

STATE OF ARKANSAS
DEPARTMENT OF LABOR
Safety Code
**For Mechanical
Power-Transmission Apparatus**

Code No. 1

(Authority, Act 161 of 1937)



Promulgated:

STATE DEPARTMENT OF LABOR
Little Rock, Arkansas

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SAFETY CODE NO. 1

MECHANICAL

POWER - TRANSMISSION

APPARATUS

INTRODUCTION

The safety code for Mechanical Power-Transmission Apparatus was promulgated in 1940. While the methods of guarding belts, shafts, and the like have not changed, the wide use of V-belts and the great increase in the use of individual motor drives make this revision advisable. Also informational material intended to be helpful to those who use this code is included in this revision. The code provisions (mandatory for the most part) are printed at the left side of the page. The informational and safe practice material is at the right.

Every employer in the State who operates mechanical power transmission machinery must comply with all the mandatory provisions herein insofar as they apply to his machinery. However, in cases of practical difficulty or unnecessary hardship, the Commissioner of Labor may grant exceptions from the literal requirements of this code or permit the use of other devices or methods, but only if it is clearly evident that equivalent protection is afforded thereby.

Attention is called to the fact that in this revision guarding heights have, in general, been raised from 6' to 7'. This change is justified by experience showing that in very many cases a 6' guard is not high enough and that moving parts within 7' above the floor or working level should be guarded. However, because of the obvious hardship in requiring all existing, otherwise satisfactory, guards 6' to be rebuilt to give a height of 7', this requirement is at this time made mandatory only for new installations, alterations and in repairs to existing guards. It is earnestly recommended, however, that existing guards be carried up to 7' unless the cost is excessive.

This code contains references to specific "American" Safety Standards. These standards are developed through a democratic procedure whereby all who wish to - manufacturers, users, technical and engineering societies, labor and enforcing authorities - set up committees to draft standards depicting good practice in protecting workers against the hazards of the various machines, operations, and processes. These "American" Safety Standards have gained wide national acceptance as sound standards and valuable sources of good information on the control of the hazards involved. They are published by American Standards Association, Incorporated, 70 East Forty-Fifth Street, New York 17, New

York.

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SAFETY CODE FOR MECHANICAL POWER-TRANSMISSION APPARATUS

PART I

DEFINITIONS:

"Shall" and "Must" are used to indicate the provisions which are mandatory.

"Should" or "It is recommended" are used to indicate provisions which are not mandatory because of variation in work conditions. If, however, work conditions in the opinion of the State Labor Commissioner require the practical application of the rule, it shall be followed.

Terms used in this code, other than those specifically defined shall be interpreted in the most commonly accepted sense.

The term "Approved" shall mean acceptable to the Commissioner of Labor. Tests made by a nationally recognized testing agency may be considered as sufficient for an approval when equipment so tested is installed and used in strict accordance with, and limited to, the specifications and use for which the tests were made.

The term "Prime Movers" as used in this code is to include the primary source of motivation, such as: Steam, gas, oil, electric and air engines, motors, steam and hydraulic turbines, and shall include wind, water, draft animals or any other than human hand power.

The term "Transmission Apparatus" shall mean all mechanical means of transmitting power from engine, motor, or other prime mover to a machine.

The term "Flywheel" is to include flywheels, balance wheels and pulleys mounted and revolving on crank shaft of engine or other shafting.

A "Belt Pole," sometimes called a "Belt Shipper" or "Shipper Pole," is a device used in shifting belts on and off pulleys on line or countershaft where there are no loose pulleys.

A "Belt Shifter" is a device for mechanically shifting belts from tight to loose pulleys or vice versa, or for shifting belts on cones of speed pulleys.

The term "Exposed to Contact" shall be interpreted as meaning that the location of an object is such that a person is liable to come into contact with it and be injured.

Maintenance Runway. "Runway" shall mean any permanent runway or platform used for oiling, maintenance, running adjustment or repair work, but not for passageway.

A "Nip-point Belt and Pulley Guard" is a device which encloses the pulley and is provided with rounded or rolled edge slots through which the belt passes. (See

Interpretations and Exceptions for Textile Industry.)

"Point of Operations" shall be understood to mean that point at which cutting, shaping, or forming is accomplished upon the stock and shall include such other points as may offer a hazard to the operator in inserting or manipulating the stock in the operation of the machine.

"Sheaves" shall be considered as grooved pulleys, and shall be so classified unless used as fly-wheels.

"Sprockets." A set of sprockets comprises two or more sprockets carrying one or more chains.

GENERAL REQUIREMENTS:

SCOPE.

This safety code applies to all moving parts of equipment used in the mechanical transmission of power, including prime movers, intermediate equipment, driven machines, and appurtenances thereto, excluding only point of operation.

INTERPRETATIONS.

The mere technical fulfillment of these requirements does not assure the approval of the guard or means of guarding if examination shows lack of practicability, durability or both. Where specific devices, methods or materials are mentioned in this code, other devices, methods or materials which will secure equivalent results may be used, subject to the approval of the Commissioner of Labor.

The rules contained herein shall apply to all power-driven machinery other than that in storage or out of position. Machinery shall be considered out of position only when it is located where it could not be operated without the relocation of the machine. A machine whose driven pulleys are in line with transmission pulleys shall be considered in operation, even though it is not belted thereto. Small portable machines (such as drills, cloth cutters), which are carried from place to place by employees, shall not be considered under this part of the safety code.

Exceptions: Guarding is not required for the following unless they are endless belts of high strength and so placed as to present a definite hazard such as to the fingers or the hair of women workers.

Flat belts one (1) inch or less in width and round belts one-half (1/2) inch or less in diameter running at any speed, and flat belts in association with flat or crowned pulleys when two (2) inches or less in width which are free from metal lacings or fasteners and running not more than two hundred and fifty (250) feet per minute are exempted. This exemption does not include V-belts, Spoke, or other hazards of pulleys which shall be guarded.

Vertical and inclined belts if not more than two and one-half (2 1/2) inches wide and running as a speed of less than one thousand (1,000) feet per minute and if free from metal lacings or fastenings may be guarded with a "nip-point belt and pulley guard." (See "Definitions" - Nip-Point belt and pulley guard).

For the Textile Industry, because of the presence of the excessive deposits of lint, which constitutes a serious fire hazard, the sides and face sections only of nip-point belt and pulley guards will be required, provided the guard shall extend at least six (6) inches beyond the rim of the pulley on the inrunning and offrunning sides of the belt and at least two (2) inches away from the rim and face of the pulley in all other directions.

The Commissioner of Labor may require guards not called for in these standards, if, in his opinion, a sufficient hazard exists to warrant such action.

INSPECTIONS.

All mechanical power-transmission equipment should be maintained in a safe operating condition at all times. This requirement shall not be construed to require the dismantling of gear cases, torque drives or other enclosed equipment provided the lack of such inspection will not create a hazardous condition.

Preventive inspection is the secret of continuous trouble-free operation, provided, of course, that the machinery is of good quality and properly installed. A definite inspection schedule designed to discover developing defects before they yield breakdowns should be set up and maintained by competent well-trained men.

PART 2 - PRIME MOVERS

RULE 1 - FLYWHEELS.

Flywheels located so that any part is seven (7) feet or less above floor or platform shall be guarded in one of the following ways:

(a) With an enclosure of sheet, perforated, or expanded metal or woven wire. For Standards see Part 5, Sections 1 and 2.

(b) With guard rails placed not less than fifteen (15) inches nor more than twenty (20) inches from rim. When flywheel extends into pit or is within 12 inches of floor, a standard toe board shall also be provided. For standards see Part 5, Rule 49.

(c) When the upper rim of flywheel protrudes through a working floor, it shall be entirely enclosed or surrounded by a guard rail and toe board.

(d) For flywheels with smooth rims five (5) feet or less in diameter, where the preceding methods cannot be applied, the following may be used. A disk attached to the flywheel in such manner as to cover the spoke of the wheel on the exposed side and present a smooth surface and edge, at the same time providing means for periodic inspection. An open space, not exceeding four (4) inches in width, may be left between the outside edge of the disk and the rim of the wheel if desired, to facilitate turning the

Operating engineers frequently object to guarding flywheels probably because of lack of personal knowledge of accidents from lack of guarding. The records of compensation boards and of insurance underwriters definitely prove the need of guarding. The requirements herewith, are based on nation-wide experience as taken from the records. They emphasize the fact that wherever a practicable guard can reduce the chance that someone will get hurt, the guard should be provided. Engineers may absentmindedly step backward into an unguarded flywheel or tailrod; others may unthinkingly get against or get caught by a moving part near a bearing; sweepers may get their brushes caught and thrown, etc.

Flywheels are used to equalize speed in reciprocating engines, compressors, and other impulse equipment. The flywheel is subject to varying internal stresses and it is necessary to prevent its over-speeding or it will burst due to these stresses. The construction of the flywheel determines its safe operating speed and this should never be exceeded. Information on the safe operating speeds for flywheels of different sizes and types of construction is available from various engineering

wheel over. Where a disk is used, the keys or other dangerous projections not covered by disk shall be cut off or covered. See Standard for disk Part 5, Section 2.

NOTE: This does not apply to flywheels with solid web centers.

(e) Adjustable guard to be used for starting engine or for running adjustment may be provided at the flywheel of gas or oil engines. A slot opening or jack bar will be permitted.

RULE 2 - CRANKS AND CONNECTING RODS

Cranks and connecting rods, when exposed to contact, shall be guarded in accordance with Part 5, Sections 1 and 2, or by a guard rail as described in Part 5, Rule 49.

RULE 3 - TAIL RODS OR EXTENSION PISTON RODS

Tail rods or extension piston rods shall be guarded in accordance with Part 5, Section 1 and 3, or by a guard rail on sides and end, with a clearance of not less than fifteen (15) inches when rod is fully extended.

RULE 4 - GOVERNOR BALLS

Governor balls seven (7) feet or less from the floor or other working levels, when exposed to contact, shall be provided with an enclosure extending to the top of the governor balls when at their highest position. The material used in the construction of this enclosure shall conform to Part 5, Section 1 and 3.

handbooks and the safety engineer should ascertain the safe speed for each flywheel in his plant and make sure that this speed is not exceeded.

While not all flywheel explosions are due to excessive speed, overspeeding has caused a large number of flywheel explosions. Overspeeding may be due to several causes, such as: breaking or derangement of the governor which may occur from a number of causes, as for example, breaking of the governor belt or gears; loss of load due to breaking of the engine belt or sudden shutdown of machines; breakage of engine parts. Flywheels may also burst from mechanical causes such as flaws in the casting or the improper installation. The engine and its appurtenances should be inspected frequently to eliminate the conditions that might cause the governor to become inoperative or the engine to lose its load.

The engine flywheel should be guarded against accidental contact, the design and construction of the guard being similar to that for other mechanical power transmission apparatus. A standard railing, with or without filled-in panels, is often used for flywheel guards and is generally satisfactory, although for some exposures a complete enclosure is preferable. Flywheel guards are intended to prevent a person from coming in contact with the flywheel, not to retain the wheel in case the flywheel bursts. No guard would withstand the impact due to the bursting of a large flywheel.

A guard should be provided along the side of the engine to prevent contact with the crank, connection rod, or cross head. A railing guard is usually chosen so as to permit a clear view of the equipment and yet allow the attendant to adjust oil cups, feel the crosshead, and so on, by reaching over the railing. If the piston rod extends through the cylinder, this tail rod should also be guarded.

PART 3 - MECHANICAL POWER TRANSMISSION EQUIPMENT

SECTION 1 - SHAFTING

RULE 5 - INSTALLATION

(a) Each continuous line of shafting shall be secured in position against excessive endwise movement.

(b) Inclined and vertical shafts, particularly inclined idler shafts, shall be securely held in position against endwise thrusts.

RULE 6 - GUARDING HORIZONTAL SHAFTING

(a) All exposed parts of horizontal shafting seven (7) feet or less from floor or working platform excepting runways used exclusively for oiling, or running adjustments, shall be protected by a stationary casing enclosing shafting completely or by a trough enclosing sides and top or sides and bottom of shafting as a location requires.

(b) Wherever shafting extends over a driveway it shall be protected as stated above unless it is located fifteen (15) feet or more above driveway.

(c) Shafting under bench machines shall be enclosed by a stationary casing, or by a trough at sides and top or sides and bottom, as location requires. The sides of the trough shall come within at least six (6) inches of the underside of table, or if shafting is located near floor within six (6) inches of floor. In every case the sides of trough shall extend at least two (2) inches below or above the shafting as the case may be.

NOTE: For requirements regarding materials and construction see Part 5, Sections 1 and 3.
RULE 7 - GUARDING VERTICAL AND INCLINED SHAFTING

Vertical and inclined shafting seven (7) feet or less from floor or working platform, excepting maintenance runways, shall be enclosed with a stationary casing in accordance with requirements of Part 5, Sections 1 and 3.

The record of fatalities and serious injuries due to getting caught by mechanical power transmission equipment is a very black one. While the frequency of injuries from this source has decreased greatly through the years their volume for the nation as a whole is still high. The major factors in the reduction made have undoubtedly been the changeover to individual motor drives, guarding, the wide adoption of the countersunk (safety) set screw and the installation of bearings requiring less frequent servicing. The guarding of shafting and its appurtenances is an important phase of the guarding of mechanical power transmission apparatus. Shafting accidents are nearly always severe, often fatal, and are caused by loose clothing of the workman being caught by the revolving shaft. Any roughness or projections of any sort, such as keys or set screws, increases the possibility of shaft accidents. The projecting set screw is particularly hazardous and should be replaced by the set screw. But even a perfectly smooth rapidly revolving shaft can grasp loose clothing and whirl the victim around the shaft. Shafting is usually located in out-of-the-way places, back of or underneath machines or overhead so that the repairman must work in close quarters or from a ladder. The fact that freedom of motion is usually lacking when persons are working near shafting increases the number and severity of shaft accidents. Another reason for the large number of shaft accidents is that shafting does not look dangerous. Many persons, therefore, fail to realize the danger and so do not take even ordinary precautions when working about it. And when loose clothing such as shirt sleeves, neckties, aprons, or long hair in the case of women employees, become entangled in the shaft, it is impossible for the individual to get loose.

Before individual motor drives

RULE 8 - PROJECTING SHAFT ENDS

(a) Projecting shaft ends shall present a smooth edge and end and shall not project more than one-half the diameter of the shaft unless guarded by non-rotating caps or safety sleeves.

(b) Unused key-ways shall be filled up or covered.

RULE 9 - POWER TRANSMISSION APPARATUS LOCATED IN BASEMENTS

All mechanical power transmission apparatus located in basements, towers, and rooms used exclusively for power transmission equipment shall be guarded in accordance with these standards, except that the requirements for safe-guarding belts, pulleys, and shafting may be waived when the following conditions are met:

1. The basement, tower or room occupied by transmission equipment shall be locked against unauthorized entrance.

2. The vertical clearance in passageways between the floor and power transmission beams, ceiling or any other objects, should not be less than five (5) feet six (6) inches.

3. The illumination should conform to the provisions of the "American" Standard Code for Lighting of Factories, Mills and other Work Places.

4. The footing shall be dry, firm and level.

5. The route followed by the oiler shall be protected in such manner as to prevent accident.

NOTE: The exemption granted by this rule shall not apply to single isolated hazards which can be guarded without hardship in the usual prescribed manner.

become common, it was standard practice to have all line shaft ends project well beyond the end bearing to permit adding another section as needed. The need for that practice rarely exists today but it is still followed in a great many establishments. Better practice is to cut the shaft length so as to have it flush with the bearing housing thus saving shafting and reducing the hazard at the same time. Projecting shaft ends constitute deadly traps for the unwary maintenance man, electrician, oiler, etc.

When it is necessary to fill the reservoirs of self-oiling bearings while the shafting is moving, care should be used to avoid filling them to capacity. When a shaft revolves, it picks up some of the oil and if the reservoir is full when the shaft stops, it will overflow.

When one suggests guarding transmission machinery in basements, attics, and other places to which operating personnel are not required to go or perhaps are excluded the answer often returned is that "no one goes in there" or "we keep the door locked," the master mechanic has the keys" or "the machinery is always shut down for oiling," etc. Actually it is close to impossible to live up to these statements. Men do have to keep an eye on such machinery. If a bearing runs hot it will be given attention in an effort to avoid shutting the machinery down. Some men choose such out-of-the-way places to steal a smoke or loaf a bit. In any event the record of fatal and serious accidents in such places amply proves the importance of applying at least the safeguards required in this code. Plants whose safety practice is regarded as first rate guard machinery in such places as carefully as they would if it was on an operating floor.

Women's long hair offers an especially serious hazard about moving machinery. Loose hair is so easily drawn into a machine or a pulley or gears or around a shaft that every precaution should be taken to prevent any possible contact. The injury is almost always serious. The victim is usually at least

partly scalped. She may receive additional injuries by being jerked up or against the machine and then dropped when the scalp tears away. Their neck may be broken.

So far as possible every rotating part in possible reach of women workers should be covered up. If a woman drops a coin, a bobby pin, a thimble, or a tool or part she is working with and it goes under a machine or work bench, she is likely to go head first after it. If there is not a fully-enclosed shaft there, her hair is likely to be caught. Result, another scalping.

SECTION 2 - PULLEYS

RULE 10 - GUARDING

Pulleys, any parts of which are seven (7) feet or less from the floor or working platform, shall be guarded in accordance with the standards specified under Part 5, Sections 1 and 3. Pulleys serving as balance wheels (e.g., punch presses) on which the point of contact between belt and pulley is more than seven (7) feet from the floor or platform may be guarded with a disk covering the spokes. See Part 5, Section 2.

RULE 11 - LOCATION OF PULLEYS

(a) Unless the distance to the nearest fixed pulley, clutch, or hanger exceeds the width of the belt used, a guide shall be provided to prevent the belt from leaving the pulley on the side where insufficient clearance exists.

(b) Where there are overhanging pulleys on line, jack or counter-shafts with no bearing between the pulley and the outer end of the shaft, a guide to prevent the belt from running off the pulley shall be provided.

If a belt runs off the driven pulley into a space narrower than the belt, it is likely to pull the shaft down. While a belt in good condition on properly lined-up shafting and pulleys will run true, various things can cause belts to leave the pulley. Among them are sudden heavy overloads, uneven stretching due to wear or overload, an incorrect splice leaving one side of the belt longer than the other, a worn bearing throwing a pulley out of line or uneven "build up" on a pulley.

Cast pulleys should be inspected for cracks. This can be done by striking the pulley lightly with a hammer; a cracked pulley will give a different ring than a perfect one. The belt shall always be removed when hammer-testing a pulley, as the belt causes a different ring. Split pulleys shall be inspected to see that the holding bolts are tight. Proper inspection and maintenance of pulleys will discover and correct developing defects that eventually cause breakdowns or accidents, or both.

RULE 12 - BROKEN PULLEYS

Pulleys with cracks, or pieces

broken out of rims shall not be used.

RULE 13 - PULLEY SPEEDS

Pulleys operating at rim speed in excess of 4,000 feet per minute shall be especially designed for the purpose and carefully balanced for the speed at which they are to operate.

RULE 14 - BELT GUIDES

Belt guides should not be installed except as provided in Rule 11 (a) & (b).

RULE 15 - COMPOSITION AND WOOD PULLEYS

Composition or laminated wood pulleys shall not be installed where they are continually subjected to the action of moisture.

RULE 16 - PULLEYS EXPOSED TO CORROSION

Pulleys used where conditions are such as to produce active corrosion shall be of corrosion resisting material.

RULE 17 - PULLEYS OUT OF SERVICE

Pulleys permanently out of service shall not be allowed to remain on shafting which is in use.

RULE 18 - HORIZONTAL BELTS AND ROPES

(a) Where both runs of horizontal belts are seven (7) feet or less from the floor level, the guard shall extend to at least fifteen (15) inches above the belt or to a standard height (see table following Rule 45) except that where both runs of a horizontal belt are 42" or less from the floor, the belt shall be fully enclosed in accordance with Part

Where a pulley is located near a shaft hanger or bearing, a shield should be placed between the pulley and the bearing for protection of the oiler. A pulley shall not be placed outside the hanger on the shaft end unless provision is made to keep it from falling if it should become loose on the shaft. Pulleys should be aligned properly on the shaft to prevent weaving of the shaft and also to prevent the belt from running off the pulley.

The old saying, "a shaft is no better than its hangers," refers to the fact that unless hangers are firmly secured to resist fluctuating loads without sway, all supporting bolts and screws are kept tight, the bearing boxes are properly adjusted and the entire alignment is true and secure, deterioration will be rapid.

Belts must be reckoned among the industrial appliances which continue to be fruitful sources of serious injuries. Attention cannot be called to forcefully to precautions which should be taken in maintaining and safeguarding them. While great reductions have been made in the flow of belt-caused injuries their number is still large year by year.

5 Sections 1 and 3.

NOTE: In power plants or power-development rooms, a guard rail may be used in lieu of the above.

(b) Overhead horizontal belts, with lower part seven (7) feet above floor or platform shall be guarded on sides and bottom in accordance with Part 5, Section 3, Rule 47.

(c) Horizontal overhead belts more than seven (7) feet above floor or platform shall be guarded for their entire length under the following conditions:

1. If located over passageways or work places and traveling 1,800 feet or more per minute, and,

2. If center to center distance between pulleys is ten (10) feet or more, and,

3. If belt is eight (8) inches or more in width.

NOTE: For details of guard construction and for sizes of material see Part 5, Section 3, Rule 47; and table following Rule 48, also Discussion Part 5.

For exception in case of flat belts 1" or less in width or round belts 1/2" or less in diameter, see "Interpretations and Exceptions." (d) Where the upper and lower runs of horizontal belts are so located that passage of persons between them would be barely possible, the passage shall be either:

1. Completely barred by a guard rail or other barrier in accordance with Part 5, Sections 1 and 3; or

2. Where passage is regarded as necessary there shall be a platform over the lower run guarded on either side by a railing completely filled in with wire mesh or other filler, or by a solid barrier.

The upper run shall be so guarded as to prevent contact therewith either by the worker or by objects carried by him.

In power plants only the lower run of the belt need be guarded.

(e) Overhead chain and link belt drives, where the chain exceeds two (2) inches in width, are governed by the same rules as overhead horizontal belts and shall be guarded in the same manner as belts.

NOTE: All guards to be constructed in accordance with Part 5,

While possible, dressing should not be applied when belt or rope is in motion; but, if this is necessary, it should be applied only where belt or rope leaves pulley. The same applies to lubricating chains. This type of work should be done only by experienced and well-trained and cautious workers. They should not wear ragged or loose clothing and should apply the dressing to the belts near the points where they leave the pulleys. When workers are dressing a moving belt, care should be taken not to distract their attention by talking nor to startle them by unusual sounds or any other disturbance.

When replacing a belt it should always be put on the driven pulley first. The belt should never be thrown off by hand as the hand may be caught between the belt and the pulley.

It is a difficult proposition to decide which overhead belts need guarding and which can be left exposed. These belts, under certain operating conditions, offer a decided accident hazard in case they break. Any belt transmitting power is subjected to a certain stress which increases with the load and the speed. In case this belt breaks, this force is reduced somewhat due to the fact that the driving power is eliminated. The belt is impelled only by its momentum, but this is usually sufficient to give it a decided whipping force strong enough to inflict serious or fatal injury or to cause considerable property damage. This question of overhead belts located more than seven (7) feet above floor or working platform is well worth investigating, as the cost of one serious accident might suffice to pay for quite a number of guards.

(The hazard of static electricity from belts shall be carefully considered where explosives, explosive dusts, flammable vapors or flammable liquids exist.)

NOTE: Static electricity may be removed from belts by means of metallic flexible-tooth combs the same widths as the belts. One comb should be placed within ten (10) inches of the line of contact where the belt leaves each pulley or flywheel. These combs should be in contact with and placed transversely to

Section 3, Rule 48.

(f) American or Continuous System rope drives so located that the condition of the rope (particularly the splice) cannot be constantly and conveniently observed, shall be equipped with a "tell-tale" device (preferably electric-bell type) that will give warning when rope begins to fray.

For guarding of overhead rope drives see Part 5, Section 3, Rule 48.

RULE 19 - VERTICAL AND INCLINED BELTS

(a) Vertical and inclined belts shall be enclosed by a guard conforming to standards in Part 5, Sections 1 and 3.

(b) All guards for inclined belts shall be arranged in such a manner that a minimum clearance of seven (7) feet six (6) inches is maintained between belt and floor at any point outside of guard.

RULE 20 - VERTICAL BELTS

Vertical belts running over a lower pulley more than seven (7) feet above floor or platform shall be guarded at the bottom in the same manner as horizontal overhead belts, if conditions are such as stated in Rule 18-c, 1 and 3.

RULE 21 - V-BELTS

All V-belts within seven (7) feet of floor or working platform shall be:

(a) Enclosed by a guard conforming to standards in Part 5, Sections 1 and 3, or

(b) If only one pulley is within seven (7) feet of the floor or working platform, a nip-point and pulley guard will be acceptable.

RULE 22 - CONE-PULLEY BELTS

(a) The cone belt and pulley shall be equipped with a belt shifter so constructed as to adequately guard the nip-point of the belt and pulley. If the frame of the belt shifter does not adequately guard the nip-point of the belt and pulley, the nip-point shall be further protected by means of a vertical guard

the belt and also be well grounded with No. 12 insulated copper wire. The teeth of the comb should point in the direction of the belt motion. Other effective methods may be used.

NOTE: For exception in the case of narrow belts and slow-moving belts see "Interpretations and Exceptions."

NOTE: For exceptions in the case of narrow belts and slow-moving belts see "Interpretations and Exceptions."

Endless belts running on flanged pulleys, particularly, the common V-belt, are developing an unenviable record as producers of hand and finger amputations and other injuries. The belts look harmless because they are small, but they are as strong as flat belts of substantial size and the flanged pulleys will cut almost like knives.

In many shops this nip-point guard is made up in two parts, namely a bar which supports a shaped sheet metal pulley enclosure. The bar is secured to the machine frame, is shaped to conform to the contour of the cone and extends through the nip of each step. If properly

placed in front of the pulley and extending at least to the top of the largest step of the cone.

(b) If the belt is of the endless type or laced with rawhide laces, and a belt shifter is not desired, the belt will be considered guarded if the nip-point of the belt and pulley is protected by a nip-point guard located in front of the cone extending at least to the top of the largest step for the cone, and formed to follow the contour of the cone in order to give the nip-point of the belt and pulley the maximum protection. (See Rule 38.)

(c) If the cone is located less than three feet from the floor or working platform, the cone pulley and belt shall be guarded to a height of three feet regardless of whether the belt is endless or laced with rawhide.

(d) Belts which of necessity must be shifted by hand and which cannot be guarded in accordance with the intent of this code shall not be fastened with metal in any case nor with any other fastening which by construction or wear will constitute a hazard.

RULE 23 - BELT TIGHTENERS

(a) Suspended counterbalanced tighteners and all parts thereof shall be of substantial construction and securely fastened; the bearings shall be securely capped. Means must be provided to prevent tightener from falling, in case the belt breaks.

(b) Where suspended counterweights are used and not guarded by location, they shall be so encased as to prevent accident.

SECTION 4 - GEARS, SPROCKETS, AND CHAINS

RULE 24 - GEARS

Gears shall be guarded in accordance with one of the following specifications:

(a) A complete enclosure.

(b) A standard guard as described in Section 3 at least seven (7)

shaped and placed this bar will not need to be removed for even a pulley replacement. Therefore, in some shops it is welded in place. The sheet enclosures can be secured to it by spring-on clamps.

This bar guard properly positioned eliminates the hazard of catching (in the nip of belt and pulley) the stick or tool used to shift the belt. It makes the common practice of using, for this purpose, a mechanic's hammer grasped by the head acceptable.

This can be accomplished by securely fastening cables or chains of sufficient strength to the tightener and to the roof, or some substantial object above, to prevent it from falling far enough to strike a person.

Gears should never be regarded as adequately guarded by position, even within the frame of a machine, unless they cannot be reached while running.

The accident records are full of cases of workmen getting caught in gears that are high overhead or at arm's length

feet high extending six (6) inches above the mesh point of the gears.

(c) By a band guard covering the face of gear and having flanges extended inward beyond the root of the teeth on the exposed side or sides. Where any portion of the train of gears guarded by a band guard is less than seven (7) feet from the floor a disk guard or a complete enclosure to the height of seven (7) feet shall be required.

NOTE: Rule does not apply to hand-operated gears used only to adjust machine parts and which do not continue to move after hand power is removed. However, the guarding of these gears is highly recommended.

RULE 25 - SPROCKETS AND CHAINS

All sprocket wheels and chains shall be enclosed unless more than seven (7) feet above the floor or platform. Where the drive extends over other machines or working areas, protection against falling shall be provided.

NOTE: This does not apply to manually operated sprockets.

RULE 26 - OPENINGS FOR OILING

When frequent oiling must be done openings with hinged or sliding self-closing covers shall be provided. All points not readily accessible shall have oil feed tubes if lubricant is to be added while machinery is in motion.

SECTION 5 - FRICTION DRIVES

RULE 27 - GUARDING

(a) The driving point of all friction drives when exposed to contact shall be guarded.

(b) All arm or spoke friction drives and all web friction drive with holes in the web shall be entirely enclosed.

(c) All projecting bolts or friction drives where exposed to contact

under a machine or at the back of a machine where they cannot be reached from any work station. The point is that at one time or another, workmen do have to get to every spot in or about every plant. Painters, electricians, sweepers, oilers, etc., repeatedly get caught by out-of-the-way gears. The only safe protection for gears is complete enclosure so arranged that it needs to be opened up only to replace the gears themselves.

Another point of importance in this connection is the fact (proved by careful comparison), that gears running in oil last from 5 to 10 times as long as the same gears run in the open air of the average factory. If there is gritty dust present in any considerable amount the difference is even greater than this.

Hand-operated gears may cause injuries particularly when used on a hoist or other device on which two persons may be working. Such devices are operated by a lever, crank or wheel and the operator may get one hand caught in the gears in bracing himself, or the second person may get caught.

shall be guarded.

SECTION 6 - KEYS, SET SCREWS AND OTHER PROJECTIONS

RULE 28 - ELIMINATION OR GUARDING

All projecting keys, set screws and other projections in revolving parts shall be removed or made flush or guarded by metal cover. This does not apply to keys or set screws within gear of sprocket casings or other enclosures, nor to keys, set screws or oil cups in hubs of pulleys less than twenty (20) inches in diameter where they are within the plane of the rim of the pulley.

It is recommended, however, that no projecting set screws or oil cups be used in any revolving pulley or part of machinery, even though they are within the limits stated in the above paragraph.

Projecting set screws have been aptly described as "man killers." They are small and unobtrusive. On a rapidly revolving shaft or clutch or face plate or pulley hub they may be invisible or nearly so, particularly if the lighting is not good. Men intent on their work - a maintenance man, an oiler, an electrician - are apt to brush against them. They usually need only one good chance and we have another obituary in the local paper. Another widow wears mourning, another compensation board makes another award and the case is closed. Good safety practice, learned at the cost of many lives, say "eliminate all projecting set screws from rotating parts."

When "safety" set screws first appeared acceptance was slow because it was hard for men used to driving the ordinary set screw "home" by "bearing down" on a heavy wrench to believe they could make the countersunk type as secure. Actually the current types made of specially hardened and tempered steel will hold better than the old type.

SECTION 7 - COLLARS AND COUPLINGS

RULE 29 - COLLARS

All revolving collars, including split collars, shall be cylindrical, and screws or bolts used in collars shall not project beyond the largest periphery of the collar.

RULE 30 - COUPLINGS

(a) Shaft couplings shall be so constructed as to prevent any hazards from bolts, nuts, set screws or revolving surfaces.

Bolts, nuts, and set screws will, however, be permitted where they are covered with safety sleeves or where they are used parallel with the shafting and are countersunk or else do not extend beyond the flange of the coupling.

NOTE: While the use of the rib- or clamp-type coupling is not recommended they

will be acceptable if the ends of the fastenings be well within the periphery of the body of the coupling and the ends of all bolts are flush with or below the crown of the nut. All outside surfaces are to be turned or ground and outside edges carefully rounded.

(b) The shifting part of jaw clutches, and the shifting of mechanism part of friction clutch couplings should be attached to the driven shaft, i.e., the shaft that will be idle when clutch is disengaged.

SECTION 8 - BEARING AND FACILITIES FOR OILING

RULE 31 - BEARINGS. LUBRICATION.

The regular oilers shall wear tight fitting clothing and shall use cans with long spouts to keep their hands out of danger. Machinery shall be oiled when not in motion, wherever possible.

(a) Self-lubricating bearings are recommended.

(b) All drip cups and pans shall be securely fastened.

RULE 32 - LADDERS

Wherever portable ladders are used in oiling, repairing, or adjusting power-transmission machinery, these ladders shall be equipped with safety hooks or anti-slip device at bottom.

NOTE: For standard construction of ladders, see "American" Standards, "Safety Code for Ladders."

RULE 33 - OILERS, RUNWAYS AND PLATFORMS

Oilers, runways and platforms shall conform to the "American" Standard "Safety Code for Floor and Wall Openings, Railings, and Toe Boards."

PART 4 - STARTING AND STOPPING DEVICES

RULE 34 - GUARDING

(a) Clutches, cut-off couplings or clutch pulleys having projecting parts, where such clutches are located seven (7) feet or less above the floor or working platform shall be enclosed by a stationary guard constructed in accordance with these standards (the "U" guard is permissible, see Rule 44).

NOTE 1. Where clutches, cut-off couplings or clutch pulleys are so situated within a machine or otherwise guarded by location, the application of this rule is within the direction of the enforcing authority.

NOTE 2. In engine rooms, a guard rail, preferably with toe board, will be permitted instead of the above, provided this room is occupied only by engine-room attendants.

Exposed clutches are dangerous and many persons have been injured, some fatally, because of contact with rapidly moving parts. Modern friction clutches are now provided with metal enclosures which guard the dangerous revolving parts. In some instances, clutches are so situated within a machine, or are otherwise so located, that it may appear unnecessary to provide guards about the revolving clutch parts. However, if there is the slightest possibility that any one may be injured by such parts, suitable enclosures should be provided. Belt shifters should be so located that they can be easily and quickly operated, will not interfere with machine guards and can be easily inspected, maintained and repaired.

NOTE 3. The use of a bearing support immediately adjacent to a friction clutch or cut-off coupling being recognized engineering practice, only self-lubricating bearings requiring attention at infrequent intervals shall be used in such locations.

RULE 35 - BELT SHIFTERS

(a) Tight and loose pulleys on all new installations made subsequent to the date of the adoption of this Code shall be equipped with a permanent belt shifter provided with mechanical means to prevent belt from creeping from loose to tight pulley.

NOTE: It is recommended that old installations be changed to conform to this rule.

(b) Belt shifter and clutch handles shall be rounded and be located as far as possible from danger of accidental contact, but within easy reach of the operator. Where belt shifters are not directly located over a machine or bench, the handles shall be cut off six feet, six inches (6 ft. 6 in.) above floor level.

(c) All belt and clutch shifters of the same type in each shop should move in the same direction to stop machines, i.e., either all right or all left.

NOTE: This does not apply to friction clutch or countershaft carrying two clutch pulleys with open and crossed belts, respectively. In this case the shifter handle has three positions and the machine is at a standstill when clutch handle is in the neutral or center position.

RULE 36 - BELT SHIPPERS AND SHIPPER POLES

The use of belt poles as substitutes for mechanical shifters is not recommended. Where necessity compels

Care should be taken to locate shifter handles in safe positions. If it is necessary to locate shifter handles over work places, the handles should not extend lower than within six feet six inches above the floor level.

This will help to prevent men striking them. Shifter handles should not be located over or along passageways where they are liable to be struck and accidentally moved to the running position. The handles of all belt shifters of the same type in any shop should move in the same direction to stop the machines, that is, all to the right or all to the left. Otherwise, there may be confusion resulting in injury to someone or in damage to property.

It is understood that the moving of all belt shifters of a type in one direction does not apply to friction clutches or countershafts carrying two clutch pulleys with open and crossed belts respectively. In such cases, the belt shifter handle has three positions and the machine is at a standstill when the handle is in the neutral or center position.

Belts should never be shifted by hand. Such a practice, sooner or later, results in a serious injury, either by cutting the fingers or hand by contact with the edge of the belt or its fasteners or by catching the fingers or hands between the belt and the pulley. Belt shifters may be divided into two general types: Those which shift the belts by means of forks fastened to a bar connected to a shifter handle, and those which shift the belt by means of a series of levers or chains. The latter type is generally used for shifting cone belt pulleys on lathes, shapers, drill presses, slotters and other machines driven by cone pulley belts.

their use they shall be of sufficient size to enable workmen to grasp them securely. (A two-inch (2 in.) diameter or 1 1/2 in. x 2 in. cross-section is suggested). Poles shall be smooth and preferably of straight grain hardwood, such as ash or hickory. The edges of rectangular poles should be rounded. Poles should extend from the top of the pulley to within about forty (40) inches of floor or working platform.

RULE 37 - BELT PERCHES

Where loose pulleys or idlers are not practicable, belt perches in form of brackets, rollers, etc., shall be used to keep idle belts away from the shafts. Perches should be substantially made and so designed that the shipping of belts to and from them can be safely accomplished.

RULE 38 - BELT FASTENERS

Belts which of necessity must be shifted by hand and belts within seven (7) feet of the floor or working platform which are not guarded in accordance with the intent of this code shall not be fastened with metal in any case nor with any other fastening which by construction or wear will constitute an accident hazard.

PART 5 - GUARD STANDARDS

SECTION 1 - STANDARD GUARDS - GENERAL REQUIREMENTS

RULE 39 - MATERIALS

(a) Standard conditions will be secured by the use of the following materials: Expanded metal, perforated or solid sheet metal or wire mesh on a frame of angle iron or iron pipe securely fastened to floor or to frame of machine. See Rule 41.

(b) All metal should be free from burrs and sharp edges.

(c) Wire mesh should be of the type in which the wires are securely fastened at every cross point either by welding, soldering or galvanizing, except in case of diamond or square wire mesh made of No. 14 gauge wire, 3/4 in. mesh or heavier.

NOTE: For method of fastening diamond or square wire mesh made of crimped wire into frames, see Rule 41 (3).

RULE 40 - DESIGN OF GUARDS

(a) Where it is necessary to change belts, make adjustments or for the admission of oil or grease, guards should preferably be provided with hinged sections or be made removable.

(b) Guards should be designed so as not to interfere with the usual machine operations, but give the maximum protection to the operator.

RULE 41 - METHOD OF MANUFACTURE

(a) Expanded metal, sheet or perforated metal and wire mesh shall be securely fastened to frame by one of the following methods:

(1) With rivets or bolts spaced not more than (5) inches center to center. In case of expanded metal or wire mesh, metal strips or clips shall be used to form a washer for rivets or bolts.

(2) By welding to frame every four (4) inches.

(3) By weaving through channel or angle frame, or if No. 14 gauge 3/4 inch mesh or heavier is used by bending entirely around rod frames.

(4) Where openings in pipe railing are to be filled in with expanded metal, wire mesh or sheet metal, the filler material shall be made into panels with rolled edges or bound with "V" or "U" edging of No. 24 gauge or heavier sheet metal fastened to the panels with bolts or rivets spaced not more than five (5) inches center to center. The bound panels shall be fastened to the railing by sheet-metal clips spaced not more than five (5) inches center to center.

NOTE: Diamond or square mesh made of crimped wire fastened into channels, angle or round-iron frames, may also be used as a filler in guards.

Size of mesh shall correspond to table given under Rule 45.

(b) Where the design of guards requires filler material of greater area than 12 square feet, additional frame members shall be provided to maintain panel area within this limit.

(c) All joints of framework shall be made equivalent in strength to the material of the frame.

SECTION 2 - DISK, SHIELD, AND "U" GUARDS

RULE 42 - DISK GUARDS

(a) A disk guard shall consist of a sheet-metal disk not less than No. 22 gauge fastened by "U" bolts or rivets to spokes of pulleys, flywheels or gears. Where possibility of contact with sharp edges of the disk exists, the edge shall be rolled or wired. In all cases the nuts shall be provided with lock nuts which shall be placed on the unexposed side of the wheel.

RULE 43 - SHIELD GUARDS

(a) A shield guard shall consist of a frame filled in with wire mesh, expanded, perforated or solid sheet metal.

(b) If area of shield does not exceed six (6) square feet the wire mesh or expanded metal may be fastened in a frame work of 3/8 in. solid rod, 3/4 in. x 3/4 in. x 1/8 in. angle iron or metal construction of equivalent strength.

Metal shields may have edges entirely rolled around a 3/8 in. solid iron rod.

NOTE: All material of shield guard shall meet the requirements of Rule 45.

RULE 44 - "U" GUARDS

"U" guards shall be constructed of materials specified in table, Rule 45. Edges shall be smooth and if size of guard requires, these edges shall be reinforced by rolling, wiring, or

by binding with angle or flat iron.

SECTION 3 - APPROVED MATERIALS

RULE 45 - MINIMUM REQUIREMENTS

The materials and dimensions specified in this rule shall apply to all guards except horizontal overhead belts, rope, cable, or chain guards more than seven (7) feet above the floor, or platform. (For the latter, see table following Rule 47).

(a) Framework.

(1) Minimum dimensions of materials for the framework of all guards except as noted in paragraph 3 shall be angle iron 1 in. x 1 in. x 1/8 in. metal pipe of 3/4 in. inside diameter or metal construction of equivalent strength.

All guards shall be rigidly braced every three feet or fractional part of their height to some fixed part of machinery or building structure.

(2) The framework for all guards fastened to floor or working platform and without other support or bracing shall consist of 1 1/2 in. x 1 1/2 in. x 1/8 in. angle iron, metal pipe or 1 1/2 in. inside diameter or metal construction of equivalent strength. All rectangular guards shall have at least four upright frame members each of which shall be carried to the floor and be securely fastened thereto.

Cylindrical guards shall have at least three supporting members carried to floor.

(3) Guards thirty (30) inches or less in height and with a total surface area not in excess of ten (10) square feet may have a framework of 3/8 in. solid rod, 3/4 in. x 1/8 in. angle or metal construction of equivalent strength. The filling material shall correspond to the requirements of the table under Rule 45.

NOTE: This rule is made for the purpose of providing a standard for small guards not subject to severe stress for use in locations where guards constructed of framework as specified in the above standards would be cumbersome and unnecessarily expensive.

(b) Table of Standard Materials and Dimensions

MATERIAL	CLEARANCE FROM MOVING PARTS AT ALL POINTS	LARGEST MESH OR OPENING ALLOWABLE	MINIMUM GAUGE U.S. STANDARD OF THICKNESS	MIN HEIGHT OF GUARD FROM FLOOR OR PLATFORM LEVEL
Woven Wire	Under 4"	1/2"	No. 16	6' 0"
	4"-15"	2"	No. 12	5' 0"
Expanded Metal	Under 4"	1/2"	No. 18	6' 0"
	4"-15"	2"	No. 13	5' 0"
Perforated Metal	Under 4"	1/2"	No. 20	6' 0"
	4"-15"	2"	No. 14	5' 0"
Sheet Metal	Under 4"		No. 22	6' 0"
	4"-15"		No. 22	5' 0"
Wood or Metal Strip Crossed			Wood 3/4"	
	Under 4"	1/2"	Metal No. 16	6' 0"
	4"-15"	2"	Wood 3/4"	
			Metal No. 16	5' 0"
Wood or Metal Strip not Crossed			Wood 3/4"	6' 0"
	Under 4"	1/2" Width	Wood 3/4"	
	4"-15"	1" Width	Metal No. 16	5' 0"
Standard Rail	Min. 15"			
	Max. 20"	See Standard for Railings (Rule 48)		

NOTE: For flat belts 1 inch or less in width and round belts 1/2 in. or less in diameter, see "Scope".

(c) The specifications given (a) and (b) are the minimum requirements; where guards are exposed to unusual wear or deterioration, heavier material should be used.

RULE 46 - WOOD GUARDS

(a) Wood guards may be used in the woodworking and chemical industries in industries where the presence of fumes or where manufacturing conditions would cause the rapid deterioration of metal guards; also in construction work and in locations outdoors where extreme cold or extreme heat make metal guards and railings undesirable. In all other industries, wood guards will not be allowed, except by special permission of the supervising authority.

NOTE: A wood guard unless very carefully constructed is not substantial. Wood guards are a decided fire hazard, especially when they become saturated with oil and when they are located near flammable material.

(b) Material and construction.

(1) Wood shall be sound, tough, and free from any loose knots.

(2) Guards shall be made of planed lumber not less than one (1) inch rough board measure and edges and corners rounded off.

(3) Wood guards shall be securely fastened together with wood screws, hard wood dowel pins, bolts or rivets.

(4) While no definite dimensions are given under this heading for framework or filler materials, wood guards shall be equal in strength and rigidity to metal guards specified in Rule 44 (a), (b) and (c).

(5) For construction of standard wood railing, see Rule 49.

RULE 47 - GUARDS FOR HORIZONTAL OVERHEAD BELTS

(a) Guards for horizontal overhead belts shall run the entire length of the belt and follow the line of the pulley to the ceiling or be carried to the nearest wall, thus enclosing the belt effectively. Where belts are so located as to make it impracticable to carry the guard to wall or ceiling, construction of guard shall be such as to enclose completely the top and bottom runs of belt and the face of pulleys. See Rule 18b and c.

(b) The guard and all its supporting members shall be securely fastened to wall or ceiling by gimlet-point lag screws or through bolts. In case of masonry construction, expansion bolts shall be used. The use of bolts placed horizontally through floor beams or ceiling rafters is recommended.

(c) Suitable reinforcement shall be provided for the ceiling rafters or overhead floor beams, where such is necessary, to sustain safely the weight and stress likely to be imposed by the guard. The interior surface of all guards, by which is meant the surface of the guard with which a belt will come in contact, shall be smooth and free from all projections of any character, except where construction demands it; protruding shallow round-head rivets may be used. Overhead belt guards shall be at least one-quarter wider than belt which they protect, except that this clearance need not in any case exceed six (6) inches on each side. Overhead rope drive and block and roller-chain-drive guards shall not be less than six (6) inches wider than the drive on each side.

In overhead silent chain-drive guards where the chain is held from lateral displacement on the sprockets the side clearance required on drives of twenty (20) inch centers or under shall be not less than 1/4 in. from the nearest moving chain part and on drives of over twenty (20) inch centers a minimum of 1/2 in. from the nearest moving chain part.

(d) The table following Rule 48 gives sizes of materials to be used and general construction of guards for belts ten (10) inches or more in width. No material for overhead belt guards should be smaller than that specified in this table for belts ten (10) inches to fourteen (14) inches wide, even if the belt is less than ten (10) inches in width. However, No. 20 gauge sheet metal may be used as a filler on guards for belts less than ten (10)

inches wide. Expanded metal because of the sharp edges, should not be used as a filler in horizontal belt guards.

(e) For clearance between guards and belts, ropes or chains of various center-to-center dimensions between the shafts, see bottom of table following Rule 47.

RULER 48 - GUARDS FOR HORIZONTAL OVERHEAD ROPE AND CHAIN DRIVES

Overhead-rope and chain-drive guard construction shall conform to the rules for overhead-belt guard construction of similar width, except that the filler material shall be of the solid type as shown in the table unless the fire hazard demands the use of open construction. A side guard member of the same solid filling materials should be carried up in a vertical position two (2) inches above the level of the lower run of the rope or chain drive and two (2) inches within the periphery of the pulleys which the guard encloses thus forming a trough. These side filler members should be reinforced on the edges with 1 1/2 in. x 1/4 in. flat steel, riveted to the filling material at not greater than eight (8) inch centers; the reinforcing strip should be fastened or bolted to all supporting members with at least one 3/8 inch rivet or bolt at each intersection, and the ends should be secured to the ceiling with lag screws or bolts. The filling material shall be fastened to the framework of the guard and the filler supports by 3/16 inch rivets spaced on 4 inch centers. The width of the multiple drive shall be determined by measuring the distance from the outside of the first to the outside of the last rope or chain in the group accommodated by the pulley.

RULE 49 - GUARD RAILS AND TOE BOARDS

(a) Guard rails shall be forty-two (42) inches in height, with mid-rail between top rail and floor.

(b) Posts shall be not more than eight (8) feet apart; they are to be permanent and substantial, smooth, and free from protruding nails, bolts, and splinters. If made of pipe, it shall be one and one-fourth (1 1/4) inches inside diameter, or larger. If made of metal shapes or bars their section shall be equal in strength to that of one and one-half (1 1/2) by one and one-half (1 1/2) by three-sixteenths (3/16) inch angle iron. If made of wood, the posts shall be two by four (2x4) inches or larger. The upper rail shall be two by four (2x4) inches, or two one by four (1x4) strips, one at the top and one at the side of posts. The mid-rail may be one by four (1x4) inches or more. The rails (metal shapes, metal bars, or wood), should be on that side of the posts which gives the best protection and support. Where panels are fitted with expanded metal or wire mesh as noted in table 45a, the middle rail may be omitted.

(c) Toe boards shall be four (4) inches or more in height, of wood, metal or of metal grill not exceeding one (1) inch mesh. Toe boards at flywheel pits should preferably be placed as close to edge of the pit as possible.

HORIZONTAL OVERHEAD BELTS, ROPES, AND CHAINS, 7 FEET OR MORE ABOVE FLOOR OR PLATFORM

MEMBERS	WIDTH			MATERIAL
	OVER 10" TO 14" INC.	OVER 14" TO 24" INC.	OVER 24"	
Framework	1 1/2" x 1 1/2" x 1/4"	2" x 2" x 5/16"	3" x 3 3/8"	Angle Iron
Filler (belt guards)	1 1/2" x 3/16"	2" x 3/16"	2" x 5/16"	Flat Iron
Filler & vertical side member	No. 20 A.W.G.	No. 18 A.W.G.	No. 18 A.W.G.	Solid Sheet Metal
Filler supports	2" x 5/16" flat iron	2" x 3/8" flat iron	2 1/2" x 2 1/2" x 1/4" angle Flat and Angle	Flat Iron
Guard supports	2" x 5/16"	2" x 3/8"	2 1/2" x 3/8"	Flat Iron
Fastenings				
Filler supports to framework	(2) 5/16"	(2) 3/8"	(3) 1/2"	Rivets
Filler flats to supports				
(belt guards)	(1) 5/16"	(1) 5/16"	(2) 3/8"	Flush rivets
Filler to frame & supports				
(Rope & chain guards)	3/16" rivets spaced 8" centers on sides and 4" centers on bottom			
Guard supports to framework	(2) 3/8"	(2) 7/16"	(2) 5/8"	Rivets or bolts
Guard & supports to overhead ceiling	1/4" x 3 1/2" lag screws or 1/2" bolts	5/8" x 4" lag screws or 5/8" bolts	3/4" x 6" lag screws or 3/4" bolts	Lagscrews or bolts
Details-Spacing, etc.				
Widths of guards	One-quarter wider than belt, rope or chain drive			
Spacing between filler supports	20" C. to C.	16" C. to C.		
Spacing between filler flats (belt guards)	2" apart	2 1/2" apart	16" C. to C. 3" apart	
Spacing between guard supports	36" C. to C.	36" C. to C.	36" C. to C.	
Other Belt Guard				
Filling Permitted				
Sheet metal fastened as in rope and chain guards	No. 20 A.W.G.	No. 18 A.W.G.	No. 18 A.W.G.	Solid or perforated
Woven wire 2" mesh	No. 12 A.W.G.	No. 10 A.W.G.	No. 8 A.W.G.	
	Clearance from Outside of Belt, Rope or Chain Drive to Guard			
Distance center to center of shafts	up to 15' inc.	Over 15' to 25' inc.	Over 25' to 40' inc.	Over 40'
Clearance from belt, rope				

or chain to guard

6"

10"

15"

20"