

## 24 COLD FORMING OF METALS

### ANSWERS—QUIZ 1

1. a
2. a
3. a
4. b
5. b
6. a
7. d
8. c
9. d
10. d
11. b
12. The policy should cover use of guards or devices for all operations, consideration of the safety factor in new operations, and enforcement of safe operating standards.
13. A die shoe is a plate or block upon which a die holder is mounted. A die shoe functions primarily as a base for the complete die assembly and, when used, is bolted or clamped to the bolster plate or the face of slide.
14. Pullback devices are usually limited to secondary operations and jobs where the operator can remain at the feeding position.
15. The six main types of semiautomatic feeds are chute (gravity and follow), slide or push, plunger, sliding die, dial, and revolving die.
16. The exceptions are (1) friction surfaces last much longer, (2) units are usually physically smaller because of a higher rpm and may contain a set of planetary or other type of gears, and (3) the unit may require an oil cooler and pump.
17. General-purpose press brakes, whether mechanical or hydraulic, are operated by one individual with a single operating control station. Special-purpose press brakes include all other types having mechanical, hydraulic, and other drive arrangements.
18. Two major areas of hazards associated with power press brakes are those areas related to the design and manufacture of the brake and those associated with the point of operation.
19. The two basic categories are the guard and the device. A guard is best understood as a physical barrier that absolutely prevents access to a point-of-operation die

hazard when it is in place and while it remains in place during a production run of successful cycles. If a barrier allows any access to a point-of-operation die hazard during a production run, it is not a guard; it is only an inadequate enclosure. An inadequate enclosure always requires a device in conjunction with its use to form an acceptable safeguarding system. A device is best understood as safeguarding means that control access to the point of operation. These means are (1) press-controlling devices, (2) operator-controlling devices, and (3) devices that control the operator and the power press.

20. If operators inappropriately handle dies, they can suffer from strains and hernias. Dies falling off trucks, benches, bolster plates, or storage shelves can cause foot injuries. Crushing injuries can occur when operators catch body parts in between the die and the press, in pinch points, or other movements. Hand injuries or even amputations can result from the sudden descent of the ram due to brake failure, premature tripping during tryout, failure to lock out the switch, or failure to maintain proper pressure on pneumatic clutches. Operators can suffer from lacerations if wrenches slip off worn nuts or if they use incorrect tools. They can also suffer eye injuries from pieces of shattered parts, dies, or material.

### ANSWERS—QUIZ 2

1. b
2. a
3. a
4. a
5. b
6. b
7. c
8. b
9. a
10. a
11. c
12. The two major factors in deciding the number of point-of-operation guards to be installed are the number and productivity of the dies.
13. It is a self-powered movable barrier, which in normal operation is designed to (1) close off access to the point of operation in response to operation of the press-tripping control; (2) prevent engagement of the

- clutch prior to closing of the barrier; (3) hold itself in the closed position; and (4) remain in the closed position until the slide has stopped at the top of stroke.
14. It is an operator control designed to delay its action after being operated to stop slide motion at a predetermined point in stroke. This predetermined point is independent of the instant at which button actuation was made.
  15. The two hazards associated with using air jets as ejector mechanisms are increased hazard of flying particles and increased noise levels.
  16. All two-hand controls, regardless of the means of point-of-operation safeguarding, need to comply with the National Fire Protection Association standard 79, *Electrical Standard for Industrial Machinery*.
  17. Safeguarding for power squaring shears has the following three purposes: (1) to prevent operators from placing their hands into the point of operation, (2) to prevent or stop the operation of the shear if any part of the operator's body approaches the point of operation, and (3) to provide awareness to operating personnel upon entry into a hazardous area.
  18. A full cycle is the complete movement of the ram from its open position through its closed position and back to its previous open position. A half cycle is the movement of the ram from its open position to its close position.
  19. A two-hand trip is clutch- or clutch/brake-actuating method that requires the momentary concurrent use of both hands of each operator to initiate a complete stroke of a mechanical press, generally the full-revolution clutch type. Because only momentary pressure is necessary on hand buttons or other mechanisms, two-hand trip can be used as a point-of-operation safeguarding device. It can be used for single-stroke operations and only when the location of the buttons or other hand mechanisms is of sufficient distance from the point of operation. This prevents moving either hand into a point-of-operation hazard prior to die closing. Two-hand trip is generally not practical on presses operating at speeds less than 120 strokes per minute.
  20. Alligator shears are used for a variety of cutoff operations and mainly for cutting rods and bar stock to length. They can operate continuously and, therefore, the operator must be trained to time his or

her movements with the opening and closing of the cutter. Because the machine is relatively simple and slow, management and operators often disregard its hazards. As a result, alligator shears are responsible for far more injuries than their inherent hazards or frequency of use warrants. Some of the principal hazards of an alligator shears include finger or hand amputations at the shear point, cut fingers, hand or arm lacerations from handling materials, eye injuries from flying metal, foot and leg injuries from falling metal, and other injuries and damage to the machine caused by poor maintenance practices.

### ANSWERS—CASE STUDY

1. To prevent costly accidents and repairs and to promote maximum production, power presses should be inspected on a regular basis. The type of press, its related equipment, and its usage determine the frequency of inspections. Regulatory standards may require that a press be inspected weekly. Any necessary repairs or maintenance should be taken care of before the press is operated again. Weekly inspections are not required for presses that meet "hands-in-the-dies" requirements. Management should keep records of these inspections and any maintenance performed. It should also create a checklist that details the frequency of inspection and the maintenance history for each press. The checklist can provide immediate information about the condition of a press and makes it easier to schedule production and avoid downtime due to equipment failures. Checklists should cover: frames, bearings, motors and drives, electrical controls, rams or slides, clutches and brakes, cushions and springs, die carriages, lubrication, and guards and safeguarding devices.
2. Employees should test all operating buttons when they inspect electrical controls. All buttons must be depressed to start a press cycle and released at the end of a stroke. Employees should make sure the holding times are adequate for the operation and tooling involved. They should also check for defective lamps in ground detector circuits where provided, inspect ground connections on grounded controls, and ground-detector connections on ungrounded controls. The physical condition of wiring, relays, rotary-limit switch drives, pressure switches, valves,

and other electrical devices should be examined. Employees should follow the manufacturer's schedule for preventive maintenance.

3. When employees inspect motors and drives, they should look at the condition of the drive belt, gears, pins, and bores among other things. Belts should be adjusted to prevent excess slippage or excess loads on the bearings and shaft, which could cause premature failure. If belts are adjusted properly, they should slip slightly when the motor first starts, but not when the press is operating. Employees should check that all pins, slides, turnbuckles, jackscrews, or other means of adjusting the motor are secure. They should tighten all hold-down screws and attach the motor to the press by a chain or wire rope for maximum safety. The motor's shaft bearings should be inspected and lubricated; gears should be checked for worn, pitted, or broken teeth and proper lubrication. Finally, employees should check bores and shafting for worn keys and keyways.