GUARDING MOVING PARTS OF MACHINES

1. GENERAL

1.01 This section outlines procedures recommended for the guarding of moving parts of machines normally provided in telephone buildings in order to minimize any potential hazard of injury to personnel. The following provisions are based upon common sense procedure in the handling of machines and excerpts from the "Handbook of Industrial Safety Standards," current edition published by the National Conservation Bureau, 60 John Street, New York, New York 10005. Where local or state legislation requires higher degrees of protection than herein described, the legislated provisions should be controlling.

1.02 This section is reissued to update our approach to safety in the handling of machines.

1.03 The types of machinery listed below typify those that may require some form of guard protection but by no means includes all the machinery that warrants attention.

Engine powered generator sets
Pumping machines
Ventilation machines
Elevator machines
Compressor machines
Refrigerator machines (remote type)
Water cooling machines (central type)
Vacuum cleaning machines (central type)
Hand hoist machines
Coal stoking machines

1.04 Safe operation of machinery involves three important fundamentals.

1. Safe operating procedures
2. Guarding
3. Inspection and maintenance

2. PARTS REQUIRING PROTECTION

2.01 All dangerous moving parts of machines, so located that any person or any clothing worn may come in contact with them should be guarded. Gears, sprockets, setscrews and projecting keys or similar projections wherever located, should be guarded unless they are completely encased by the machine housing. All other dangerous moving parts within six feet above the floor, working platform or intermediate steps or ladder should be guarded unless they are so located with respect to walls, other equipment or other machines that they are as effectively protected as if they were guarded. Typical of dangerous exposed moving parts are belts and pulleys, gears, sprockets and chains, shaft couplings having projecting bolt heads, drums, flywheels, cranks, etc, whether revolving or reciprocating.

Safe Operating Practices for Machines

2.02 Additional important aspects of machine guarding is involved with safe procedures on and around machinery. The following procedures should be adhered to in order to prevent misunderstanding.

(a) No guard should be adjusted or removed for any reason by anyone, unless (1) specific permission is given by the supervisor (2) the person concerned is specifically trained, and (3) machine adjustment is considered a normal part of his job.

(b) No machine should be started unless the guards are in place and in good condition. Defective or missing guards should be reported to the foreman immediately.

(c) Whenever safeguards or devices are removed to make repairs or adjustment or to service equipment (lubrication and maintenance) the power for the equipment should be turned off and the main switch locked and tagged.

(d) Employees should be cautioned about working on or around mechanical equipment while wearing neckties, loose-fit clothing, watches, rings, or other jewelry.

2.03 Placement of machinery is another important aspect of machine guarding. Machines should be arranged, if possible, so that operator faces the aisle. If the operator is work-

ing near the aisle he should be protected from the flow of traffic by some form of railing. Material space should be provided around machine for waste, storage and, where possible, material fed automatically or semiautomatically. Adequate lighting is very important. Insufficient illumination presents a disadvantage to the efficient, safe and accurate operation of machinery.

3. GUARD CONSTRUCTION

3.01 All metal in the completed guards should be free from burrs, sharp edges and sharp corners. Guard frames usually consist of angle iron or iron pipe well secured to the floor, wall, ceiling or the frame of the machine. The filling material attached to the frame is of expanded, perforated or solid sheet metal, or wire mesh. Where angle iron is used for frames and supports, its recommended minimum size is 1 inch by 1 inch by 1/8 inch. Iron pipe used for these purposes is not less than 3/4 inch, Iron Pipe size. The sizes of supports and frame members are, of course, increased according to the weight and size of the guard and its location with respect to aisles and traffic volume. Moving parts of machines that may require occasional adjustment or maintenance, such as belt and pulley assemblies, are usually protected with guards that are either readily removable or fitted with a removable access panel. The filling material is securely fastened to the framework. Where angles are used with wire mesh or expanded metal fillers, the fastening may be 3/4 inch by 1/8 inch steel plate secured to the angle by 3/16 inch bolts or rivets not over 10 inches apart. For pipe frames the fastening is usually by means of clamps or heavy wire. Plain or perforated sheet metal fillers may be bolted or riveted directly to the supports or may be spot-welded in place. In general, where guards are within 4 inches of the protected moving parts, no perforation or mesh opening is in excess of 1/2 inch. Guards placed more than 4 inches from the protected moving parts may have perforated or mesh openings not in excess of 2 inches. Wire mesh fillers having 1/2 inch openings are of the type in which wires are securely fastened at every cross point by soldering, welding or galvanizing. Wire mesh with openings larger than 1/2 inch is of the crimped and woven type. The recommended minimum sizes or gauges of various filler materials are as follows:

MATERIAL	U.S. GAUGE
1/2 inch mesh woven wire	#16
2 inch mesh woven wire	#12
Expanded metal, 1/2" openings	#18
Expanded metal, 2" openings	#13
Perforated metal, 1/2" openings	#20
Perforated metal, 2" openings	#14
Plain sheet metal	#22

3.02 The use of plastic or safety glass where visibility is required may be used.

3.03 Where resistance to rust or possible damage to tools and machinery is an important factor, guards of aluminum or other soft metal are sometimes used. Plastic guards are coming into increased use where the inspection of the moving parts is necessary and where strength can be sacrificed. Shatterproof glass is similarly used, particularly where illumination of guarded parts is a problem and where the flexibility of plastic is not required. Safety glass and plastics used where chips or other flying particles are likely to mar the surface may be protected by inexpensive and easily replaced cover glasses.

4. INSPECTION AND MAINTENANCE

4.01 Inspection of machine guards should be considered an important part of the regular schedule of plant inspection and of guard maintenance. Such inspections are necessary because employees are inclined to operate a machine without a guard if the guard is not functioning properly or if it has been removed for repairs. Further, regular inspections uncover need for repair of the machines themselves which, if neglected, might result in more expensive work later.

An inspection check for each type of machine makes the job easier and constitutes a convenient record for followup. These checklists should be as brief as possible, but should include all necessary inspection points.

Responsible inspection and maintenance includes constant checking of the condition of the guards, enforcement of their use, and prevention of tampering. The operator also should see that the machines from which guards have been removed for repair are locked, or temporary guards are installed.