

**DEPARTMENT OF CONSUMER AND INDUSTRY SERVICES  
DIRECTOR'S OFFICE  
GENERAL INDUSTRY SAFETY STANDARDS**

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(as amended January 24, 2000)

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(By authority conferred on the director of the department of consumer and industry services by sections 16 and 21 of Act No. 154 of the Public Acts of 1974, as amended, and Executive Reorganization Order No. 1996-2, being §§408.1016, 408.1021, and 445.2001 of the Michigan Compiled Laws)

R 408.16227 and R 408.16234 of the Michigan Administrative Code are amended as follows:

**PART 62. PLASTIC MOLDING**

**TABLE OF CONTENTS**

Scope .....	R 408.16201	Lubrication and maintenance .....	R 408.16227
Definitions B to E .....	R 408.16204	Blow molding .....	R 408.16231
Definitions H and I .....	R 408.16205	Compression, transfer, and matched metal molding machinery .....	R 408.16232
Definitions M to Q .....	R 408.16206	Extrusion machinery and equipment .....	R 408.16233
Definitions R and S .....	R 408.16207	Injection molding machinery .....	R 408.16234
Definitions T to V .....	R 408.16208	Expansion molding .....	R 408.16235
Employer responsibilities .....	R 408.16211	Vacuum and thermoforming .....	R 408.16236
Employee responsibilities .....	R 408.16212	Rotational molding .....	R 408.16237
Illumination .....	R 408.16215	Guillotine cutter .....	R 408.16241
Aisles and work areas .....	R 408.16216	Hopper filling methods .....	R 408.16242
Housekeeping .....	R 408.16217	Processing plastic .....	R 408.16243
Machine installation .....	R 408.16221	Transfer printer, crush and embossing rolls ...	R 408.16244
Devices, guards, and protective equipment ...	R 408.16222	Hot plate, spin, and ultrasonic welding machines; guards .....	R 408.16245
Platforms and ladders .....	R 408.16223	Dielectric sealing .....	R 408.16246
Hydraulic and pneumatic systems, safety factors .....	R 408.16224	Plastic scrap granulators .....	R 408.16247
Point of operation devices .....	R 408.16225	Other machinery .....	R 408.16251
Controls .....	R 408.16226		

**GENERAL PROVISION**

**R 408.16201. Scope.**

**Rule 6201.** (1) This part sets forth safe practices for employees and safeguards for all machinery and equipment used in the following areas of plastics processing:

- (a) Blow molding.
- (b) Foam molding.
- (c) Compression and transfer molding.
- (d) Injection molding.
- (e) Extrusion.
- (f) Expansion molding.
- (g) Rotation molding.
- (h) Vacuum molding.
- (i) Sealing.
- (j) Heating.
- (k) Granulating.
- (l) Welding.

(2) The process of blister, skin, or shrink packaging is not subject to the requirements of these rules.

**R 408.16204. Definitions; B to E.**

**Rule 6204.** (1) "Blow molding machine" means a plasticizer and a clamping unit that work in conjunction with each other so that the plasticizer produces molten

plastic which is blown by air, gas, or liquid and the clamping unit performs the manufacture of hollow products.

(2) "Compression molding machine" means a machine that uses temperature-controlled molds for pressing plastic material into the shape of a mold cavity.

(3) "Device" means a machine control that is designed and installed to perform either of the following functions:

- (a) Prevent normal machine operation if the operator's hands are within the point of operation.
- (b) Require the concurrent use of both hands of the operator to actuate the machine.

(4) "Dielectric sealing" means a process for bonding plastic films using high-frequency energy.

(5) "Expansion molding" means to make plastic shapes by expanding polystyrene beads with a heating medium within a mold.

(6) "Extrusion machine" means a plasticizer which is mounted on a base and which takes raw plastic material, changes it into a molten state, and extrudes it through a die into a predetermined shape.

**R 408.16205. Definitions; H and I.**

**Rule 6205.** (1) "Heat sealing" means the joining of plastic by simultaneous application of heat and pressure to the area of contact.

(2) "Hot plate welding" means the joining of plastic by preheating followed by application of pressure to the plastic pieces.

(3) "Hot-wire cutter" means a machine using electrically resistant wire for heating, spaced at intervals to cut expanded plastic blocks into predetermined sizes.

(4) "Injection molding machine" means a machine using a plasticizer to force a charge of processed plastic material into a closed mold, which produces a molded part.

**R 408.16206. Definitions; M to Q.**

**Rule 6206.** (1) "Matched metal molding" means a method of molding reinforces plastics between 2 close-fitting metal molds mounted in a power press.

(2) "Nip point" means a point at which it is possible to be caught between 2 or more shafts or rolls that rotate parallel to each other in opposite directions.

(3) "Operator" means any employee who is assigned to operate or anyone who comes around plastic processing equipment and who is exposed to the point of operation.

(4) "Pinch point" means a point at which it is possible for an employee to be caught between moving parts of a machine or between moving and stationary parts of a machine.

(5) "Plastic scrap granulator" means a machine that has rotating knives which cut plastic articles into particles.

(6) "Point of operation" means the area of a machine where material is actually worked.

(7) "Qualified person" means one who, by knowledge, training, and experience, has successfully demonstrated, to the employer, his or her ability to solve or resolve problems relating to the subject matter, the work, or the project.

**R 408.16207. Definitions; R and S.**

**Rule 6207.** (1) "Rotational molding" means a method of making hollow articles by charging a hollow rotating mold with a plastic material. After the heated material covers all surfaces of the mold it is cooled and stripped out.

(2) "Safety factor" means the ratio of the breaking strength of a piece of material or object to the maximum designed load or stress applied when in use.

(3) "Ship-lap machine" means a powered machine equipped with feed rolls and milling cutters for the purpose of cutting grooves in the edge of expanded sheet material.

(4) "Spin welding" means a method of fusing 2 objects together by spinning 1 or both until frictional heat melts the interface. The spinning is then stopped and pressure applied to both objects.

**R 408.16208. Definitions; T to V.**

**Rule 6208.** (1) "Transfer molding machine" also known as a plunger molding machine, means an auxiliary chamber used to heat plastic to a hot state before transferring it into a closed mold of a compression molding machine.

(2) "Transfer printer" means a machine with rolls which imprints a pattern on material run between the rolls.

(3) "Two hand control" means an actuating device with an anti-tie down, anti-repeat feature that requires the concurrent use of both hands of an operator to actuate a machine.

(4) "Ultrasonic welding" means to seal plastic by application of vibratory mechanical pressure which creates localized heat to melt the plastic surfaces which effects the seal.

(5) "Vacuum forming" also known as thermo forming, means forming of pliable sheet plastic into shapes by use of molds and atmospheric or mechanical pressure.

**R 408.16211. Employer responsibilities.**

**Rule 6211.** (1) An employer shall provide training to an employee regarding the operating procedures, hazards and safeguards of any assigned job.

(2) An employer shall not allow a machine to be operated which is not guarded as prescribed by this part or where the machine has a known defect which could affect the safety of an employee.

(3) An employer shall establish and maintain a lockout system as prescribed in subrule (3) of rule 6227.

**R 408.16212. Employee responsibilities.**

**Rule 6212.** (1) An employee shall not operate a machine unless trained in its operating procedures, hazards and safeguards and has been authorized to do so.

(2) An employee shall report to a supervisor a machine or safeguard which is defective.

(3) A guard removed for inspection, maintenance, die setting or mold setting shall be replaced before a machine is released for production.

**R 408.16215. Illumination.**

**Rule 6215.** Illumination of not less than 25 foot candles shall be provided at an operator's work station.

**R 408.16216. Aisles and work areas.**

**Rule 6216.** An aisle or work area shall be kept free of protruding objects, holes, loose boards, oil and water spillage which create a tripping and slipping hazard.

**R 408.16217. Housekeeping.**

**Rule 6217.** Dust, scrap and spills of plastic materials shall be cleaned up and disposed of daily, or more often if it constitutes an employee hazard.

## EQUIPMENT INSTALLATION AND MAINTENANCE

**R 408.16221 Machine installation.**

**Rule 6221.** (1) An electrically powered machine shall be grounded.

(2) A machine installed on a bench, table or stand shall be designed or secured to prevent unintentional movement or tipping.

(3) A machine shall be so located that there will be space for the employee to handle the material and operate the machine with no interference to or from another employee or machine.

(4) A machine shall be so located that it will not be necessary for an operator to stand in an aisle.

(5) A powered gate shall have the leading edge equipped with a return switch and circuit so designed that the gate will retract and not cause an injury if an employee is struck by it.

**R 408.16222. Devices, guards, and protective equipment.**

**Rule 6222.** (1) An electrical connection to a heated portion of a ram or screw cylinder shall be covered with a nonconducting guard or a grounded metal barrier to prevent contact with live terminals during normal operation of the machine.

(2) An exposed heated surface which could cause an injury shall be covered or guarded to prevent contact by an employee. This subrule does not apply to an area that requires accessibility, such as the adapter or grate on an extrusion machine.

(3) A machine that uses a blade or knife to cut plastic materials shall be guarded by a barrier, by position, or by a device to prevent contact between the operator and the machine.

(4) An employee, if exposed to the possibility of burns from a heated surface which cannot be covered or guarded, shall use heat-resistant personal protective equipment that is provided by the employer to the employee at no expense to the employee.

(5) The effectiveness of a safeguard shall not be diminished when auxiliary equipment is applied to or from a plastic molding machine.

#### **R 408.16223 Platforms and ladders.**

**Rule 6223.** If it is necessary for an employee to mount a machine to perform assigned duties, a platform or ladder, or both, shall be provided and used. The floor of the platform shall have an open design or slip-resistant surface. A platform shall be as prescribed in the general industry safety standards commission standard, Part 2. Floor and Wall Openings, Stairways, and Skylights, being R 408.10201 et seq. of the Michigan Administrative Code. A fixed ladder shall be as prescribed in the general industry safety standards commission standard, Part 3. Fixed Ladders, being R 408.10301 et seq. of the Michigan Administrative Code. A portable ladder shall be as prescribed in the general industry safety standards commission standard, Part 4. Portable Ladders, being R 408.10401 et seq. of the Michigan Administrative Code.

#### **R 408.16224. Hydraulic and pneumatic systems, safety factors.**

**Rule 6224.** Flexible and rigid hydraulic and pneumatic piping and its component parts shall be designed and constructed with a safety factor of not less than 4.

#### **R 408.16225. Point of operation devices.**

**Rule 6225.** (1) Either of the following point of operation devices shall protect an operator:

- (a) A device that prevents or stops, or both, the normal machine function if the operator's hands are within the point of operation.
- (b) A device that requires the application of both of the operator's hands to the machine operating controls until a point is reached in the cycle where the operator cannot remove a hand and place it within a pinch point or point of operation. Sweep guards are not acceptable as a device to protect the operator.

(2) If a presence-sensing point of operation device is used, it shall protect the operator as provided in subrule (1)(a) of this rule and shall be interlocked into the control circuit to prevent or stop motion if the operator's hand or other part of his or her body is within the sensing field of the device during the closing cycle of the machine. The device shall not be used to initiate operation of the machine and shall be in compliance with all of the following provisions:

- (a) The device shall be constructed so that a failure within the device initiates a stopping action and prevents the initiation of a successive cycle until the failure is corrected. The failure shall be indicated by the system.
- (b) The distance from the sensing field to the point of operation shall be such so as to permit the mold or die to close or stop before the employee can reach into the point of operation with any body part.
- (c) Safety guards shall be used to protect an employee from all hazardous motion which is not protected by the presence-sensing device.

The protection function of a presence-sensing point of operation device may be bypassed for the purposes of parts ejection, circuit checking, and feeding as the mold or die opens if the operator is not exposed to hazardous motion.

#### **R 408.16226. Controls.**

**Rule 6226.** (1) An operating control shall be guarded against accidental contact. A control button or lever shall be identified as to its function.

(2) If a machine requires more than 1 operator, and if each operator is exposed to a point of operation, the controls shall be activated concurrently before the machine will operate.

(3) A machine shall be provided with an emergency stop control at each operator station. The stop control shall be red in color and readily accessible. A button, if used, shall have a mushroom shape.

(4) A machine shall be provided with a means which, upon power failure, will prevent automatic restarting upon the restoration of power. Fire, coolant, and sump pumps are excepted from the requirements of this subrule.

(5) When used, interlocks shall be installed to minimize the possibility of accidental operation or tampering.

(6) Where more than 1 operator is assigned to a plastic molding machine that is not equipped with interlocked gates and the operator is exposed to a point of operation, or when hazardous motion in or near the point of operation could cause injury, each operator shall be provided with a device that prevents reaching into the point of operation during the closing cycle.

(7) Two-hand control devices shall be located in a manner to prevent bridging.

#### **R 408.16227. Lubrication and maintenance.**

**Rule 6227.** (1) Lubrication of a machine shall be accomplished by 1 of the following:

- (a) Manually when the machine can be shut off and locked out.
- (b) An automatic pressure or gravity feed system.
- (c) An extension pipe leading to an area outside of the guards or away from any hazard.

(2) In any case, R 408.10732, on lubrication of the general industry safety standards commission standard, Part 7. Guards for Power Transmission, shall apply.

(3) Except as permitted in R 408.16234(10), each employee doing the work shall lock out the power source of the machine or equipment to be repaired or serviced if unexpected motion would cause injury. Any residual pressure which would be hazardous shall be relieved before and remain relieved during work by an employee doing the work.

## SPECIFIC EQUIPMENT

#### **R 408.16231. Blow molding.**

**Rule 6231.** (1) A blow molding machine shall be equipped with a safety gate that is designed and constructed to prevent an employee from reaching into the point of operation when the gate is in a closed position.

(2) A safety gate shall activate, at its final closing, at least 1 electrical control which shall be part of the electrical mold-closing circuit. Opening or removing the gate shall prevent further closing of the mold.

(3) A safety gate shall also be directly interlocked with a hydraulic or pneumatic valve that controls mold closing or have a mechanical means which will prevent movement of the machine with the gate open or removed.

#### **R 408.16232. Compression, transfer, and matched metal molding machinery**

**Rule 6232.** (1) A compression, transfer, or matched metal molding machine shall be equipped with either of the following:

- (a) A moving gate guard that covers the front opening to the point of operation. An electric interlock on the moving gate guard shall be arranged to prevent the machine from closing until the moving gate guard has covered the opening. When the moving gate guard is opened, the machine shall stop or reverse.

(b) A device as prescribed by the provisions of R 408.16225.

(2) The point of operation for a machine that does not require access for an operator shall be guarded by an interlocked removable barrier or a fixed barrier. The toggles on such a machine shall also be enclosed by an interlocked removable or fixed barrier to prevent inadvertent contact by an employee.

(3) Two 2-handed control devices shall be provided and used when operating a transfer molding machine. One set shall close the mold and then the other set shall actuate the transfer plunger. Where the entrance to the plunger is guarded by an interlocked gate, 1 such control device is acceptable.

**R 408.16233. Extrusion machinery and equipment.**

**Rule 6233.** (1) An extrusion machine and floor model controller panel shall be secured to prevent tipping.

(2) When running production, the in-running nip points on a take-off machine pulling extrusions, except sheets, from the extruder shall be guarded by a barrier adjusted to within 1/4 inch of the material.

(3) When running production, sheet and film extrusion machinery shall be guarded by a barrier or enclosed at all in-running pinch points exposed to contact.

(4) An extrusion machine having an open feed screw shall have the feed screw covered by an interlocked gate or cover to prevent the operator from being caught in the point of operation.

**R 408.16234. Injection molding machinery.**

**Rule 6234.** (1) An injection molding machine, except for one with a movable table that is subject to the provisions of subrule (4) of this rule, shall be equipped with a safety gate that is designed and constructed to prevent an employee from reaching into the point of operation, except when the gate is open.

(2) A safety gate on an injection molding machine that was manufactured after August 28, 1973, shall be interlocked with electrical, mechanical, and hydraulic or pneumatic devices, except as noted in subrule (9) of this rule.

(3) An injection molding machine that was manufactured on or before August 28, 1973, shall have the safety gate interlocked by any 2 of the following:

(a) An electrical mold-closing control.

(b) Hydraulic or pneumatic valves that control mold closing.

(c) A mechanical device that prevents mold closing.

(4) An injection molding machine that uses a movable table to hold the lower mold shall be provided with a guard or device that is designed and constructed to deny an operator access to the point of operation during machine cycle.

(5) An injection molding machine shall be equipped with a fixed or an interlocked removable barrier that is designed and constructed to prevent an employee from reaching into the clamping mechanism.

(6) When purging an injection molding machine, an employee shall be protected from the purging splatter by a shield that is fixed, portable, or worn on the employee. The same guarding shall be used when servicing a heated runner manifold nozzle.

(7) An injection molding machine that uses an extruding machine that has an exposed feed screw shall have the screw guarded as prescribed by the provisions of R 408.16233(4).

(8) An electrically interlocked barrier shall be provided to cover the mold area opposite the operator on an injection molding machine that was manufactured after August 28, 1973. An injection molding machine that was manufactured on or before August 28, 1973, shall be provided with an interlocked or fixed barrier to cover the mold area opposite the operator.

(9) On injection molding machines that are powered by sources other than hydraulics or pneumatics, at least 1 additional

electrical interlock shall also be provided. The interlock shall be independent of, and perform the same function as, the control specified in subrule (3)(a) of this rule.

(10) An employer shall ensure that routine mold changes on a horizontal injection molding machine are conducted in accordance with either of the following if the machine has an interlocked safety gate which complies with subrule (2) of this rule and an electrically interlocked barrier covering the mold area opposite the operator:

(a) On a horizontal injection molding machine which has a functional mechanical safety device plus two independent interlocks on the operator's gate and an emergency or other stop which shuts off the motor or motors which activate the clamping mechanism, the person changing the mold shall activate the emergency or other stop and lock the operator's gate in the open position. An employer shall ensure that the interlocks shall be checked and found to be functional and properly adjusted before beginning the mold change.

(b) On a horizontal injection molding machine which has two independent interlocks on the rear barrier which shut off the motor or motors which activate the clamping mechanism, the person changing the mold shall lock the rear barrier in the open position. An employer shall ensure that the interlocks are checked and found to be functional and properly adjusted before beginning the mold change.

**R 408.16235. Expansion molding.**

**Rule 6235.** (1) A shiplot machine shall have the milling cutters guarded or enclosed at the point of operation to prevent contact with the operator's fingers. A barrier shall be provided in front of the in-running nip points of the feed rollers to within 3/8 of an inch of the material.

(2) A multiple hot-wire cutter shall have a manual control for setup use only. Any control for the automatic cycle shall be interlocked with the carriage so that the hot-wire cutter is activated before the carriage moves and is shut off when the carriage stops.

(3) A multiple hot-wire cutter shall be equipped on both sides of the moving portion of the machine with a barrier that is designed to prevent an employee from reaching the hot wires.

(4) An expansion block mold shall have reinforcements necessary to contain the force of the expanding plastic particles. Locking mechanisms shall not be more than 24 inches apart.

(5) A custom expansion block machine shall protect the operator by means of an interlocked gate across the mold parting line or by a device as prescribed by the provisions of R 408.16225. When the gate is opened or removed, the machine shall cease to function until the gate is closed.

**R 408.16236. Vacuum and thermoforming.**

**Rule 6236.** (1) An in-line automatic vacuum forming or trim press that is used to form or die cut vacuum-formed pieces shall have the point of operation and all moving parts guarded that would otherwise be exposed to contact.

(2) A punch press that is used to trim or die cut vacuum or thermoformed pieces shall be guarded as prescribed in general industry safety standard Part 23. Hydraulic Power Presses, being R 408.12301 et seq. of the Michigan Administrative Code, or Part 24. Mechanical Power Presses, being R 408.12401 et seq. of the Michigan Administrative Code.

(3) A trim machine that uses a moving roll to supply pressure to the top die shall be provided with devices that are designed to keep both hands of the operator from the point of operation when the die closes.

(4) Toggles on an automatic vacuum or thermoforming press shall be guarded by a barrier to prevent access to the pinch point.

(5) A rotary vacuum forming machine shall be equipped with a 2-hand control device that is located and timed as

prescribed by the provisions of R 408.16225(1)(b) and R 408.16226(7).

(6) Where a hazard exists due to movement or heating, the area below the level of the lower mold on a vacuum forming machine shall be guarded.

(7) An indexing machine shall be equipped with a stop control, such as a paddle switch, that is interlocked to stop the indexing operation. The stop control shall be located ahead of the first point of operation or pinch point beyond the work station.

**R 408.16237. Rotational molding.**

**Rule 6237.** (1) A pinch point created where the revolving drive wheel of a rotational molding machine meets the driving surface shall be guarded.

(2) The perimeter of the path of travel of the rotating molds shall be guarded by a standard barrier as prescribed in rule 231 of the general industry safety standards commission standards, Part 2. Floor and Wall Openings, Stairways and Skylights, being R 408.10231 of the Michigan Administrative Code. Access into the area shall be by a gate or door. If the gate or door is interlocked to the power source, the guarding required in subrule (1) need not be installed. The interlocked gate or door on the standard barrier shall not be used as an operating control.

(3) Such a machine, having each movement of the mold manually controlled by an operator, may substitute a yellow line 4 inches wide for a standard barrier around the perimeter of the path of travel of the rotating molds, except the perimeter between the heating and cooling chambers. However, movement of the molds shall be preceded by automatic activation of a warning device, such as a flashing light, bell, horn or siren for 5 seconds before the movement.

(4) The operating controls for a manually operated machine shall be so located that the operator cannot reach into the path of or be struck by the moving mold.

**R 408.16241. Guillotine cutter.**

**Rule 6241.** A guillotine plastic cutter shall have the cutter blade guarded on each side by a barrier constructed in such a manner to prevent contact with the cutter by the operator.

**R 408.16242. Hopper filling methods.**

**Rule 6242.** The method used to fill a hopper more than 5 feet above a floor or platform of a plasticizer shall be 1 of the following:

- (a) A barrel dumper that is used with a hoist.
- (b) A barrel dumper or an enclosed platform on a powered industrial truck.
- (c) A portable stair that has handrails and wheel locks.
- (d) A platform that is located not more than 5 feet below the hopper opening.
- (e) An automatic feed system.
- (f) Another method that does not expose the employee to a hazard.

**R 408.16243. Processing plastic.**

**Rule 6243.** (1) A heat-sealing machine shall be equipped with a device as prescribed by the provisions of R 408.16225.

(2) A punch press that is used for die cutting plastic shall be guarded as prescribed by the provisions of R 408.16236(2).

(3) A printing press that is used for diecutting shall be equipped with an effective device which restricts or removes the operator's hands from the point of operation at each closing.

(4) A machine that uses rotary cutters to cut and shape plastic shall have the point of operation enclosed.

**R 408.16244. Transfer printer, crush and embossing rolls.**

**Rule 6244.** The in-running rolls of a transfer printer, crush or embossing roll shall be guarded by a barrier which will prevent an operator from being caught in the nip point.

**R 408.16245. Hot plate, spin, and ultrasonic welding machines; guards.**

**Rule 6245.** (1) The point of operation on a hot plate, spin, or ultrasonic welding machine shall be guarded with either of the following:

- (a) A movable interlocked gate or fixed barrier that is designed and constructed to prevent an employee from reaching into the point of operation, except when the gate is open.
- (b) A device as prescribed by the provisions of R 408.16225.

(2) Moving parts of a hot plate, spin, or ultrasonic machine which create a pinch point shall be guarded as prescribed by the provisions of subrule (1)(a) of this rule.

(3) The heated plates of a hot plate welding machine shall be guarded against accidental contact when in a retracted position.

(4) A fixed barrier of solid material shall be installed on a spin welding machine if any of the following conditions exist:

- (a) A rotating chuck continues to spin when in the retracted position.
- (b) Flash is projected and the machine is guarded by a device.
- (c) Fixed orientation is accomplished by an indexing mechanism.

**R 408.16246 Dielectric sealing.**

**Rule 6246.** (1) An electrical power pack or oscillator cabinet shall have the access doors interlocked in a manner which will cut the power when the doors are opened and shall have a mechanical shorting bar which will automatically ground out the residual energy.

(2) An employee shall be protected by an interlocked and grounded shield that is constructed to block the direct passage of the stray currents moving out of the intended path.

(3) The point of operation shall also be guarded as prescribed by the provisions of R 408.16245(1). The movable or fixed barrier and the shield required in subrule (2) of this rule may be the same if it accomplishes both purposes.

**R 408.16247. Plastic scrap granulators.**

**Rule 6247.** (1) The opening of a hopper of a plastic scrap granulator shall be of such distance from the cutting knives that the fingers of an employee cannot make contact. A baffle gate shall be installed at the feed entrance of a hopper so that the opening is normally closed except for charging with scrap.

(2) An access opening for maintenance, cleaning or inspection shall be covered with a solid plate, secured by a fastener which requires the use of a tool to unfasten it.

(3) Before a hopper is removed, a plastic scrap granulator shall have the power source disconnected and locked out.

**R 408.16251. Other machinery.**

**Rule 6251.** Where woodworking machinery is used in the processing of plastics, the machinery shall be as prescribed in the general industry safety standards commission standard, Part 27. Woodworking Machinery, being R 408.12701 et seq. of the Michigan Administrative Code.

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