American National Standard

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

ANSI/SPI B151.5-2000

Approved American National Standard
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**ANSI/SPI B151.5-2000**
Revision and redesignation of
ANSI B151.5-1982

American National Standard
for Plastic Film and Sheet Winding Machinery –

# Manufacture, Care and Use

Secretariat

**The Society of the Plastics Industry**

Approved August 3, 2000

**American National Standards Institute, Inc.**

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Published by

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## Foreword (This foreword is not part of American National Standard B151.5-2000.)

This standard is a revision of *American National Standard for Plastics Machinery - Plastic Film and Sheet Winding Equipment - Construction, Care, and Use*, ANSI B151.5-1982.

The standard was revised because:

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

2) Additional definitions were required;

3) Some paragraphs required modification and some paragraphs were added to conform more closely to change in technology;

4) 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) Eliminating by design certain recognized hazards and the establishment of standard approaches to design so those machines available from competitive manufacturers will have similar operational characteristics;

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

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

To assist 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 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, Sections 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.

The Society of the Plastics Industry Extrusion Section - Standards Development Committee on Machinery Standards was responsible for developing this standard.



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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 Requirements," 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 a 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 and Sheet Winding Machinery –

# Manufacture, Care and Use

## STANDARD REQUIREMENTS

## EXPLANATORY INFORMATION

### 1. Scope, Purpose, and Application

**1.1 *Scope***

**The requirement of this standard shall apply to all film and sheet winding machinery (Machinery).**

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

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.

**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 manufacture 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***

E1.3.2 *Existing Installations*

Exceptions to the standard:

**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.**

**By the end of the three-year transition period, the 4-inch opening referred to in 5.3.1.1 shall be changed to 3 inches.**

If modifications are required to achieve this reduced dimension, the employer is strongly encouraged to use a 3-inch opening if at all possible.

**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, *Electrical Standard for Industrial Machinery*. Only those requirements that address personnel safety require updating.**



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**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.**

## 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/NFPA 79-1997, *Electrical Standard for Industrial Machinery*[1)]**

**ANSI Z535.4-1991, *Product Safety Signs and Labels*[1)]**

**OSHA 1910.93[2)]**

*E.2 Related References*

AN-137, *SPI Recommended Guideline for Safety Signs for Plastics Machinery and Related Equipment*[3)]

OSHA 1910.1042[2)]

## 3 Definitions

**3.1 *Alarm***

**A visual or audible signaling device.**

**3.2 *Arbor***

E3.2 *Arbor*

**Any shaft or spindle over which is placed a core or tube on which the web is wound, or on which the web is wound directly without a core.**

Also known as a mandrel or shaft.

**3.3 *Arbor Cradle***

**A device that will support the ends of the arbor when in the loading/unloading position.**

**3.4 *Block***

**Any type of spacer or device that prevents movement of a member under its own weight or when actuating the normal movement control.**

**3.5 *Chuck***

**A device used to support an arbor, or core, for rotation to wind the web; generally used in pairs, one supporting and driving and one supporting and idling, at the ends of the arbor, or core.**

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1) 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.

2) Available from the Superintendent of Documents, US Government Printing Office, P.O. Box 371954, Pittsburgh, PA 15250.

3) Available from the Society of the Plastics Industry, 1801 K Street, NW, Suite 600, Washington, DC 20006-1301.



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**3.6** ***Emergency Stop Device***

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

**3.7** ***Employer***

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

**3.8** ***Guard***

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

E3.8 *Guard*

Other devices may include presence-sensing devices.

**3.8.1** ***Fixed Guard***

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

E3.8.1 *Fixed Guard*

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

**3.8.2** ***Movable Guard***

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

E3.8.2 *Movable Guard*

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

**3.9** ***Instructions***

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

**3.10** ***Interlock***

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

**3.11** ***Lay-on-Roll***

**A driven or nondriven roll that rides on or in close proximity to the outside of the winding roll.**

**3.12** ***Local Control***

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

E3.12 *Local Control*

The operator must be able to see the hazard.

**3.13** ***Maintenance Personnel***

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

**3.14** ***Manufacturer***

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

**3.15** ***Modification***

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



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**3.16** ***Modifier***

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

**3.17** ***Nip, Counter Rotating***

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

**3.18** ***Nip, Fixed member***

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

**3.19** ***Nip, Web Generated***

**The contact point between a web surface and a rotating roll.**

**3.20** ***Operator***

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

E3.20 *Operator*

Production work includes thread-ups.

**3.21** ***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.**

**3.22** ***Presence-Sensing Device***

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

E3.22 *Presence-Sensing Device*

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

**3.23** ***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.**

**3.24** ***Remanufacture***

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

E3.24 *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 that are not in conformance with Sections 5 and 7 of this standard and informing the employer of the removal.



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**3.25 *Remanufacturer***

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

**3.26 *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.**

E3.26 *Repair*

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

**3.27 *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.**

**3.28 *Shall***

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

**3.29 *Should***

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

**3.30 *"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 rolls without wrapping either.**

**3.31 *Traversing***

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

E3.31 *Traversing*

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

**3.32 *Turret Winder***

**An arrangement of two or more parallel winding positions spaced around a common axis of rotation that is used to wind the web.**

**3.33 *Unloader***

**A device for delivering a roll of product from the winder to the floor or some other device.**

E3.33 *Unloader*

Sometimes referred to as a doffer.



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## 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.**

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.

### 4.3 *Inspection and Maintenance*

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

E4.3 *Inspection and Maintenance*

To meet the requirements of this subsection, 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 preventative maintenance program for the Machinery. This program can be used as a basis for periodic operational inspections and maintenance. In the absence of such a program, the employer should fulfill this requirement.

## 5 Manufacture, Remanufacture, and Modification

### 5.1 *Responsibility*

#### 5.1.1 *Manufacture*

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

#### 5.1.2 *Remanufacture*

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

#### 5.1.3 *Modification*

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



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**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.**

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.

**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.**

**5.2.3 *Cutting Devices***

**All web-cutting devices within the reach point during normal production operation 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 from 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:

- fixed or moveable guard;
- presence-sensing device that, when activated, shall open the nip;
- or any combination of the above.

**5.3.1.1 *Nip Roll Opening***

**The rolls shall open to a minimum of 4 inches (4") between roll surfaces, provided this does not create additional hazards.**

E5.3.1.1 *Nip Roll Opening*

An example of a case where nip opening creates additional hazard is the wound roll and surface drum of a surface winder.



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**5.3.1.2 *Nip Roll Closing***

**If operator-accessible nip rolls are closed by local control, no alarm or delay is required. If local control is not used, then a local preclose alarm shall be used. The preclose alarm circuit shall be designed such that an alarm of three seconds duration sounds prior to immediate roll closing.**

***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 active from the time the rolls are opened until they close.**

**5.3.1.3 *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.**

**5.3.1.3.1 *Opening Time***

**Minimum roll opening shall be achieved within three (3) seconds from the time the command is given.**

**5.3.1.4 *Independently Moveable Guards***

**Where guard motion is independent of roll movement, the guard shall be interlocked to prevent closing of the rolls when the guard is not in place and shall open the roll if the guard is withdrawn from its effective position. Closing of the guard shall not of itself cause the rolls to close. Rotation of the rolls is permitted with the rolls open independent of guarding. See 5.3.1.2.**

**5.3.1.5 *Nip-Powered Moveable Guards***

**Nip-powered moveable guards within the operator's reach point that form a pinch point when the guard is closing shall comply with 5.3.1.2.**

**5.3.1.6 *Counter-Rotating Nips as Part of Winding Lay-On Roll Assemblies***

**The hazard associated with a counter-rotating lay-on nip within the operator's reach point on center or surface winders shall be guarded or be provided with a presence-sensing device that shall activate a local visual or audible alarm indicating that a person has entered a hazardous area.**

**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 ¼" of the moving surface and not create a hazard.**

E5.3.1.3 *Emergency Conditions*

See E5.3.1.1.

E5.3.1.6 *Counter-Rotating Nips as Part of Winding Lay-On Roll Assemblies*

This presence-sensing device may be the same device as required in 5.4.4.4 of this standard.



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**5.3.3 *Nip, Web Generated***

**Where a web-generated hazard exists within the operator's reach point, the hazard shall still be guarded. Where it is not technically or operationally feasible to guard this nip, an Emergency Stop Device that is 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 in the winder.

**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 that 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 an 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.**

**5.4.4 *Winding Related***

**5.4.4.1 *Arbor Selection***

**Arbors used shall be appropriately selected for the specific application considering roll size, number of rolls, and line speeds. Limitations, if any, shall be discussed in the Machine instructions.**

**5.4.4.2 *Chucks***

**Two independent means shall be provided to maintain chucks in the closed position.**

E5.4.4.2 *Chucks*

Check valves, mechanical blocks, air power, fluid power and detents, etc. are examples of independent means.



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**5.4.4.3 *Turret Indexing***

**Means shall be provided to prevent turret indexing unless arbors, when present, are properly chucked.**

**5.4.4.4 *Unloading Area (Winder)***

**The floor area where unloading devices deposit the wound roll or the maximum extension of the turret including a full roll in front of the winder shall be color-coded. Interlocked physical barriers and/or presence sensing device(s) shall be provided to prevent or stop all motions associated with an automatic roll change sequence except for the web winding motion when personnel are within the winder unloading area. Exiting this area shall not re-start the sequence.**

**5.4.4.5 *Unloading Devices***

**Unloading devices shall be position interlocked with the turret winder indexing control to prevent accidental damage.**

E5.4.4.5 *Unloading Devices*

The purpose of these devices is to require positive operator control during the actual unloading operation.

**5.4.4.6 *Warning Signal***

**There shall be a 3-second minimum delay during which an alarm device is activated to warn the operator and others when the Machines or major subcomponent, such as turret or lay-on assembly, are about to move. An alarm will be activated during all traversing motions. After 3 seconds, the intermittent motion of the Machine can continue without the requirement. After stopping, motion of the machine may be resumed within 12 seconds without the 3-second delay.**

**5.5 *Electrical***

**5.5.1 *Electrical Systems***

**Machines shall be designed and built to the requirements of ANSI/NFPA 79-1997.**

**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 *Arbors***

**If arbors with a cable drive member are used, the cable shall be completely covered by a core at all times when in reach of the operator and rotating.**



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**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 make all instructions available to the operator and maintenance personnel.**

E6.3 *Instruction of Operators*

The employer should consider setting up a checklist to ensure the 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.

**6.4 *Attaching Web to a Rotating Core***

**The employer shall require that two operators be present whenever a web is to be manually attached to a rotating core. The first operator shall attach the web to the surface of the core. The surface of the core itself should be coated with adhesive or sticky tape. From a position at the winding drive stop controls, the second operator shall monitor the first operator; in case of entanglement with the web and/or core, the second operator shall immediately stop the winding drive.**

**6.5 *Personal Protective Equipment***

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

**6.6 *Work Area***

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

## 7 Signs and Plates

**7.1 *General***

**All new signs shall conform to ANSI Z535.3-1998 and ANSI Z535.4-1991 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 close to the actual hazard as practical**

E7.2 *Safety Sign Wording and Location*

See AN-137, *SPI Recommended Guideline for Safety Warning Signs for Plastics Machinery and Related Equipment.*



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