



**DEPARTMENT OF LABOR & ECONOMIC GROWTH**  
**DIRECTOR'S OFFICE**  
**GENERAL INDUSTRY SAFETY STANDARDS**

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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R 408.14515, R 408.14517, and R 408.14527 are rescinded. R 408.14521 is effective as of the date of this amendment.

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**PART 45. DIE CASTING**

**TABLE OF CONTENTS**

R 408.14501 Scope.....	1	R 408.14535 Cylinder handling, storage and use.....	3
R 408.14503 Definitions; A to G.....	1	R 408.14541 Die casting machines, general.....	3
R 408.14504 Definitions; H to M.....	1	R 408.14543 Die casting machines, hot and cold.....	3
R 408.14505 Definitions; P to T.....	1	chamber types.....	3
R 408.14507 Employer responsibility.....	2	R 408.14544 Extractors.....	3
R 408.14508 Employee responsibility.....	2	R 408.14545 Automatic safety doors.....	3
R 408.14511 Personal protective equipment.....	2	R 408.14551 Hand and bull ladles and syphons.....	3
R 408.14513 Illumination.....	2	R 408.14552 Hot chamber pots and chutes.....	4
R 408.14521 Machine installation.....	2	R 408.14553 Furnaces.....	4
R 408.14522 Machine controls.....	2	R 408.14554 Warning devices.....	4
R 408.14523 Hydraulic and pneumatic systems.....	2	R 408.14555 Sprue cutting machines.....	4
R 408.14525 Maintenance and servicing.....	3	R 408.14561 Magnesium, general.....	4
R 408.14533 Die handling and storage.....	3		

**GENERAL PROVISIONS**

**R 408.14501 Scope.**

**Rule 4501.** This part provides for safe maintenance and operation of machinery and equipment by employers and their safe use by employees in, around, and about die casting operations, which are not covered by other standards. Permanent-mold casting is not included.

**R 408.14503 Definitions; A to G.**

- Rule 4503. (1) "Automatic die casting machine"** means a machine which will cycle continuously without the attention of an operator.
- (2) **"Bull ladle,"** also known as a **transfer ladle,** means a large vessel used for transporting and pouring molten metals.
- (3) **"Cold chamber machine"** means a die casting machine where the injection plunger and cylinder is not submerged in molten metal, but the molten metal is transferred into the cylinder.
- (4) **"Die casting"** means the injection of molten metal under pressure into dies to make various shaped parts.
- (5) **"Guard"** means a physical barrier or a device which protects a machine or an employee.

**R 408.14504 Definitions; H to M.**

- Rule 4504. (1) "Holding furnace"** means a furnace designed to hold molten metal within a desired temperature range.
- (2) **"Hot chamber machine"** means a die casting machine where the injection mechanism is submerged in the molten metal.
- (3) **"Lockout procedure"** means a method of shutting off the power to equipment and securing it by means of a lock and key.
- (4) **"Manually tended"** means a machine which has an operator who controls the cycle, inserts or removes a part or ladles molten metal.
- (5) **"Melting furnace,"** also known as a **breakdown furnace,** means a furnace designed to convert solid metals into a molten state. It includes a furnace designed as a combination melting and holding furnace.

**R 408.14505 Definitions; P to T.**

- Rule 4505. (1) "Parting plane"** means the line formed where segments or halves of a die meet.
- (2) **"Safety door"** means a movable guard interlocked to a control system and located between the operator and the die.

- (3) **“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.
- (4) **“Two hand control”** means an anti-tie down, anti-repeat actuating device that requires concurrent use of both hands of an operator to activate or control a machine.

**R 408.14507 Employer responsibility.**

- Rule 4507. (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 would affect the safety of an employee.
  - (3) An employer shall establish and maintain a lockout procedure as prescribed in R 408.14525(1).

**R 408.14508 Employee responsibility.**

- Rule 4508. (1)** An employee shall not operate a machine until he has been trained in its operating procedures, hazards and safeguards and has been authorized to operate it.
- (2) An employee shall report immediately to his supervisor a machine, equipment or safeguard which is defective.
  - (3) An authorized employee shall remove guards from a machine for maintenance or set up only. The guards shall be replaced before the machine is returned for production.

**R 408.14511 Personal protective equipment.**

- Rule 4511. (1)** Eye protection with side shields shall be provided and used by an employee operating a die casting machine or tending a melting or holding furnace, as prescribed in general industry safety standard, Part 33. Personal Protective Equipment, being R 408.13301 et seq. of the Michigan Administrative Code.
- (2) Except for the operator of a cold chamber machine, a face shield shall be provided and used by an employee handling molten metals or tending a furnace, as prescribed in general industry safety standard, Part 33. Personal Protective Equipment, being R 408.13301 et seq. of the Michigan Administrative Code.
  - (3) An employee manually tending a die casting machine or a melting or holding furnace shall wear clothing which will cover the arms to hands, legs to feet and have the feet covered with hard soled shoes. Spats or leggings shall be provided to the employee, at no expense to the employee and used by an employee manually ladling a cold chamber die casting machine, tending a melting or holding furnace or transferring molten metal unless the employee wears moulders shoes with pant legs covering the tops.
  - (4) Other personal protective equipment required for the hazards as described in general industry safety standard, Part 33. Personal Protective Equipment, being R 408.13301 et seq. of the Michigan Administrative Code, shall be provided by the employer to an employee, at no expense to the employee.
  - (5) Open sandals, cloth shoes, exposed rings or necklaces shall not be worn in the work areas.

Rings covered by gloves or tape shall not be regarded as exposed.

**R 408.14513 Illumination.**

**Rule 4513.** A machine shall have a minimum of 20 footcandles of illumination at the operator's work station.

**R 408.14515 Rescinded.**

**R 408.14517 Rescinded.**

## **EQUIPMENT INSTALLATION AND MAINTENANCE**

**R 408.14521 Machine installation.**

- Rule 4521. (1)** An electrically powered machine shall be grounded.
- (2) A machine shall be so located that there will be space for the employee to handle the material and operate the machine without interference to or from other employees or machines.

**R 408.14522 Machine controls.**

- Rule 4522. (1)** An operating control on a machine, except a stop button, shall be so located or guarded to prevent accidental contact.
- (2) A machine requiring more than 1 operator shall have controls for each operator which shall be activated concurrently before the machine will operate as prescribed in R 408.14541(1).
  - (3) A machine shall be provided at each work station with a non-concealed emergency stop device distinguished by its size or color.
  - (4) A machine shall be equipped so that upon power failure it will not automatically restart upon restoration of the power.
  - (5) An automatic die casting machine shall be equipped with a time delay device or circuit that will prevent the machine from recycling if more than 2 seconds delay occurs between the automatic demand for recycle and its commencement. It shall be necessary for the operator to reset the controls before the machine will restart. Other equivalent means may be used that will prevent recycling until the machine is cleared if the intent of this subrule is met.
  - (6) A safety interlock, exposed to contact, shall be guarded against accidental actuation.

**R 408.14523 Hydraulic and pneumatic systems.**

- Rule 4523. (1)** Flexible and rigid hydraulic and pneumatic piping and its component parts shall have a designed safety factor of not less than 4 and shall be maintained to prevent leaks that constitute a hazard.
- (2) A hydraulic pressure relief valve shall be provided on each separate system and set to open at a pressure of not more than 10% above the maximum operating pressure. The discharge of the valve shall not create a hazard for the employee. A die casting machine shall not be operated with the pressure relief valve removed.
  - (3) Fire resistant fluid shall be used in equipment where failure of a hydraulic system could cause ignition of the fluid by molten metal or flame.
  - (4) Hydraulic and pneumatic lines shall be protected from damage due to chafing or pinching.

**R 408.14525 Maintenance and servicing.**

- Rule 4525. (1)** A power source of a machine or equipment to be repaired or for die repair shall be locked out by each employee doing the work if unexpected motion would cause injury. Residual pressure shall be relieved or isolated before and during the work if unexpected motion would cause injury. The means of isolation shall also be locked out.
- (2) An employee who services or sets up a hot chamber die casting machine shall do either of the following:
- (a) Pull the plunger from the goose neck.
  - (b) Insert a safety bar to block action of the plunger.
- (3) During service or set-up, an extractor shall be locked out as prescribed in subrule (1).

**R 408.14527 Rescinded.****R 408.14533 Die handling and storage.**

- Rule 4533. (1)** A die transported by a powered industrial truck shall be moved in a manner to prevent the die from falling off. The handling equipment shall be used within its rated capacity.
- (2) A die rack, when provided, shall have a designed safety factor of not less than 2. The shelves shall be level or slanted to the back.
- (3) A die shall not be piled on top of another die unless blocked to prevent slipping and falling.
- (4) Where an eye bolt or swivel hoist ring is used in die handling, it shall be made of drop forged steel and include a shoulder or a collar set flush. An eye bolt or hoist ring shall have a designed safety factor not less than 4. An eye bolt or hoist ring which is cracked or bent or has damaged threads or open hooks shall not be used.

**R 408.14535 Cylinder handling, storage and use.**

**Rule 4535.** A compressed gas cylinder shall be handled, stored and used as prescribed in rules 1221 to 1225 of the general industry safety standards commission standard, Part 12. Welding and Cutting, being R 408.11221 to R 408.11225 of the Michigan Administrative Code.

**SPECIFIC EQUIPMENT AND MATERIALS****R 408.14541 Die casting machines, general.**

- Rule 4541. (1)** A manually tended die casting machine shall be equipped with 1 of the following:
- (a) Two-hand constant pressure anti-repeat controls requiring concurrent use of both hands during the die closing cycle. The movable platen shall stop or reverse if either control is released before the die closes.
  - (b) A constant-pressure anti-repeat single hand control located at a point where the operator cannot reach the point of operation. The movable platen shall stop or reverse if the control is released before the die is closed.
  - (c) A safety door, interlocked with the control system, which when opened will prevent closing of the dies. The door shall be of a size to keep the operator from reaching into the point of operation when the door is closed.
  - (d) A manually tended die casting machine installed after July 11, 1973, shall be equipped with an interlocked safety door.

- (2) A die casting machine shall have a barrier interlocked to the control system on the side opposite the operator. The barrier shall cover the die opening in a manner to prevent an employee from reaching into the point of operation. Where the operation requires a helper, the barrier may be removed but the controls prescribed in R 408.14522(2) shall be provided.
- (3) A die casting machine shall be equipped with an interlocked safety door or by metal shielding which will protect the operator and other employees from inadvertent metal splash or squirting from the parting line.
- (4) Either a long-handled tool shall be furnished and used to remove castings or flash from a die casting machine if they are not automatically extracted or ejected or the employee shall be protected by a mechanical device which automatically prevents closing of the machine.
- (5) An automatic die casting machine shall be equipped with interlocked doors or barrier guards of a size and design to keep an employee from reaching into the point of operation. A door or barrier may be removed or maintained in an open position where an extractor would interfere with its use, if the extractor is guarded as prescribed in R 408.14544.

**R 408.14543 Die casting machines, hot and cold chamber types.**

- Rule 4543. (1)** A hot chamber die casting machine shall be equipped with a control or cam operated switch which will prevent operation of the metal injection plunger until the machine is completely closed.
- (2) A cold chamber die casting machine shall be equipped with a control which will prevent the injection of molten metal unless the machine is completely closed.
  - (3) A cold chamber die casting machine having a faulty plunger tip which allows metal to bypass the tip shall not be used until repaired.
  - (4) An automatic ladler on a cold chamber machine shall be so interlocked that it will ladle or feed only when the plunger is fully returned to the receiving position.

**R 408.14544 Extractors.**

- Rule 4544. (1)** A die casting machine using an automatic extractor to remove castings shall have the path of travel of the extractor guarded by a barrier if required to protect employees in the area.
- (2) Where the extractor does not keep an employee from the point of operation, a fixed or interlocked barrier shall be provided.

**R 408.14545 Automatic safety doors.**

**Rule 4545.** One hundred eighty days after this part takes effect, a die casting machine purchased with an automatic safety door shall be equipped with a retractable safety edge which will function to stop and reopen the door in case it is obstructed while closing.

**R 408.14551 Hand and bull ladles and syphons.**

- Rule 4551. (1)** A bull ladle shall not be transported over the head of an employee or otherwise moved in a hazardous manner.
- (2) A bull ladle or the tipping equipment shall be equipped with a safety latch or brake. A powered

industrial truck carrying a ladle of molten metal shall not travel faster than 5 miles per hour.

- (3) A bull ladle of 2,000-pound capacity or more shall be mechanically tilted and equipped with an automatic safety latch or brake which shall hold the bull ladle at any altitude.
- (4) A bent pipe syphon, when used, shall be preheated before use.
- (5) A ladle, trough or furnace tool shall be free of moisture and preheated before being filled with or immersed into molten metal.

#### R 408.14552 Hot chamber pots and chutes.

**Rule 4552. (1)** A hot chamber machine shall be provided with a sheet metal shield extending from the cover die platen beyond and on each side of the injection mechanism and the holding furnace. The shield shall contain any splashing of molten metal which may be caused by the injection system or by the furnace recharging operation. A window may be inserted for flame observation.

- (2) A metal chute shall be provided for filling the holding furnace except where the molten metal can be transferred to the holding furnace without splash.

#### R 408.14553 Furnaces.

**Rule 4553. (1)** Cold or damp metal ingots shall be preheated and dried before being added to molten metal.

- (2) A furnace which needs to be tilted for discharge shall have operating controls located outside any splash area or the operator shall be protected by a splash shield.
- (3) A furnace tender shall be not less than 2 feet from the furnace when tapping or plugging, or the tender shall be protected by a splash shield.
- (4) A gas or oil fired melting furnace installed or modified after March 23, 1976 shall be equipped with a control system which shall:
  - (a) Prohibit ignition and combustion until completion of a purge cycle which will provide a minimum of 4 complete volume air changes in the ignition and combustion chamber.

- (b) Positively and immediately shut off the fuel supply in case of a pilot light or combustion failure, or flame failure where direct ignition to the burner is used.

- (5) A holding furnace installed or modified after March 23, 1976 shall be equipped as prescribed in subrule (4) (b).

- (6) The requirements of subrules (4) and (5) do not apply to a gas or oil melting or holding furnace that employs explosion resistant immersion tubes and where the products of combustion do not discharge into a closed equipment work chamber or into a confined space.

#### R 408.14554 Warning devices.

**Rule 4554.** Equipment other than an enclosed trough, used to deliver molten metal to a holding furnace or pot, shall be equipped with a warning device which shall be activated during delivery and at the beginning of a pour.

#### R 408.14555 Sprue cutting machines.

**Rule 4555.** A sprue cutting machine shall be equipped with a point of operation guard or point of operation device as prescribed in the general industry safety standards commission standard, Part 23. Hydraulic Power Presses, being R 408.12301 to R 408.12371 of the Michigan Administrative Code.

#### R 408.14561 Magnesium, general.

- (1) Accumulations of magnesium dust on floors, ledges and beams shall be avoided.
- (2) Magnesium chips, shavings, and flash shall be cleaned up and disposed of daily or when they constitute a fire hazard. Storage of chips and shavings shall be in covered metal drums.
- (3) Smoking, flames, and sparks shall not be allowed where magnesium dust, chips, or shavings are present.
- (4) Powdered graphite or dry powdered extinguishing agents made specially for magnesium fires shall be used to extinguish a magnesium fire and be available in the work area. Water or other extinguishing agents shall not be provided or used.



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