



SAFETY INFORMATION

Extruder Safety

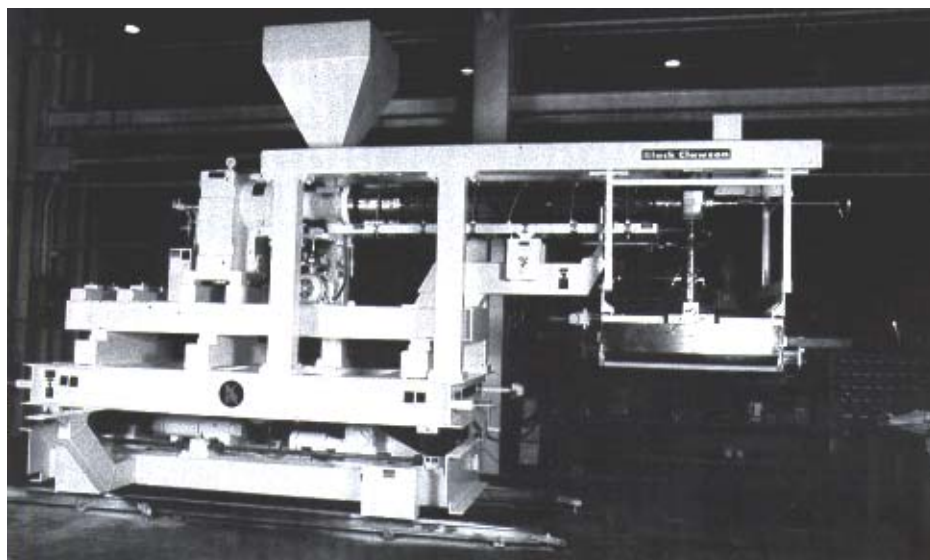


Figure 1.

INTRODUCTION

The purpose of the extruder is to melt plastic and then force it through a die to manufacture plastic products, such as bags for the packaging industry, films, coatings for paper/board used in the food industry, pellets, tubing, etc. The list of products made by extrusion equipment is virtually endless.

The extruder (Refer to Figure 2) consists of a alloy steel hollow cylinder known as a barrel. Located in the barrel is a screw, driven at one end by a gear reducer and motor. At the drive end of the barrel is a hopper into which plastic pellets or powder are poured. The driven screw pushes the

pellets towards the front of the barrel where a die is located. As the pellets move through the barrel, heat and pressure are generated and by the time the pellets reach the end of the barrel, they are completely melted into a homogenous fluid.

This combination of HEAT, PRESSURE & MOLTEN PLASTIC under certain circumstances can be HAZARDOUS. This SAFETY manual is not intended to replace the operator's manual presently used, but to augment it and to remind operators of safe operation and potential hazards.



SAFETY INFORMATION

WARNING – START-UP

It is very important that operators and other personnel follow the start-up procedures for your particular extruder. Do not attempt adjustments requiring an operator to come in close proximity to the extruder, back-pressure valve, or die until conditions for cold or hot start-up are satisfied.

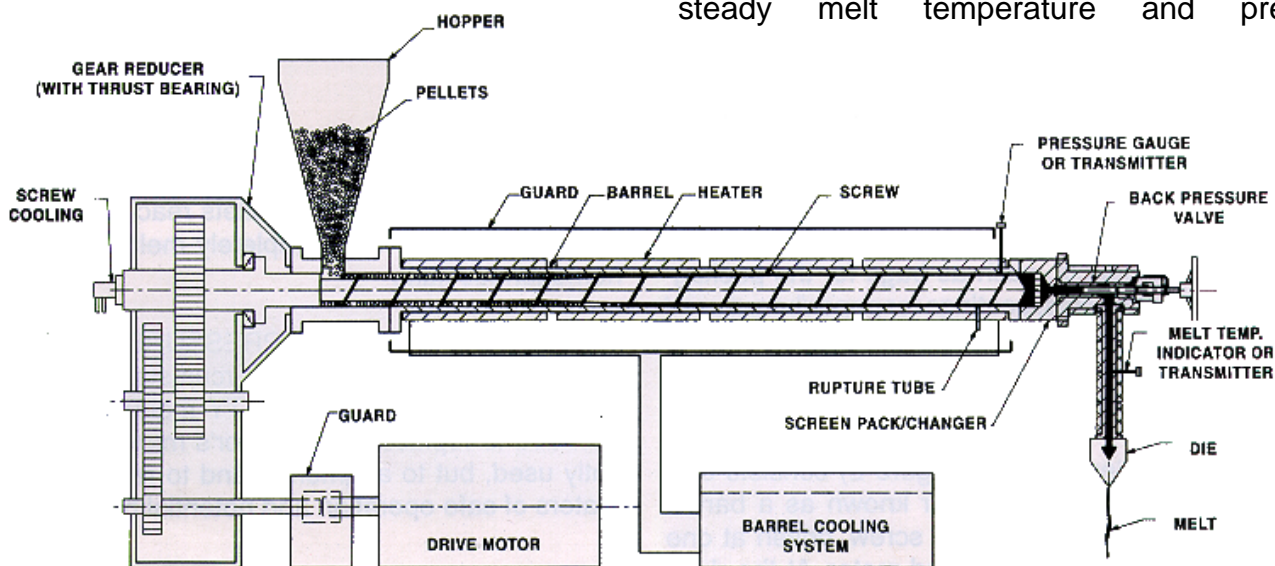
FAILURE TO FOLLOW THOSE INSTRUCTIONS AND THE INSTRUCTIONS SET FORTH BELOW MAY RESULT IN AN EXPLOSION THAT COULD CAUSE SERIOUS PERSONAL INJURY OR DEATH AND MACHINE DAMAGE.

START (Initial)

First, heat up and soak at normal operating temperature for 1 hour. Start screw rotation and "drool" off line until uniform melt, steady melt temperature and pressure are achieved. DO NOT ADJUST BACK PRESSURE VALVE until after extruder has been running at normal operating speed with uniform melt and steady melt temperature and pressure.

HOT START (Restart)

First, check to make sure that all zones are at normal operating temperature. Start screw rotation and "drool" off line until uniform melt and steady melt temperature and pressure are achieved. DO NOT ADJUST BACK PRESSURE VALVE until after extruder has been running at normal operating speed, with uniform melt and steady melt temperature and pressure.



BASIC COMPONENTS OF AN EXTRUSION SYSTEM
(ELECTRIC HEATED/WATER COOLED)

Figure 2





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WARNING PRESSURE

Black Clawson Converting Machinery, Inc. extruder barrels are designed to withstand bore pressures of up to 10,000 PSI. However, normal operating pressures, depending on the product, will be much less. To protect personnel from injury due to the hazard of overpressure, a rupture tube is installed at the end of the barrel. It is important that the rating of the rupture tube allow a sufficient factor of safety between the rating of the rupture tube and the strength of equipment parts. On older Black Clawson Company and Black Clawson Converting Machinery LLC machines, the rating of the rupture tube was the same as the barrel.

Black Clawson Converting Machinery Inc strongly recommends that rupture tubes be rated not to exceed 75% of the design rating of the barrel. This is of particular importance given instances of users inadvertently purchasing and installing counterfeit/defective fasteners and defective rupture tubes.

For example, if the operator's manual states a barrel rating of 10,000 PSI, the barrel must be equipped with a 7500 PSI (or less) rupture tube.

FAILURE TO INSTALL A RUPTURE TUBE HAVING A PROPER RATING COULD RESULT IN SERIOUS PERSONAL INJURY OR DEATH AND MACHINE DAMAGE.

Important Note:

There are exceptions to every rule. Check your operator's manual for the pressure rating of your particular extruder barrel. Use 75% of this rating for the selection of rupture tube **UNLESS YOUR MANUAL SPECIFIES A LOWER**

PRESSURE RATING for your particular rupture tube.

WARNING - PRESSURE GAGE

Barrel pressure varies from product to product and it is important that operators know what pressure to expect when adjusting the back pressure valve and what to expect during start-up. Operators must consult the product log book or supervisor as to what pressure to expect. At least two operators must be present at the start up of the extruder or when adjusting the back pressure valve. One operator must be stationed at the stop button. During this period constantly monitor the pressure gage for any unexpected increase in pressure. Should the pressure increase beyond what is expected, stop the extruder immediately. Back off the back pressure valve and allow the pressure in the barrel to stabilize. Determine cause of pressure increase before restarting extruder.

When adjusting the back pressure valve in order to increase melt temperature, remember it takes time for the effects on temperature to be displayed. **DO NOT HURRIEDLY ADJUST BACK PRESSURE VALVE - BE PATIENT.** Pressure always rises before temperature increases.

The pressure gage or pressure indicator is an indispensable operating tool which must be kept in proper working order. **NEVER OPERATE THE EXTRUDER WITHOUT A WORKING PRESSURE GAGE OR PRESSURE INDICATOR. SERIOUS PERSONAL INJURY OR DEATH AND MACHINE DAMAGE COULD RESULT.**





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WARNING — BACK PRESSURE VALVE

Some older Black Clawson Company extruders have back pressure valves that can be completely closed. Refer to Figures 3 & 4. When this happens, flow to the die is completely cut off and a sudden rise in pressure will occur. With a proper rupture tube as recommended and fasteners meeting ANSI standards, no machine damage or personal injury will occur as the rupture tube will simply "blow", thereby relieving the pressure. If the rupture tube fails to "blow" at its specified burst pressure, a dangerous situation could exist, especially if the fasteners clamping the head are not up to grade. IF THE FASTENERS CLAMPING THE HEAD FAIL BEFORE THE RUPTURE TUBE FAILS, THE EXPLOSION COULD CAUSE SERIOUS PERSONAL INJURY OR DEATH AND MACHINE DAMAGE.

Black Clawson Converting Machinery, Inc. strongly recommends that if your extruder is presently equipped with a back pressure valve having the capability of being closed completely, install a washer to ensure the valve never fully closes or alternatively a jam nut and pin. If you are unable to determine if your back pressure valve can fully close, or require instructions for installing the washer, jam nut and pin please call Black Clawson Converting Machinery, Inc.

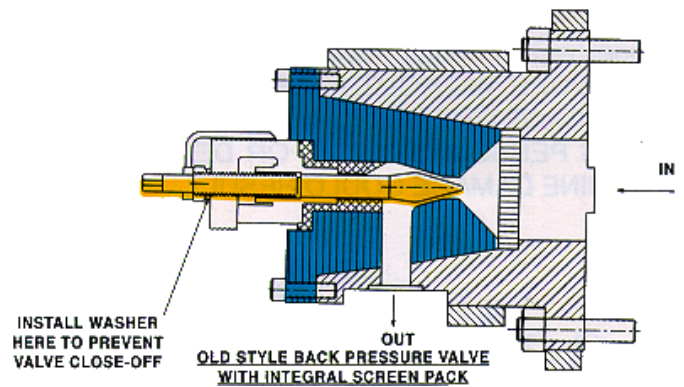


Figure 3.

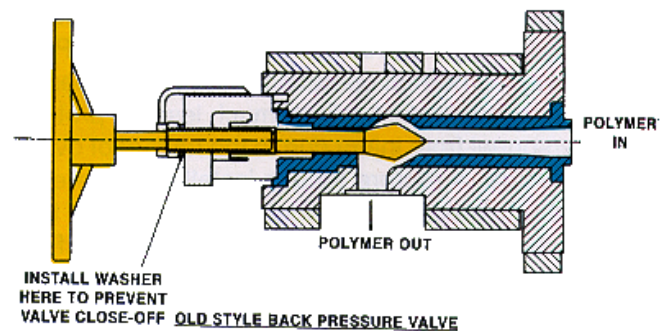


Figure 4.



SAFETY INFORMATION

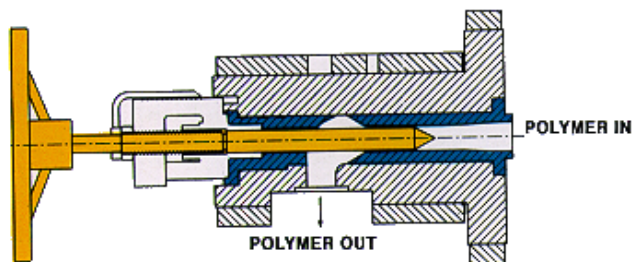
LINEAR BACK PRESSURE VALVE RECENT DEVELOPMENTS

Some older Black Clawson Company back pressure valves did not respond to adjustment in a linear fashion. This made it difficult to estimate just how much of a turn would be needed for a specific pressure change.

To make it easier and quicker for operators to set the valve to proper operating pressure, a new "linear" design has been developed. Refer to Figure 5.

An inherent feature of the new design is its inability to be completely closed off. However, precautions when adjusting this valve are still required.

Older Black Clawson Company valves generally cannot be modified to the new linear design and, therefore, must be replaced to gain this new feature. Contact Black Clawson Converting Machinery, Inc. if you wish us to evaluate your current process need.



LINEAR BACK PRESSURE VALVE

Figure 5.

WARNING — RUPTURE TUBES

Rupture tubes are an essential safety device. Abnormally high pressure in the barrel causes the rupture tube to "blow" or vent this pressure to the atmosphere.

Stay clear of the vicinity of rupture tubes. If the rupture tube "blows," injury may result from the escaping pressure, noise, hot chemicals, and/or fragmented particles. It is never safe to be in the vicinity of the rupture tubes unless the extruder is at room temperature.

Always wear full protective clothing when replacing a blown rupture tube and cleaning up the vented polymer.

Always have a stock of properly rated replacement rupture tubes available. Never plug a blown rupture tube in order to get restarted. **FAILURE TO USE A PROPER RUPTURE TUBE MAY RESULT IN AN EXPLOSION THAT COULD CAUSE SERIOUS PERSONAL INJURY OR DEATH AND MACHINE DAMAGE.** If you should find yourself without a replacement, call Black Clawson Converting Machinery, Inc. if the extruder in question was manufactured by Black Clawson Company, Black Clawson Converting Machinery LLC or Black Clawson Converting Machinery, Inc.



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WARNING — FASTENERS

Beware of counterfeit fasteners. When purchasing fasteners, do not assume that they meet the applicable standards. Check for obvious dimensional defects. Always purchase fasteners from a reputable supplier and be specific as to the grade and quality required. Ask for documentation of the grade of the fasteners being supplied. Black Clawson Converting Machinery, Inc. recommends that all Alloy Steel socket head cap screws meet the requirements of ANSI B 18.3 and ASTM A574-7. If you have a question about the proper grade or quality of fasteners, contact Black Clawson Converting Machinery, Inc. **FAILURE TO USE PROPER FASTENERS COULD RESULT IN PERSONAL INJURY OR DEATH AND MACHINE DAMAGE.**

WARNING — TORQUING

Alloy Steel socket head cap screws must be torqued to specified requirements. Once torqued and removed for any reason, **DO NOT REUSE AND RETORQUE.** Always replace with new socket head cap screws. **RETORQUING CAN CAUSE CAP SCREW FAILURE WHICH COULD CAUSE SERIOUS PERSONAL INJURY OR DEATH.**

All Black Clawson Converting Machinery, Inc. extruders equipped with socket head cap screws have screws conforming to ANSI B 18.3 and ASTM A574-7.

COMMENTS:

1. Some extruders are equipped with swing bolts and others with studs and nuts for flanging the adaptor to the barrel.
2. If manuals and/or drawings supplied by Black Clawson Converting Machinery, Inc. Black Clawson Company or Black Clawson Converting Machinery, Inc. do not specify the required torque, you should contact Black Clawson Converting Machinery, Inc. for assistance.

WARNING LEAKAGE

Never retorque fasteners to stop leaks. Replace fasteners if leaks are detected.

Always stop machine, disassemble, clean joint, replace seals, if any, replace fasteners and torque to Black Clawson specifications.

LEAKS CAN CAUSE FIRES AND/OR SEVERE BURNS.

IMPORTANT NOTE

This bulletin applies to Extruders manufactured by Black Clawson Converting Machinery, Inc., Black Clawson Company and Black Clawson Converting Machinery LLC only. If the instructions in this bulletin do not apply to your particular extruder contact Black Clawson Converting Machinery, Inc. immediately.



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WARNING HEAT & MOLTEN PLASTIC

As previously mentioned, heat is important in the extrusion process. Therefore, care must be taken when in the vicinity of the extruder. Severe burns can result in touching the extruder or die. Operators sometimes drool or purge the extruder off machine. This drool is hot: maybe as high as 650°F. As the polymer becomes clear, a slight change in air velocity within the plant can cause the film to bellow out and engulf a person. Keep clear when plastic is being extruded. Molten plastics stick to skin and cause severe burns.

Always wear protective clothing and shields in the area of drool or any die opening or vent. Polymer may also splatter as it exits the die if it is overheated or moisture is present in the feed stock. **FAILURE TO WEAR PROTECTIVE CLOTHING AND SHIELDS MAY RESULT IN SERIOUS PERSONAL INJURY.**

WARNING BRIDGING

The best way to prevent bridging is to be sure the feed cylinder and screw cooling sections have adequate water supply. In the event bridging does occur, stop the drive, lock out the drive, empty the hopper and vacuum out remaining pellets from the feed throat. Once this has been accomplished, unlock the drive, start the extruder, and feed a rod of similar plastic through the feed hopper and into the feed section such that the screw flights pull the rod down the screw and pushes the stuck pellets along the screw and allows normal feeding of the pellets to follow.

If this procedure does not work, the extruder must be stopped and screw may need to be removed for cleaning.

WARNING HAND FEEDING

HAND FEEDING is dangerous and must only be performed with extreme caution. Moisture in the barrel or on the pellets can cause splattering from the open head. Use a non-metallic container to feed pellets of power into the feed opening.

WEAR PROPER PROTECTIVE CLOTHING AND A FACE SHIELD TO AVOID INJURY. KEEP HAND CLEAR OF ROTATING SCREW. SEVERE PERSONAL INJURY COULD RESULT.

WARNING EXTRUDER HOPPER

Never look into the hopper inlet at start-up, during operation or during problem times without a proper protective shield. **SEVERE PERSONAL INJURY MAY RESULT FROM EJECTED PELLETS OR GASES.**

Never reach into a hopper at any time while the extruder is in operation. **SEVERE PERSONAL INJURY MAY RESULT FROM THE ROTATING SCREW. ALWAYS LOCK OUT THE DRIVE BEFORE REACHING INTO THE HOPPER.**



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SAFETY- RELATED DEVICES

In conjunction with rupture tubes and pressure gages, other safety related devices are sometimes also used.

Audible Alarm can be set to go off at a predetermined barrel pressure to alert operator of a potentially hazardous over pressure.

Visual Alarm can be set to go off at a predetermined barrel pressure, which will show on the control screen, to alert operator of a potentially hazardous over pressure.

Shut Down Switch will shut down the screw drive when barrel pressure reaches a potentially unsafe condition.

Under no circumstances should these alarms and switches be used alone. They are no substitute for a visible functional pressure gage, rupture tube and screws meeting applicable standards.

WARNING

Extruders are part of a larger system. The following warning applies where interlocks are provided as part of that system:

Safety devices are no substitute for safe and proper operating procedures. Interlocks and safety devices can be bypassed if the operator feels they are a hindrance to productivity. Black Clawson only supplies interlocks and safety devices that are necessary for safe operation.

It is the duty of the user to maintain interlocks and safety devices in good repair.

UNDER NO CIRCUMSTANCES SHOULD SUCH INTERLOCKS AND SAFETY DEVICES BE BYPASSED OR REMOVED FOR ANY REASON.

DANGER — HIGH VOLTAGE

Extruders can be heated by electric resistance heaters and are powered by electric motors. The extruder must be properly grounded and all wiring checked periodically for loosening or damage and replaced if necessary.

Drive motors require HIGH ELECTRIC VOLTAGE. HIGH VOLTAGE can cause serious personal injury or death.

LOCK OUT POWER BEFORE servicing motors, drive cabinets or heaters.

Only qualified personnel are allowed to by-pass the lock out to do necessary adjustments within drive cabinets. Normally this is done by a special key issued on a restricted basis.

DO NOT OPERATE without barrel or heater covers in place.

WARNING — CONTROL PANEL LOCATION

Make sure that operators working on the extruder are always visible from the control panel.



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WARNING — LOCKOUT TAGOUT

All personnel must be trained in the proper procedures for lockout. Refer to OSHA Subpart J 1910.147. Lockout and tagout devices must identify the employee applying the device.

All drives must be de-energized and locked out before performing any maintenance on an extruder.

Where programmable logic controllers (PLCs) are being worked on, disable and lock out all output functions. Test all logic changes under controlled conditions. Do not make changes without first consulting Black Clawson since even simple changes may create a hazard.

All controls must be locked out and all systems de-energized before performing any work on the extruder by any personnel.

De-energizing the extruder or down stream equipment must not create a hazard.

After maintenance is completed, replace all guards that were removed and ensure that no unsafe condition exists and that all personnel are clear of the extruder before removing the lockouts and activating the controls.

WARNING — ROTATING SHAFTS

All transmission shafts such as main indrive and auxiliary drives within the section must be guarded in accordance with OSHA's Regulation Subpart R 1910.212 & 219

EMERGENCY STOPS

Extruders must be equipped with devices that will stop the extruder in an emergency. ANSI standard B151.7-1982 states: "An emergency stop device is any trip rod, cord, button or electronic device that when activated, will disconnect the power to the machine and stop the rotation of the spiral fluted screw(s)."

Emergency stop devices shall be red. Stop buttons or electrical switches with letters or other markings used for emergency stopping of machinery shall be red.

Emergency stops are not safety devices that can prevent accidents and must never be used as an operational tool.

All employees must be made aware of the emergency stops in their section as part of their safety training. Reference: ANSI B151.7-1982 (2.2 and (2.3).



SAFETY INFORMATION

OPERATION

REVIEW THE FOLLOWING SAFETY RULES BEFORE OPERATING THE EXTRUDER:

1. Do not remove or paint over warning signs. They are installed to warn personnel of possible danger. Observe all instructions given on the signs.
2. Observe all color coding. **ORANGE:** This color indicates hazards on the machine which might cause personal injury and are to be avoided during operation. **YELLOW:** This color indicates caution and is used for marking physical hazards such as falling and tripping, etc. Examples would be fixed guards, cross walks, and steps.
3. Footwalks, handrails, barriers, and guards must be in place before starting the machine.
4. Do not over - reach, climb, or stand on places other than properly designed and designated ladders, steps, or walkways.
5. Aisles must be clean and clear of obstructions. Wipe up spilled oil, grease, and water. Good housekeeping prevents injuries.
6. Keep clothing and all parts of the body away from in-going nips, gears, and rotating or pivoting loading mechanisms.
7. Beware of head high obstacles in and around the machinery area. Wear proper head protection when indicated.
8. Exhaust blasts from air motors may blow dirt, scale, or other foreign materials into eyes causing eye injury. Wear proper eye protection when indicated.
9. Keep all parts of the body away from rotating drive components.
10. Do not operate any equipment until all personnel are accounted for outside of safety lines.
11. Keep clear of extruder when drooling.
12. Keep clear of extruded molten plastic.
13. On air cooled extruder, exercise care when working around barrel covers. Hot air is vented through slots, so surrounding metal may be hot.





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MAINTENANCE

- Lock out heater power supply before servicing heaters or temperature sensors.
- Wear protective high temperature rated gloves when touching extruder parts even though you believe extruder to be cold.
- Use caution when servicing gear reducer.
- Reducer oil may be 150°F (66°C) or more and can cause burns. Leaking oil can cause fires.
- Smoke hood ducts may be extremely hot. Wear protective clothing when checking for residue build-up. Build-up can cause fires. Steam clean periodically.
- Do not climb on machine while in operation. Use only walkways provided for any visual inspection.
- If pressure transducers, rupture tubes, or screen packs require changing, always change after the extruder has been processing polymer or after a shutdown. This is done prevent the possible escape of gasses that could buildup in an overheated zone during a cold startup.
- In water-cooled barrel heater applications, water in the cooling tank can be hot and may boil. Do not remove tank lid while extruder is operating. Schedule all inspections and water level adjustments during shut-down.
- When hoses or tubes are plugged do not disconnect for service while hot.
- Do not disconnect the screw cooling water unless the water flow has been stopped and an adequate period of time has elapsed to allow complete boil-out.
- Always "lock out" before performing any maintenance.
- Keep screen pack clean. A dirty screen pack or jammed slide plate can block off flow and increase barrel pressure.



SAFETY INFORMATION

UNSAFE PRACTICES

To avoid injuries, operators and other personnel should be aware of and avoid the following when working with extruders and associated equipment:

- Unguarded nip points.
- Unguarded wrap points.
- Unguarded pinch points.
- Moving parts and parts capable of moving.
- Unguarded rotating machinery.
- Unguarded moving members.
- Poor maintenance of hoist equipment.
- Inadequate barriers.
- Failure to lock out and de-energize when working on or repairing the extruder.
- Inadequate safety signs.
- Removal of handrails and guarding.
- Failure to wear protective clothing.
- Inadequate training of operators and supervisors.
- Failure to read and understand operating instructions.
- Improper use of footwalks, crosswalks, access steps, ladders, etc.
- Poor housekeeping, failure to keep working and traffic areas free of waste material and other tripping hazards.
- Improper care when cleaning with chemicals.
- Improper maintenance of hydraulic hoses and fittings.
- Failure to ensure that all personnel are clear before starting the extruder.
- Operating extruder without a working pressure gage.
- Operating extruder without a rupture tube or properly rated rupture tube.
- Blocking off rupture tube before starting up.
- Operating an extruder with a blocked-off or plugged rupture tube.
- Closing back pressure valve all the way.
- Starting up extruder too quickly.
- Hurriedly adjusting back pressure valve.
- Making adjustments or operating control functions without fully understanding the consequences.





SAFETY INFORMATION

Safety Signs

INTRODUCTION

Operators of Black Clawson machinery, where practical and appropriate, may be protected from certain hazards by a physical barrier and may in addition, be warned of those hazards by the placement of Safety Signs. These signs alert persons to the degree or level of the hazard, the nature of the hazard, to how the hazard can be avoided, and the consequences of involvement with the hazard.

The following examples illustrate the ANSI Z535 standard series format for product safety signs and labels. These standards must be referred to when design safety signs and labels. Not all safety signs will have a pictorial panel.

Color-coding for the words DANGER, WARNING, CAUTION, and SAFETY INSTRUCTION is important for the identification of the hazard level.



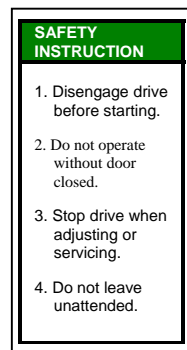
DANGER – (white letters with a red background) indicates an immediate hazard that if not avoided **WILL** result in death or serious injury. This should be limited to the most extreme situations.



WARNING – (black letters with an orange background) indicates a potential hazard that if not avoided **COULD** result in death or serious injury.



CAUTION – (black Letters with a yellow background) indicates a potential hazard that if not avoided **MAY** result in minor or moderate injury. It is also used to alert against unsafe practices and/or property damage.



SAFETY INSTRUCTION – (white letters with a green background) is used to convey multiple messages stating procedures or actions that must be followed for the safe operation of the product.



SAFETY INFORMATION

Reference Information

All machine operators, maintenance and supervisory personnel should read and understand not only the selected OSHA sections listed, but also all applicable OSHA codes pertaining to their job duties and functions.

OSHA and ANSI standards are updated periodically and the section numbers may change. The following references are correct at the time of printing. Owners of machines should be aware of the most recent standards applicable to their machine.

OSHA REGULATIONS

The following list of regulations from OSHA CFR 29, Section 1910 is for your reference. OSHA regulations are available on line at www.osha.gov.

Subpart G – Occupational Health
§95 – Noise exposure

Subpart I – Personal Protective Equipment
§133 – Eye and face protection
§134 – Respiratory protection

Subpart J – General Environmental Controls
§146 – Confined Space
§147 – Lockout Tagout.

Subpart N – Material Handling
§179 – Overhead cranes

Subpart O – Machinery & Machine Guarding
§212 – General requirements
§219 – Power transmission

Subpart R – Special Industries
§261 Pulp Paper and Board Mills.
(a) General Requirements
(b) Safe Practices
(i) Finishing Room

Subpart S – Electrical
§303 – General requirements

ANSI STANDARDS

The American National Standards Institute publishes consensus standards of interest to machinery users.

Z535.4 - Safety Signs and Labels
ANSI B151.5-2000: Plastic Film & Sheet Winding Machinery.
ANSI B151.2-1999: Plastic Cast Film Machinery
ANSI B151.20-1999: Plastic Sheet Production Machinery.



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NATIONAL & INTERNATIONAL STANDARDS

The International Standards Organization (ISO) and the International Electrotechnical Commission (IEC) lists many standards of interest as does the European Union whose standards are nearly identical. In addition, many countries promulgate their own standards. A source for many of these can be found at www.global.ihs.com.

INSTRUCTION MANUALS

It is essential that operators be thoroughly trained in surface winder safety and the procedures applicable to the process in which they are involved.

Black Clawson Converting Machinery, Inc. provides instruction manuals with all machine orders. All operators should read and understand the information in these manuals before operating the machine.

LACK OF PROPER TRAINING AND UNDERSTANDING CAN BE A MAJOR CAUSE OF SERIOUS PERSONAL INJURY.

IMPORTANT INFORMATION

For help with guarding or on how to safely operate your Black Clawson Converting Machinery, Inc's Extruder or for such assistance or help with safely operating extruders manufactured prior to March 15, 2003 by The Black Clawson Company or Black Clawson Converting Machinery LLC, contact:

Black Clawson Converting Machinery, Inc.
46 North First Street
Fulton, NY 13069, USA
Telephone – (315) 598 7121

Please locate the serial number plate on the machine in question and write down the Black Clawson order number and serial number, if any. This will greatly expedite locating information on your specific machine.

BC Order No.

Serial No.
