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American National Standard

for Plastics Machinery –

Plastics Extrusion Machines – Requirements for the Manufacture, Care, and Use

ANSI/SPI B151.7-1996

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Revision and redesignation of
ANSI B151.7-1982 (R1988)

American National Standard
for Plastics Machinery –

Plastics Extrusion Machines – Requirements for the Manufacture, Care, and Use

Sponsor
The Society of the Plastics Industry, Inc.

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American National Standards Institute, Inc.

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Foreword (This foreword is not part of American National Standard ANSI/SPI B151.7-1996.)

This standard is a revision and redesignation of *American National Standard for Plastics Machinery and Rubber Machinery – Extrusion Machines – Construction, Care, and Use,* ANSI B151.7-1982. The standard was revised because:

- the scope needed to be expanded and the title modified;
- some illustrations required modification to conform to the text and some illustrations were deleted to permit design freedom;
- additional definitions were required;
- some paragraphs required modification and some paragraphs were added to conform more closely to changes in technology;
- some paragraphs required modification for clarity and intent.

A standard treating the manufacture, care, and use of extrusion 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 from three different directions:

a) The elimination, by design, of certain recognized hazards and the establishment of standard approaches to design so that machines available from competitive manufacturers will have similar operational characteristics;

b) Where recognized hazards cannot be designed out for technical or operational reasons, then safeguarding the machine to protect the operator from recognized hazards;

c) Where elimination or safeguarding of hazards is not technically or operationally feasible, providing appropriate warnings.

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

Also, recognizing the impossibility of immediate updating of design and manufacturing methods, clauses 5 and 7 shall become effective one year after the approval date of this standard.

Suggestions for improvement of this standard will be welcome. They should be sent to The Society of the Plastics Industry, Inc., Machinery Division, Attention: Walt Bishop, 1801 K Street, NW, Suite 600, Washington, DC 20006.

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

The following organizations recognized as having an interest in the standardization of plastics extrusion machines were contacted prior to the approval of this standard. Inclusion on this list does not necessarily imply that the organization concurred with the submittal of the proposed standard to ANSI.

Aerospace Industries Association
Alliance of American Insurers
American Automobile Manufacturers Association
American Insurance Services Group
American Standards Testing Bureau
Factory Mutual Research
Industrial Safety Equipment Association
Masonry and Concrete Saw Manufacturers Institute
National Institute of Standards & Technology
Robotic Industries Association
Rubber Manufacturers
Society of the Plastics Industry – Machinery Manufacturers Division
Society of the Plastics Industry – Molders Division

The Society of the Plastics Industry Extrusion Section – Standards Development Committee on Machinery Standards, which was responsible for developing this standard, had the following members:

Donn Lounsbury, Chairman
(Davis-Standard Corp.)

Bob Monteith
(Cincinnati Milacron)
James Nissel
(Welex)
John Rexford
(HPM Corporation)
John Schultz
(Macro Engineering)
Bill Wybenga
(Brampton Engineering)

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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 column is not 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 that are equal in weight to other requirements, or unless they are guides to assist in compliance with the standard.

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AMERICAN NATIONAL STANDARD ANSI/SPI B151.7-1996

American National Standard
for Plastics Machinery –

Plastics Extrusion Machines – Requirements for the Manufacture, Care, and Use

STANDARD REQUIREMENTS

EXPLANATORY INFORMATION

(Not part of *American National Standard for Plastics machinery – Plastics Extrusion Machines – Requirements for the manufacture, care, and use*, ANSI/SPI B151.7-1996)

1 Scope, purpose, and application

1.1 Scope

The requirements of this standard shall apply to extrusion machines that are used in the plastics industries.

Safety requirements of ancillary equipment used with extrusion machines are not covered by this standard.

1.2 Purpose

The purpose of this standard is to minimize the hazards to personnel working on or adjacent to extrusion machines.

1.3 Application

1.3.1 New installations

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

1.3.2 Existing installations

The employer is responsible for bringing existing machines into compliance with the

E1.1 Scope

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requirements of this standard within three years of the approval date of this standard.

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 Z535.1-1991, *Safety color code*

ANSI Z535.2-1991, *Environmental and facility safety signs*

ANSI Z535.3-1991, *Criteria for safety symbols*

ANSI Z535.4-1991, *Product safety signs and labels*

ANSI Z535.5-1991, *Accident prevention tags*

ANSI/NFPA 79-1994, *Electrical standard for industrial machinery*

3 Definitions

3.1 *emergency stop device:* A trip rod, cord, button, or electronic device that, when actuated, stops all hazardous machine movement associated with the specific machine.

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

3.3 *extruder or extrusion machine:* A machine that plasticizes and conveys solid and/or liquid material by means of one or more screws rotating within a barrel and discharges it continuously.

E3.3 extruder or extrusion machine: See Illustrations 1 and 2 for typical extrusion machines.

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

3.4.1 *fixed guard:* A guard that is fixed in place and requires a tool for moving or removal.

E3.4.1 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 *instructions:* Documentation for the installation, operation, care, maintenance, and safe use of the extruder.

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

3.7 *maintenance personnel:* Maintenance personnel are individuals who by virtue of their training and skills are qualified to inspect, maintain, and repair extrusion machines.

3.8 *manufacturer:* Any person whose business is the manufacture of equipment covered in this standard for installation in the United States of America.

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

E3.9 modification: Modification is intended to include adding, deleting, converting, or altering the original product. This could affect such areas as control systems, ladders, enclosures, guards, etc., Anything that has been added, moved or removed, converted, or altered that affects the interface between the extruder and personnel constitutes modification.

3.10 *modifier:* Any person who performs a modification to an extruder.

3.11 *operator:* An individual who uses the extruder to perform production work.

3.12 *remanufacture:* A substantial restoration of the extruder.

E3.12 remanufacture: Remanufacture typically consists of the following:

– Complete dismantling of the extruder;

– Cleaning and carefully inspecting all parts;

– Reworking worn parts to as-new condition, or replacing with new parts;

– Reconditioning barrels, screws, etc., to meet applicable standards and guidelines;

– Completely reconditioning or replacing power system components to meet applicable standards and guidelines;

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– Thoroughly inspecting all electrical and control systems and replacing component/ systems, as required;

– Removing modifications that are not in conformance with clauses 5 and 7 of this standard and informing the employer of the removal.

3.13 *remanufacturer:* Any person whose business is the redesign and/or remanufacture of extruders for installation in the United States of America.

3.14 *repair:* The restoration of a portion of the extruder to original function using original design by replacement or reworking of worn or damaged parts.

E3.14 repair: Repair may include such items as replacement or rework of the barrel, screw, heater bands, motors, seals, meters, etc.

3.15 *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.

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

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

3.18 *vent cover:* A barrier covering the vent port opening.

3.19 *vent port:* An opening provided in the barrel to permit gasses to exit from the plastic material during processing.

4 Care

4.1 Instructions

4.1.1 Manufacturer

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

E4.1.1 Manufacturer

Although much literature of a general nature exists for guidelines in the care of these machines, each manufacturer's product has unique characteristics requiring separate treatment. Reference to the specific instructions on safe operation of each builder's machinery should be made.

4.1.2 Modifier

It shall be the responsibility of the person modifying an extruder to furnish instructions.

E4.1.2 Modifier

Many modifications and rebuilding efforts are so extensive that any original instructions from the original builder are invalidated.

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4.1.3 Remanufacturer

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

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 extrusion machines.

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 extruder 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 extruders have unique problems not necessarily identical to those of other machines; therefore, reference to the manufacturer's manual is very important.

E4.3 Inspection and maintenance

To meet the requirements of this section, 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 machine. 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 requirements

5.1 Responsibility

5.1.1 Manufacture

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

5.1.2 Remanufacture

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

5.1.3 Modification

Modification(s) made to existing extruders 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.

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5.1.4 Repair

Repair shall not reduce the level of safety of the extruder.

5.2 Guarding

5.2.1 Feed opening

All feed openings shall be guarded to the extent practical against accidental insertion of body parts and clothing by the operator. Safety signs shall be used in this area if guarding is not feasible. See clause 7.

E5.2.1 Feed opening

A fixed hopper may serve as a guard if it prevents access to the rotating screw.

5.2.2 Heated surfaces

Guards shall be provided for heated surfaces that could cause injury by contact. This shall apply except for surfaces requiring operational accessibility in which case a safety sign shall be provided.

5.2.3 Pressure limit devices

The extruder shall be provided with an extrusion pressure-relieving device or a pressure-limiting device.

5.2.4 Electrical connections to heated areas

Electrical connections to heated areas shall be covered with a fixed nonconductive guard or a grounded metal barrier to prevent contact with live terminals.

5.2.5 Access openings

Access to hazardous areas for maintenance, cleaning, or inspection shall be guarded.

5.2.6 Vent cover

A cover shall be provided over the vent port to protect personnel from hot plastic and/or vapors which may be expelled during production.

5.3 Emergency stop device

All extruders shall be equipped with an emergency stop device that, when activated, will stop the rotation of the screw(s) and any other hazardous machine motion(s). This device shall be readily accessible while the extrusion machine is operating.

Resetting shall not restart the machine, but only enable it to be restarted.

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5.4 Electrical systems

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

5.5 Power driven extruder unit

An extruder equipped for powered locomotion shall be provided with automatically operated visual and/or audible alarm device(s) giving warning of both imminent movement of the machine, and machine motion. Either a protective trip device shall be provided to stop machine motion if a person is detected in the path of the machine motion; or, a hold-to-run control device may be provided if it is located where there is a clear view of the path of the machine motion. Protective trip devices include trip bars or chords, presence sensing devices, etc.

6 Use

6.1 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 any extruder 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.

E6.1 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 check off the list.

6.2 Work Area

Adequate clearance shall be provided around machinery and equipment covered by this standard. Space for cleaning machines, handling material stock and screw shall be provided.

6.3 Ancillary equipment

It shall be the responsibility of the employer to ensure that use of ancillary equipment does not reduce the level of safety embodied in this standard.

6.4 Personal protective equipment

The employer shall evaluate hazards requiring personal protective equipment and ensure its use.

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7 Signs and plates

7.1 General

All new signs and plates shall conform to ANSI Z535 in color, format, and size, 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.

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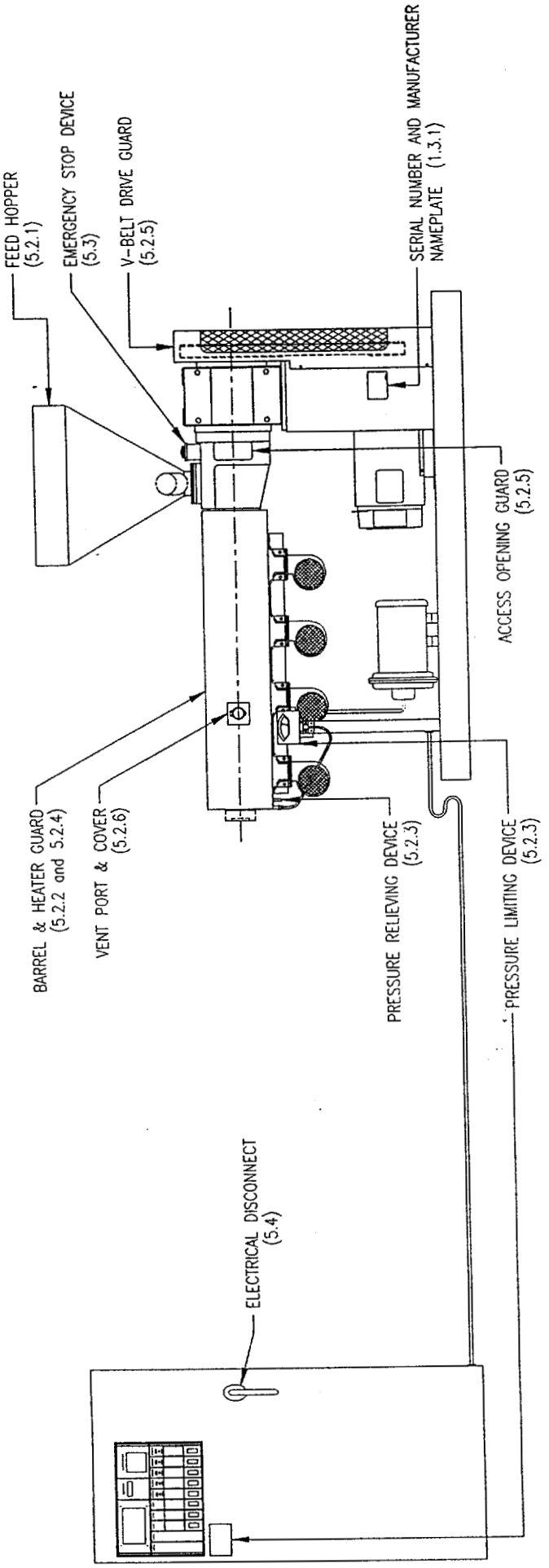


Illustration 1 – Plastics extrusion machine, showing typical locations of safety devices and guards

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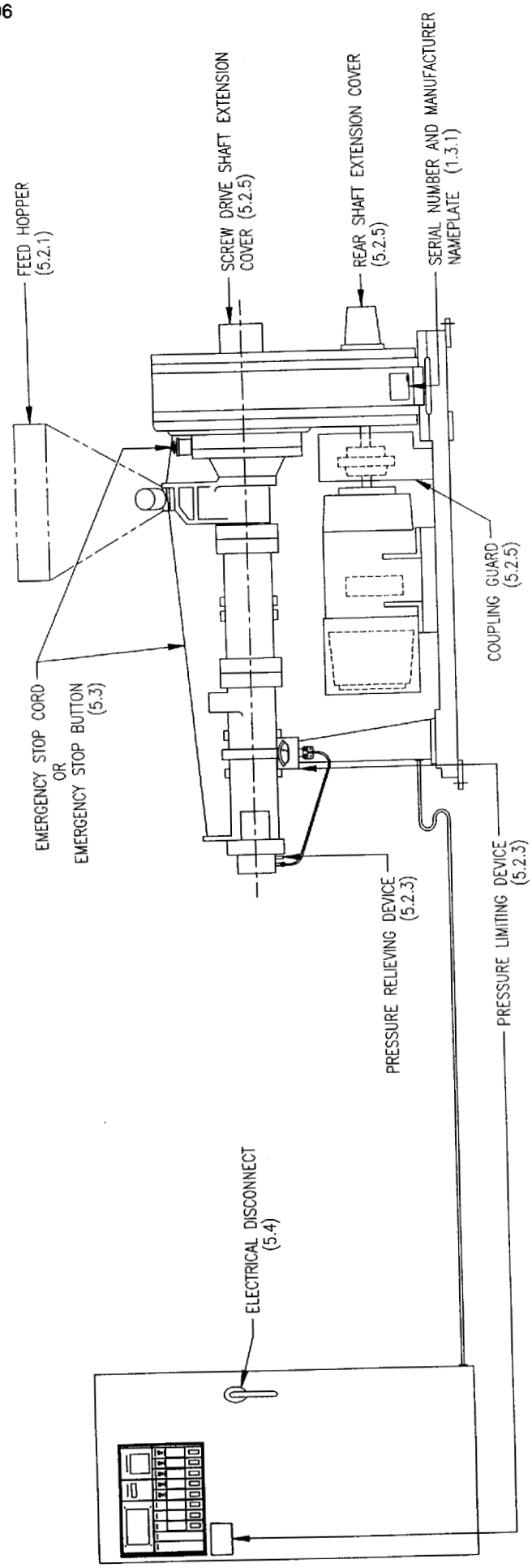


Illustration 2 – Plastics extrusion machine, showing typical safety devices, guard, and emergency stop locations

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