American National Standard

for Three-Roller Printing Ink Mills – Safety Requirements

ANSI B177.1-1997

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for Three-Roller Printing Ink Mills – Safety Requirements

Sponsor

National Association of Printing Ink Manufacturers, Inc.

Approved April 1, 1997

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Foreword (This foreword is not part of American National Standard B177.1-1997.)

The National Association of Printing Ink Manufacturers (NAPIM) on the basis of many years of experience in the use of Three-Roller Mills for the manufacturing of printing inks, combined ANSI B177.1-1975 and its supplement ANSI B177.1a-1979 in promulgating this standard. A survey of members showed that the principal safety hazards occur during wash-up operations of the rolls and knife blades of the mills. The standard also assigns responsibility to the employer and the operator for compliance with the standard. These areas are stressed in the standard.

Consensus for this standard was achieved by the use of the Canvass Method.

Organization Represented	*Name of Representative*
INSURANCE COMPANIES	
Yasuda Fire and Marine	Chris Hooper
EQUIPMENT MANUFACTURERS	
Buhler, Inc.	Pius Eigenmann
Keith Machinery	John Hatz
Lehmann Mills, Inc.	Michael E. Harrold
INK MANUFACTURERS	
INX International Ink Company	Gary Reniker
National Printing Ink Company	Peter Doyle
CZ Inks, Inc.	Paul J. Stewart
TECHNICAL ADVISORY GROUP	
ASTM	Larry Anderson Jan Pring
OTHER INQUIRES	
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Sabon Industrial Corporation	Les Wilder
Polytechnic, Inc.	R. Warso
Lake Safety Management, Inc.	Linda Morse
Eastman Kodak Company	Gregory L. Brooks
Color Matrix	John Standish
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NAPIM's Safety Committee, which updated this standard, consisted of the following people:

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(NAPIM)

William McDermott, Chairman
(Braden Sutphin Ink Company)

Gary Andrzejewski
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(BASF Corporation)
Edward Casama
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(US Ink Corporation)
Roy Flint
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American National Standard

for Three-Roller Printing Ink Mills – Safety Requirements

1 General

1.1 Scope

The requirements of this standard apply to all three-roller mills as used in the lab pilot plant or manufacture of printing inks.

1.2 Purpose

The purpose of this standard is to establish safety requirements with respect to safety controls and operating procedures for three-roller mills.

1.3 Application

The effective date of this standard shall be 18 months after its approval as an American National 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 editions of the standards indicated below.

ANSI A1264.1-1995, *Safety Requirements for Workplace floor and wall openings, stairs and railing systems* [1)]

ANSI/ASME B15.1-1992, *Safety standard for mechanical power transmission apparatus* (including supplement ANSI/ASME B15.1a-1995) [2)]

ANSI/NFPA 70-1997, *American National Standard National Electrical Code*

National Fire Codes®, National Fire Protection Association, 1993 edition [3)]

OSHA 29 CFR 1910.216(f)(2), Machinery and machine guarding – Mills and calenders in the rubber and plastics industries. [4)]

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1) ANSI A1264.1-1995 is a revision, redesignation and consolidation of ANSI A12.1-1973 and ANSI A64.1-1968.

2) Please note ANSI/ASME B15.1-1992 and its supplements have recently been consolidated into ANSI/ASME B15.1-1996.

3) Available from National Fire Protection Association, One Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101 (1-800-344-3555). These codes are subject to frequent revision. It is suggested that the user check to ensure that he is consulting the most recent edition.

4) Available from American Label Mark Company, Label Master Division, 5724 North Pulaski Road, Chicago, IL 60646-6797. Phone: (312) 478-0900; Fax: (312) 478-6054, 1-800-621-5808.

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3 Definitions

In this standard the following definitions shall apply:

3.1 apron: The apron is a discharge chute used to collect and facilitate the discharge of ink from the apron roller to cans or tubs.

3.2 apron knife: An apron knife is an expendable steel blade mounted on the mill apron and used to transfer ink from the apron (output) roller to the apron.

3.3 apron (output) side of mill casing: The apron side of the mill casing is that portion of the bearing case housing in close proximity to either apron (output) roller bearing.

3.4 feed (input) side of mill casing: The feed side of the mill casing is that portion of the bearing case housing in close proximity to either feed roller bearing.

3.5 printing ink roller mill: Printing ink roller mills are three-roller mills primarily used for, but not limited to, the dispersion of pigments into printing ink vehicle systems.

3.6 shall: The word “shall” is to be understood as mandatory.

3.7 should: The word “should” is to be understood as advisory.

3.8 trip and emergency switch: Trip and emergency switches are any single- or multiple-pole control switches used to effect an emergency stop, activated manually by a plunger, mushroom, cam lever, whisker, wobble stick, trip cable, or chain.

4 Mill safety controls and emergency stop procedures

4.1 Mills with rollers 60.96 centimeters (24 inches) or less in length

Mills with rollers 60.96 cm. (24 in.) or less in length shall be equipped with a minimum of one start-stop station with a raised stop button, or equivalent; and one mushroom emergency stop button, or equivalent emergency whisker switch, or a safety trip cable, wire, chain, or bar located on the feed side of the mill casing.

4.2 Mills with rollers 63.5 centimeters (25 inches) to 111.8 centimeters (44 inches) in length

Mills with rollers 63.5 cm. (25 in.) but not exceeding 111.8 cm. (44 in.) in length shall be equipped with a minimum of two start-stop stations with raised stop buttons, one located on the apron and one located on the feed side of the mill casing; and two mushroom emergency stop buttons, or equivalent emergency whisker switches, or a safety trip cable, wire, chain, or bar located on the feed side of the mill casing. Buttons or switches shall be on diagonally opposite sides of the mill.

4.3 Mills with rollers exceeding 111.8 centimeters (44 inches) in length

Mills with rollers exceeding 111.8 cm. (44 in.) in length shall be equipped as in 4.2 and, in addition, shall be equipped with overhead safety chains or bars accessible to the mill operator, and brake drive motors for emergency stoppage. This emergency stoppage shall conform to OSHA 29 CFR 1910.216(f)(2). [5)]

4.4 Trip and emergency switches

All trip and emergency switches shall not be of the automatically resetting type but shall require manual resetting and should not have spring-activated electrical contacts.

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5) Stopping limits for mills. All mills irrespective of the size of the roll arrangement (individually or group driven) shall be stopped within a distance, as measured in inches of surface travel, not greater than 1 1/2 percent of the peripheral no-load surface speeds of the respective rolls as determined in feet per minute.

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4.5 Unusual exposure

Where an exposure is created by the operation and the operator(s) are not within sight or hearing of other employees, an audible alarm device shall be provided so that assistance will be available in case of an emergency.

5 Mechanical mill guarding and work platforms

5.1 Mill guarding

5.1.1 Power transmission equipment

"All motion hazards associated with the operation of mechanical power transmission apparatus shall be eliminated by design of equipment or protection by a guard, device, safe distance, or safe location." [6)]

5.1.2 Feed roller guard

Mills with rollers greater than 60.96 cm. (24 in.) in length, with tub tilters that feed from the apron side of the mill and that require work platforms, shall have a removable bar in front of the feed roller or an expanded metal guard in front of the work platform.

5.2 Work platforms

Work platforms required for higher mounted mills shall be of substantial construction and equipped with nonskid safety steps and surfaces, and guard railings to protect employees from falls, in accordance with ANS A1264.1.

6 Nip-point guards and safety procedures

6.1 General

Since the rotation of the feed roller is counter to that of the middle roller of a three-roller printing ink mill, their simultaneous rotation produces an area commonly known as the in-running nip area or nip point (see figure 1) which is potentially hazardous to the mill operator during the wash-up operation. A nip point guard (see figure 2) is a device that is set into the nip point by the mill operator prior to the wash-up operation. Its function is to accomplish physical guarding of the nip point when the rollers of a three-roller printing ink mill are being cleaned.

[6)] Derived from ANSI/ASME B15.1a-1995 with the permission of the American Society of Mechanical Engineers.

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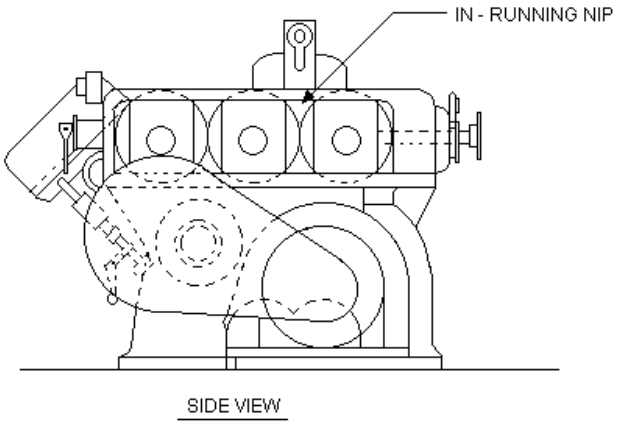


Figure 1 – In-running nip area

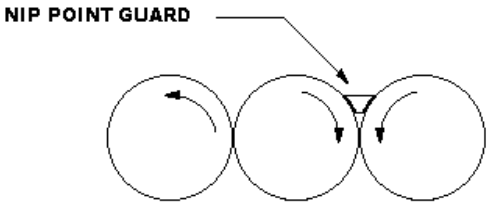


Figure 2 – Nip-point guard

6.2 Nip-point guards

It shall be the responsibility of the employer to supply a nip-point guard for each three-roller printing ink mill. Operators shall be instructed in the proper use of the nip-point guard and its use shall be enforced during the wash-up operation. Any device that accomplishes the physical guarding of the nip-point area during the wash-up operation shall be considered to be in compliance with the requirements of 6.2; examples of three types of nip-point guard in common use are:

a) A trapezoid-shaped stick constructed of hardwood (preferably), Teflon, nylon, or other suitable hard material, cut one inch longer than the roller surface length so as to fit under the point of the side shields in the raised position. See figure 3 (other cross-section configurations from that shown in figure 3 are permissible);

b) A V-shaped metal guard equipped with vertical hangers that allow suspension from overhead or from the side of the mill. See figure 4;

c) A folding, flat-plate metal guard that extends across the entire nip-point area and that rides on the rollers in such a manner that the flat plate prevents any access by the operator to the nip-point area. See figure 5.

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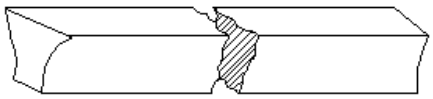


Figure 3 – Trapezoid-shaped guard

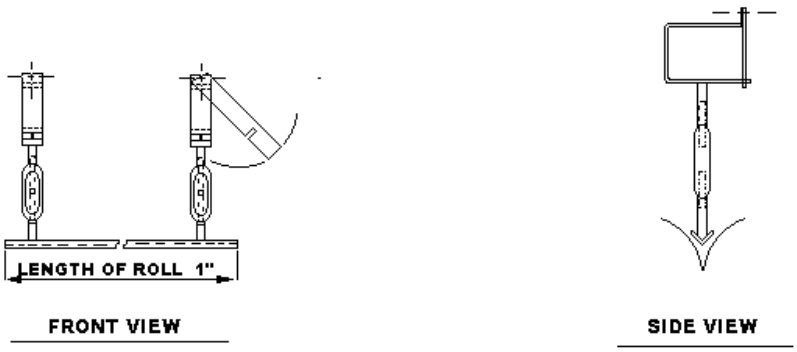


Figure 4 – V-shaped metal guard

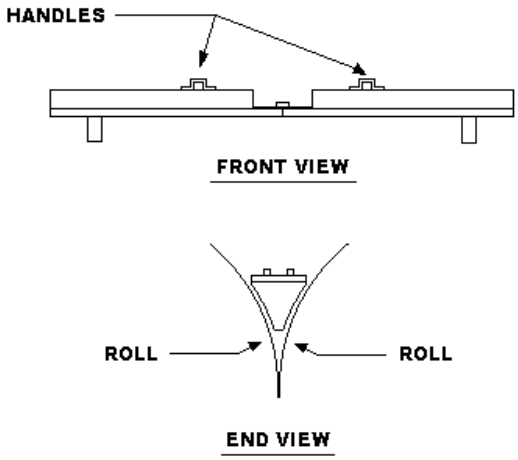


Figure 5 – Flat-plate metal guard

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6.3 General safety procedures

6.3.1 It shall be the responsibility of the employer to instruct the operator, and to enforce the operator's compliance with the instruction, never to reach across the center line of the feed roll from the feed side, or across the center line of the middle roll from the apron side, of the mill while the mill is operating.

6.3.2 In cases where the operator of the mill must throw back the mill ends with a scraper knife or spatula, the length of the knife or spatula shall be at least equal to or greater than one-half the diameter of the rollers.

6.3.3 It shall be the responsibility of the employer to instruct the operator, and to enforce the operator's compliance with the instruction, never to attempt to retrieve any object that may fall into a mill while the mill is operating.

7 Safe wash-up procedures

7.1 Responsibility

7.1.1 It shall be the responsibility of the employer to establish safe three-roller-mill wash-up procedures and to train mill operators in their use. Any procedure which establishes and enforces all of the elements given in 7.2 will be considered to be in compliance with this requirement.

7.1.2 It shall be the responsibility of the mill operator to follow the safe wash-up procedures established by the employer and to report to his supervisor any unsafe practice or condition.

7.2 Procedures

Most of the hazards involved in three-roller mill operation occur during the wash up period. Whenever the mill and rollers are being cleaned, the following procedures should be carried out:

a) Stop the mill and scrape down all residue ink from side and splash shields;

b) Start the mill and run out any scraped residue ink;

c) Back the roller pressure just enough for loose contact. Start the mill in lowest available speed and pour a small amount of the proper cleaning fluid between feed and center roller;

1) The cleaning compound (solvent or paste) used during wash-up should have a closed cup flash point of 100°F or higher;

d) Stop the mill to raise or remove and wash the side shields;

e) With the mill still stopped, install the nip-point guard. The nip-point guard shall be long enough to fit under the side shields;

f) Clean the feed roller by starting the mill in lowest available speed and holding a rag against the roller below the center line of the roller, using the palm of the hand with fingers pointing toward the floor;

g) When the feed roller is clean, back the feed roller off so that it does not touch the middle roller and wipe dry with a clean cloth, using the same hand position as in (f) above;

h) Wash and dry the middle and apron rollers by the same method used for the feed roller, except that the cleaning cloth is to be held between the apron and middle rollers;

i) Stop the mill and wash down the apron. When all cleaning has been accomplished, remove the nip point guard and bring the side shields to operating position;

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j) At no time is a mill to be cleaned with the apron dropped and the knife blade exposed. When cleaning the apron roller, if it is necessary not to have the apron in contact with the roller, the apron may be loosened, but the distance between the apron knife and the roller shall not be greater than 0.079 cm. (1/32 inch);

k) When cleaning the apron knife blade, the operator should wear cut resistant gloves and/or use a heavy thickness of cloth to carefully clean the blade;

l) If it is necessary to clean the underside of the apron, the apron knife blade should be removed using a suitable tool, e.g., pliers. If the blade is not removed a suitable protective sheath, such as a slit rubber hose, should be placed over the entire length of the blade;

m) Clean up all tools, guards, and tool trays and the general area, including the floor, around the mill.

8 Safe knife-changing procedures

The knife-changing operation presents a recognizable hazard and the following procedures for knife changing shall be carried out:

a) Stop the mill by activating any trip or emergency switch referenced in 4.4 and drop the apron, being careful not to come in contact with the blade. The operator should wear cut resistant gloves. Use pliers to remove the blade, cut the blade in half or thirds with shear cutters, and place the pieces in a container provided for safe disposal;

b) Clean the blade slot in the apron, being careful to ensure that bare hands do not come in contact with the slot;

c) Select a proper precut blade, or using a template, cut a new blade from stock. Be careful to hold the blade so that the dull side faces the bridge formed by the thumb and forefinger. Holding the blade at both ends, place the blade in the holder slot. Finish seating with a block of hard wood; then raise the apron and check for proper tension.

9 General safety requirements

9.1 Housekeeping

9.1.1 The area around the mill shall be kept clear of obstacles or tripping hazards.

9.1.2 All mill emergency equipment shall be kept in clean, operable condition, and no mill controls shall be touched with ink-covered gloves or hands.

9.1.3 Steps shall be taken to prevent spillage of ink, oil, cooling water, cleaning agents, etc. Spillage, if it does occur, shall be cleaned immediately.

9.1.4 Soiled cleaning rags shall be kept in approved oily waste containers and shall be removed daily from the premises.

9.1.5 Combustible refuse shall be discarded separately from soiled rags, wash waste, or discarded inks.

9.2 Tub tilters and monorail hoists

A tub used on a tilter shall:

a) Be of a design and size to fit the tilter;

b) Be anchored on the platform before tilting;

c) When filled, not exceed the rated capacity of the tub tilter and hoist.

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9.3 Tools and equipment

9.3.1 Cleaning cloths used on rollers shall be of a good quality fabric, free from loose ends, threads, metal chips, buttons, etc.

9.3.2 Cleaning cloths shall be folded for use and held in the flat of the hand but never wrapped around the hand.

9.3.3 All tools and rags shall be kept clear of the mill when it is running.

9.3.4 Handles of spatulas, spades, etc., shall be kept clean and dry.

9.3.5 A tool tray or holder shall be placed near the mill to enable safe storage of items the operator uses in his work.

9.3.6 A place shall be provided at each mill for the operator to store a portable nip-point guard.

9.4 General safety

9.4.1 Mills shall be equipped with emergency shear pins or other pressure-release or shearing devices to protect the mill.

9.4.2 Electrical wiring and related fixtures shall be in accordance with ANSI/NFPA No. 70-1993, and be maintained in a good state of repair.

9.4.3 Light levels of 30 to 50 foot-candles at the top of the roller shall be maintained for roller mill operations.

9.4.4 Monthly inspection of the mill room shall be made by the supervisor responsible in order that all hazardous practices and physical problems be evaluated and acted upon.

9.4.5 Fire protection shall be provided for three-roller mills in accordance with applicable codes established by the regulatory authority or the National Fire Codes® of the National Fire Protection Association, 1993 edition.[7)]

9.5 Employee safety

9.5.1 Written safety instructions shall be posted and enforced in the mill room operating area.

9.5.2 Mill operators shall wear short sleeved shirts or buttoned cuffs, and shirttails shall be inside trousers. Employees shall not wear such clothing, jewelry, or unrestrained hair styles as will be hazardous to their personal safety. [7)]

9.5.3 The use of gloves during the operation or cleaning of the mill, shall not be used.

9.5.4 Cut resistant gloves should be employed only when cleaning or replacing the knife blade or knife blade holder.

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7) Attention should be given to loose clothing, neckties, finger rings, necklaces, watchbands, and unrestrained hair including beards, goatees, mustaches and ponytails. See ANSI/ASME B15.1a.

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