs required modification for clarity and intent

A standard treating the manufacture, care and use of web handling machines is complicated by the wide variety and sizes of machines manufactured and in use, and by the virtually infinite combinations of parts being produced, production methods being used, and operating conditions existing in industry today.

The primary objective of this standard is to minimize hazards to personnel associated with machine activity by establishing requirements for the manufacture, care and use of these machines. To accomplish this objective a decision was made to approach the problem of machine safety as follows:

1) Eliminate by design certain recognized hazards and establish standard approaches to design, so that machines available from competitive manufacturers will have similar operational characteristics

2) Safeguard the machine where recognized hazards cannot be designed out for technical or operational reasons

3) Warn where elimination or safeguarding of hazards is not technically or operationally feasible

To assist in the interpretation of these requirements, responsibilities have been assigned to the manufacturer, re-manufacturer, the modifier, and the employer.

Recognizing the impossibility of updating equipment and changing operation methods allied with existing machines immediately after the approval date of this standard, a 3-year period has been provided to employers for updating machines.

Recognizing the impossibility of immediate updating of design and manufacturing methods, 4 and 6 shall become effective one year after the approval date of this standard.

Evidence of consensus on this standard was secured by use of the Canvass Method.

Suggestions for improvement of this standard will be welcome. They should be sent to The Society of the Plastics Industry Inc., 1801 K Street NW, Suite 600, Washington, D.C. 20006-1301.



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## Explanation of Standard Format

This standard uses a two-column format to provide both specific requirements and supporting information.

The left column, designated "Standard Requirement" is confined solely to these requirements and is printed in bold type. Where supporting photographs or sketches are required, they are designated as "figures."

The right column, designated "Explanatory Information" contains only information that is intended to clarify the standard. This is *not* a part of the standard. Where supplementary photographs or sketches are required, they are designated as "illustrations."

Operating rules (safe practices) are not included in either column 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.



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# American National Standard for Plastic Film Casting Machinery – Manufacture, Care and Use

## STANDARD REQUIREMENTS

## 1 Scope, Purpose, and Application

### 1.1 *Scope*

**The requirement of this standard shall apply to all film casting, cast embossing, laminating and extrusion coating machinery (Machinery).**

**Safety requirements of ancillary equipment used with the Machinery are not covered by this standard.**

### 1.2 *Purpose*

**The purpose of this standard is to identify and address known hazards to personnel working on, or adjacent to the Machinery.**

### 1.3 *Application*

#### 1.3.1 *New Installation*

**The requirements of this standard pertaining to manufacturer shall apply to all new or remanufactured Machinery installed in the United States, of America. Compliance shall be achieved within one year of the approval date of this standard. Date of shipment (month and year) shall be affixed to the Machine permanently and legibly along with the name of the manufacturer or remanufacturer.**

#### 1.3.2 *Existing Installations*

**The employer is responsible for bringing existing Machines into compliance with the requirements of this standard within three years of the approval date of this standard with the following specific exception:**

- **the 4-inch dimension referred to in 3.1 and 5.3.1.2 shall be changed to 3 inches.**

#### 1.3.3 *All Installations*

**An employer shall not operate a Machine or permit it to be operated unless it is in compliance with this standard.**

## EXPLANATORY INFORMATION

E1.1 *Scope*

Inquiries with respect to the application or the substantive requirements of the standard should be addressed to The Society of the Plastics Industry, Inc, 1801 K Street NW, Suite 600, Washington, DC, 20006-1301.

E1.3.2 *Existing Installations*

Exceptions to the standard:

It is not the intent of this standard to require existing installations to be in total compliance with the latest revision of ANSI/NFPA 79-1997, *American National Standard Electrical Standard for Industrial Machinery*. Only the requirements that address personnel safety require updating.

If modifications are required to achieve this reduced dimension the employer is strongly encouraged to use 4-inches, if at all possible.



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## 2. Normative References

**The following standards contain provisions which, through reference in this text, constitute provisions of this American National Standard. 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 edition of the standards indicated below.**

**ANSI Z535.3-1998, *Criteria for Safety Symbols**

**ANSI Z535.4-1998, *Product Safety Signs and Labels**

**ANSI/NFPA 79-1997, *Electrical Standard for Industrial Machinery**

**OSHA 1910.93[2)]**

## E2 Related References

SPI/AN-137, SPI Recommended Guideline for Safety Signs for Plastics Machinery & Related Equipment[1)]

CFR Title 29, Subpart 2, Part 1910.1042[2)]

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* For electronic copies of some standards, visit ANSI's Electronic Standards Store (ESS) at www.ansi.org. For printed versions of all these standards, contact Global Engineering Documents, 15 Inverness Way East, Englewood, CO 80112-5704, (800) 854-7179.

[1)] Available from The Society of the Plastics Industry, Literature Sales Dept., 1801 K Street, NW, Washington, DC 20006.

[2)] Available from the National Archives and Records Administration, Code of Federal Regulations, Pennsylvania Ave. at 7th Street, Washington, DC 20408.



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## 3 Definitions

**3.1 *Alarm***

**A visual or audible signaling device.**

**3.2 *Casting Stand***

**A Machine equipped with one or more metal rolls upon which a plastic melt is cast for purpose of heat transfer.**

E3.2 *Casting Stand*

The Machine may have additional capabilities such as embossing, laminating and extrusion coating.

**3.3 *Emergency Stop Device***

**A trip rod, cord, button, or other device that, when actuated, stops all hazardous movement associated with the specific Machine.**

**3.4 *Employer***

**Any person who contracts, hires, or is responsible for the personnel associated with the operation and maintenance of the Machinery.**

**3.5 Guard**

**A barrier, cover, enclosure, or other device placed over areas where hazards exist.**

E3.5 *Guard*

Other devices may include presence-sensing devices.

**3.5.1 *Fixed Guard***

**A guard requiring the use of tools for removal from the Machinery.**

E3.5.1 *Fixed Guard*

A fixed guard includes but is not limited to one that is fastened to the framework of the Machine or floor.

**3.5.2 *Movable Guard***

**A guard that may be moved or removed without the use of tools.**

E3.5.2 *Movable Guard*

A movable guard is generally connected by mechanical means to the machine frame or an adjacent fixed element (e.g. hinges or slides).

**3.6 *Instructions***

**Documentation for the installation, operation, care, maintenance, and safe use of the Machine.**

**3.7 *Interlock***

**An arrangement whereby the operation of one control of mechanism brings about or prevents the operation of another.**

**3.8 *Local Control***

**A control device located in full view of the component being controlled.**

**3.9 *Maintenance Personnel***

**Maintenance Personnel are individuals, who by virtue of their training and skill are qualified to inspect, maintain and repair the Machinery.**



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**3.10 *Manufacturer***

**Any person whose business is the manufacture of the Machinery covered in this standard for installation in the United States of America.**

**3.11 *Modification***

**For the purpose of this standard, any change to the Machinery that affects personnel safety is considered a modification.**

**3.12 *Modifier***

**Any person who performs a modification to a Machine.**

**3.13 *Nip, Counter Rotating***

**The point between two counter rotating rolls.**

**3.14 *Nip, Fixed Member***

**The point between a fixed member and a driven roll where the distance between the two is 4 inches or less.**

**3.15 *Operator***

**An individual who uses the Machinery to perform production work.**

E3.15 *Operator*

Production work includes thread-ups.

***3.16 Pinch Point***

**Any point at which it is possible for a part of the body to be caught between a moving part and a fixed part or between two moving parts except nips.**

**3.17 *Presence Sensing Device***

**A device that is capable of detecting an intrusion into specified area.**

E3.17 *Presence Sensing Device*

Examples of presence sensing devices include: Safety mat, interlocked platform, photoelectric beam, or other similar devices.

**3.18 *Reach Point***

**The farthest point an operator is expected to be able to touch when outside of the machine or on a walkway.**

**Areas that may be reached only by deliberately crawling into the machine or otherwise contorting the body are not considered within the reach point of the operator.**



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**3.19 *Remanufacture***

**A substantial restoration of a specific machine.**

E3.19 *Remanufacture*

Remanufacture typically consists of the following: 1) Substantial dismantling of the Machine. 2) Cleaning and carefully inspecting all parts. 3) Reworking worn parts to as new condition or replacing with new parts to meet applicable standards and guidelines. 4) Substantially reconditioning or replacing power system components to meet applicable standards and guidelines. 5) Inspecting all electrical and control systems and replacing component/systems as required. 6) Removing modifications which are not in conformance with clauses 5 and 7 of this standard and informing the employer of the removal.

**3.20 *Remanufacturer***

**Any person whose business is the redesign and/or remanufacture of a specific machine for installation in the United States of America.**

**3.21 *Repair***

**The restoration of a portion of a specific machine to original function using original design by replacement or re-working of worn or damaged parts.**

E3.21 *Repair*

Repair may include such items as replacement or rework of safety devices, drives, controls, meters, etc.

**3.22 *Safety Signs***

**A visual alerting device in the form of a sign, label, decal, placard, or other marking that advises the observer of the nature and degree of the potential hazard(s) that can cause injury or death.**

**3.23 *Shall***

**The word "shall" denotes a mandatory requirement.**

**3.24 *Should***

**The word "should" denotes a recommendation.**

**3.25 *"S" wrap***

**An "s" wrap is formed between two counter-rotating rolls either touching or not, when the web passes around the first roll, through the space between the two rolls, around the second roll, and continues. This is opposed to the web simply passing through the nip between the two roll without wrapping either.**

**3.26 *Traversing***

**The motion of a machine from a non-production position to a production position and vice versa.**

E3.26 *Traversing*

Traversing does not include machine motions inherent in production operation (e.g. - oscillating and rotation).



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### 3.27 *Web*

**The film or sheet passed through the Machinery.**

## 4 Care

### 4.1 *Instructions*

#### 4.1.1 *Manufacturer*

**It shall be the responsibility of the manufacturer to furnish instructions with the Machinery.**

#### 4.1.2 *Modifier*

**It shall be the responsibility of the person modifying the Machinery to furnish instructions specific to the modification.**

#### 4.1.3 *Remanufacturer*

**It shall be the responsibility of the remanufacturer to furnish instructions with the Machinery.**

### 4.2 *Training of Maintenance Personnel*

**It shall be the responsibility of the employer to ensure the original and continuing competence of personnel installing, inspecting and maintaining the Machinery.**

### 4.3 *Inspection and Maintenance*

**It shall be the responsibility of the employer to establish and follow a program of periodic and regular inspection of the Machinery to ensure that all safeguards are in proper operating condition and are properly adjusted.**

E4.2 *Training of Maintenance Personnel*

Much general literature exists to provide a good foundation for training of personnel. It should be noted that various Machines have unique features; therefore, reference to the manufacturer's or remanufacturer's manual is very important.

E4.3 *Inspection and Maintenance*

To meet the requirements of this subclause, it is recommended that a visual inspection of operations and safeguards be made. In addition, an operational inspection should be made of all safety interlocks and emergency stop devices. Each manufacturer, modifier or remanufacturer should have a recommended preventive maintenance program for the Machinery. This program can be used as a basis for periodic operational inspections and maintenance. In the absence of such program, the employer should fulfill this requirement.



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## 5. Manufacture, Remanufacture, and Modification

### 5.1 *Responsibility*

#### 5.1.1 *Manufacture*

**The manufacture of new Machinery shall be in accordance with clauses 5 and 7 of this standard.**

#### 5.1.2 *Remanufacture*

**The remanufacture of existing Machinery shall be in accordance with clauses 5 and 7 of this standard.**

#### 5.1.3 *Modification*

**Modification(s) made to existing Machinery shall be in accordance with clause 7 and the applicable parts of clause 5 of this standard. Any modification shall not reduce the level of safety existing on the machine prior to that modification.**

#### 5.1.4 *Repair*

**Repair shall not reduce the level of safety of the Machine.**

### 5.2 *Guarding, General*

#### 5.2.1 *Access Openings*

**Hazardous areas that are accessible shall be guarded. When the guard is not fixed, it shall be interlocked to stop hazardous motion exposed by moving or removing the guard. Where safeguarding of hazards is not technically or operationally feasible, these hazardous areas shall be color-coded.**

#### 5.2.2 *Rotating Shaft Extension*

**Rotating shaft extensions shall be smooth and shall not project more than one-half of the diameter of the shaft unless guarded. Smooth roll journals fitted with rotary joints and piping and presenting no significant hazard are excepted from these requirements.**

E5.2.1 *Access Openings*

Examples of hazardous areas may include but are not limited to moving or rotating motor-driven parts such as gears, sheaves, belts, chains, shafts, drive couplings and pinch point.



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**5.2.3 *Cutting Devices***

**All web-cutting devices within the reach point during normal production shall be guarded to the extent technically and operationally feasible. A means shall be provided to prevent unintentional movement during thread-up, blade change or other adjustment. Blade holders shall be color-coded and a safety sign shall be provided.**

**5.3 *Guarding, Nips***

**5.3.1 *Counter-Rotating Nips***

**The inrunning side of the counter-rotating nips within the operator's reach point shall be guarded to prevent a person form being caught in the nips and shall have an Emergency Stop Device readily accessible to that person. The guard shall not form a wedging nip.**

E5.3.1 *Counter-Rotating Nips*

Acceptable safeguarding devices include but are not limited to:

- vacuum box
- air knife or similar accessory which blocks access to the nip
- fixed or moveable guard
- presence sensing device which, when activated, shall open the nip
- deckles
- or an combination of the above

**5.3.1.1 *Inrunning Nips with Associated Flat Dies***

**Process considerations require access to the nip area. A flat die and/or its extensions typically blocks access to the nip and provides the guarding function. When blocking access to the nip, the flat die may create a wedging nip, which is not technically or operationally feasible to guard.**

**Where a die narrower than the nip rolls fails to guard the outside face of the nip, die extensions, deckles, or similar structures shall be provided to achieve the same guarding function.**

**Safety signs, color-coded roll ends and a readily accessible Emergency Stopping Device shall be provided**

E5.3.1.1 *Inrunning Nips with Associated Flat Dies*

Process Considerations include but are not limited to access for die/roll adjustment, visual inspection, etc.

**5.3.1.2 *Nip Roll Opening***

**The rolls shall open to a minimum of 4 inches (4") between roll surfaces.**



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**5.3.1.3 *Nip Roll Closing***

**Nip rolls, which are operator accessible, shall be closed by local hold-to-close control or if local control is not used, then a preclose alarm shall be provided. The control circuits shall be designed such that to close the nips an alarm of a duration of 3 seconds is active. From the moment of actuation of the alarm, at least 3 seconds shall elapse before the nip can be closed. The nip shall close within 12 seconds of termination of the local preclose alarm.**

**Exception: If the nip created by the closing rolls is in full view of the roll close control device, the rolls may be opened and reclosed within a period of 5 seconds without the local preclose alarm; however, the alarm shall be activated from the time the rolls are opened until they close.**

**5.3.1.4 *Emergency Conditions***

**Activation of the Emergency Stop Device shall initiate stopping and opening of the driven rolls, provided that this does not create additional hazards.**

**5.3.1.4.1 *Opening Time***

**Minimum roll opening shall be achieved within three (3) seconds.**

**5.3.1.5 *Independently Moveable Guards***

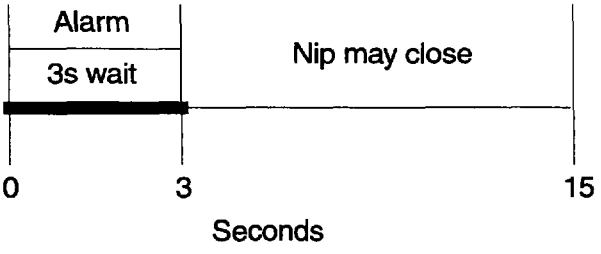
**Where guard motion is independent of nip movement, the guard shall be interlocked to prevent closing of the nip when the guard is not in place and shall open the nip if the guard is withdrawn from its effective position. Closing of the guard shall not of itself cause the nip rolls to close. Rotation of the nip rolls is permitted with the nip open independent of guarding.**

**5.3.1.6 *Nip-Powered Moveable Guards***

**Nip-powered moveable guards within the operators reach point which form a pinch point when the guard is closing, shall comply with 5.3.1.3.**

E5.3.1.3 *Roll Closing*

After 3 seconds have elapsed, the closing of the nip must take place within the next 12 seconds. Otherwise, the sequence starts over.




Momentary opening and closing of counter-rotating nip may be required for process considerations.

E5.3.1.6 *Nip-Powered Moveable Guards*

See E5.3.1.3.



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**5.3.2 *Nip, Fixed Member***

**Where a nip exists within the operator's reach point and which can cause physical injury, a guard shall be provided. The guard shall come within 1/4 inch of the moving surface and not create a wedging condition.**

E5.3.2 *Nip, Fixed Member*

See 5.3.1.1 for flat dies.

**5.3.3 *Nip, Web Generated***

**Where a web-generated hazard exists within the operator's reach point; the hazard shall be guarded. Where it is not technically or operationally feasible to guard this nip, an Emergency Stop Device readily accessible to that person from any point across the full width of the nip shall be provided. In areas where operator access is required predominantly for start-up purposes, guarding or an Emergency Stop Device is not required.**

E5.3.3 *Nip, Web Generated*

An example of a case where guarding is not required is the web carrying idlers between major line elements.

**5.4 *Operation Safeguards***

**5.4.1 *Electrostatic Treater***

**The electrostatic treater electrode zone shall be exhaust vented to maintain ozone levels in accordance with OSHA 1910.93. The electrostatic treater shall have means provided to prevent operation when the exhaust fan is not operating or when the electrode is accessible. Any access openings shall be in conformance with 5.2.1.**

E5.4.1 *Electrostatic Treater*

Refer to Federal Register, Code of Federal Regulations Title 29, Subpart 2 of Part 1910, Paragraph 1910.1042 for further specific personnel requirements regarding ozone exposure.

**5.4.2 *Protrusions***

**Any mechanical element, which creates a hazard by protruding into any passageway, shall be color-coded.**

**5.4.3 *Traversing Machines***

**There shall be a 3-second minimum delay during which a alarm is activated to warn the operator and others when the Machines are about to move. An alarm shall be activated during the traversing motion. After the 3-second delay, intermittent motion of the Machine can continue without repeating the delay requirement. After stopping, motion of machine may be resumed within 12 seconds without the 3-second delay.**



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### 5.5 *Electrical*

#### 5.5.1 *Electrical Systems*

**Machines shall be designed and built to the requirements of ANSI/NFPA 79.**

#### 5.5.2 *Power Loss*

**Power loss shall not initiate hazardous machine motion, Restoration of power shall not restart the machine.**

## 6. Use

### 6.1 *Ancillary Equipment*

**It shall be the responsibility of the employer to ensure that use of ancillary equipment does not reduce the level of safety of the machine.**

### 6.2 *Die Changes*

**The employer shall ensure that all die changes conform to 5.3.1.1.**

### 6.3 *Instruction of Operators*

**The employer shall train and instruct operators in the safe methods of operation, as well as provide instruction on the safety devices provided, before they start work on Machinery covered by this standard. The employer shall ensure that correct operating procedures are being followed. The employer shall make all instructions available to the operator and maintenance personnel.**

### 6.4 *Personal Protective Equipment*

**Employer shall evaluate hazards requiring Personal Protective Equipment and ensure its use.**

### 6.5 *Work Area*

**Adequate clearance for operation and maintenance shall be provided around the Machinery.**

E6.3 *Instruction of Operators*

The employer should consider setting up a checklist to ensure operators are kept aware of procedures to follow in operating the Machine safely. This checklist should be kept in the Machine instruction manual and periodically (such as every 6 months) the employer should have operators review the instructions and sign-off the list.



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## 7 Signs and Plates

### 7.1 *General*

**All new signs shall conform to ANSI Z535.3 and ANSI Z535.4 in color, format, size and content where feasible.**

### 7.2 *Safety Sign Wording and Location*

**Safety signs shall contain sufficient information to be understood and be located as dose to the actual hazard as practical.**

E7.2 *Safety Sign Wording and Location*

See *SPI Recommended Guideline for Safety Signs for Machines.*



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