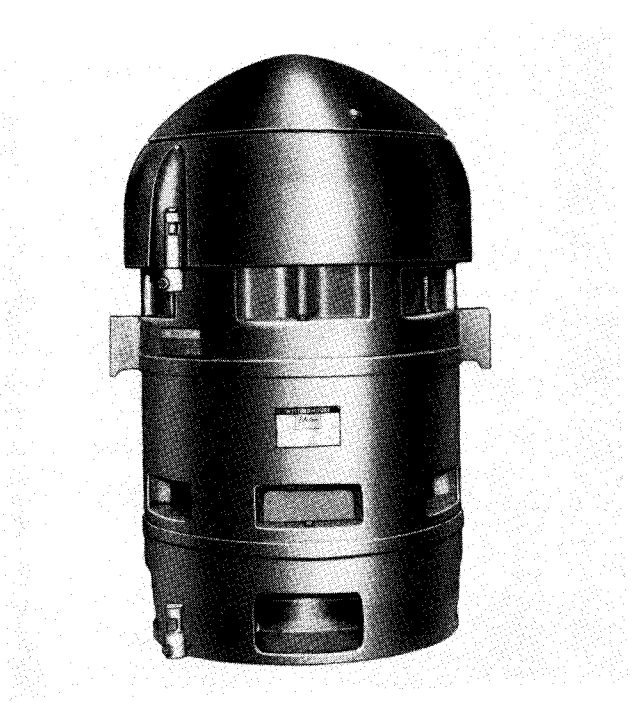
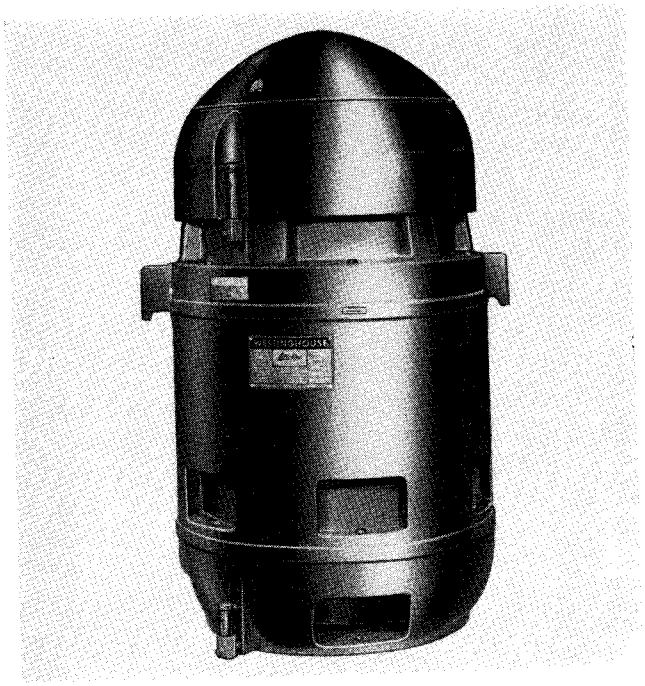
INSTALLATION • OPERATION • MAINTENANCE

INSTRUCTIONS

VERTICAL DRIP PROOF HIGH THRUST
CSP MOTORS
Frames 580 Through 683



580-P Frame Motor



680-P Frame Motor

LIFE-LINE TYPE CSP VERTICAL HIGH THRUST MOTORS in NEMA frame sizes of the 580 and 680 series are either solid shaft or hollow shaft squirrel cage induction motors specifically designed to drive vertical pumps that impose a high thrust load on the motor. The stator core is enclosed in a specially designed, ventilated, drip proof, steel frame. The ends of the frame are protected by cast brackets which carry the bearings. The thrust bearing is located in the upper bracket and the lower bracket contains a guide bearing. The lower bracket also serves as a base for the motor and is machined to NEMA 'P' base dimensions. A two piece cast iron hood protects the ventilating openings in the upper bracket.

Warranty. The Corporation in connection with apparatus sold agrees to correct any defect or defects in workmanship or material which may develop under proper or normal use during the period of one year from the date of shipment, by repair or by replacement f.o.b. factory of the defective part or parts, and such correction shall constitute a fulfillment of all the Corporation's liabilities in respect to said apparatus, unless otherwise stated in the quotation.

Any defects that may develop should be referred to the nearest Westinghouse Sales Office for complete servicing information.

Receiving. Unpack the motor and make certain that it was not damaged during shipment. Check to see that the nameplate data agrees with the voltage and frequency of the power supply provided for the motor.

The shaft extension may be coated with a slushing compound to prevent rusting during shipment and storage. This slushing compound may be removed by wiping with any petroleum solvent, such

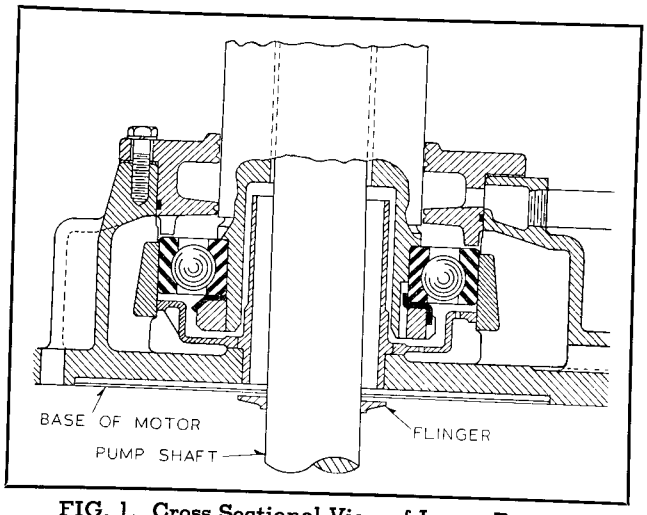


FIG. 1. Cross Sectional View of Lower Bearing

as benzine, gasoline, turpentine, Stoddard solvent, etc. See precautions under "Maintenance" for use of these solvents.

INSTALLATION

Mounting. The motor should be located in clean, dry, well ventilated place where the external air temperature will not exceed 40°C or 104°F. The foundation or pump column on which the motor is mounted must be rigid enough to prevent excessive vibration and the motor should be securely bolted down. These motors are suitable for vertical mounting only.

Method of Drive. Solid Shaft—Motor shaft must be coupled to the pump shaft through a rigid coupling so that pump thrust will be transmitted to the thrust bearing. These motors are designed to take the momentary up thrust often present during pump start up. This momentary up thrust is taken by the guide bearing in the lower bracket. If momentary up thrust is present the motor shaft must move axially to accommodate it; this axial movement will be from 0.020 inches minimum to 0.040 inches maximum. For those pumps where the normal operating thrust may be either up or down taking the up thrust on the lower bearing is not desirable and a thrust bearing capable of taking thrust in either direction must be used; motors for driving such pumps will have no end play.

Hollow Shaft. The pump shaft extends through the hollow motor shaft and is coupled to the motor at the upper end through the coupling supplied with the motor. This coupling can be used as a disengaging clutch or if up thrust is present or if the disengaging feature is not desired it can be solidly bolted to the motor drive hub. Up thrust provisions are the same as for the solid shaft motors and are discussed in the paragraph on Solid Shaft Drives. On hollow shaft drives a small flinger (See Fig. 1) should be installed on the pump shaft between the pump shaft gland and the base of the motor to keep water that might spray from the gland from entering the lower bearing of the motor. Both solid and hollow shaft motors are available with non reverse ratchets. The ratchet consists of a stationary member with teeth or steps cast into it and a rotating member with pins operating in vertical holes. When the motor starts in the forward or CCW direction, the inclined faces of the ratchet teeth throw the pins upward where they are held by centrifugal force and friction. When the motor stops, the pins drop and prevent CW or reverse rotation by striking the vertical faces of the teeth. (See Fig. 2.)

Electrical Connections. Be sure the motor is connected as shown on the nameplate diagram, and that the power supply (Voltage, Frequency and Number of Phases) corresponds with the nameplate data.

Connect to the power supply through a suitable switch and overload protection.

Install all wiring and fusing in accordance with the National Electric Code and local requirements.

To change the direction of rotation on three-phase motors, interchange any two line leads.

To change the direction of rotation on two-phase 4-wire motors, interchange the line leads of either phase. To change the direction of rotation on 2-phase 3-wire motors, interchange the two outside leads.

Conduit Box. The conduit box may be rotated 90 or 180 degrees for use with horizontal conduit or conduit from above.

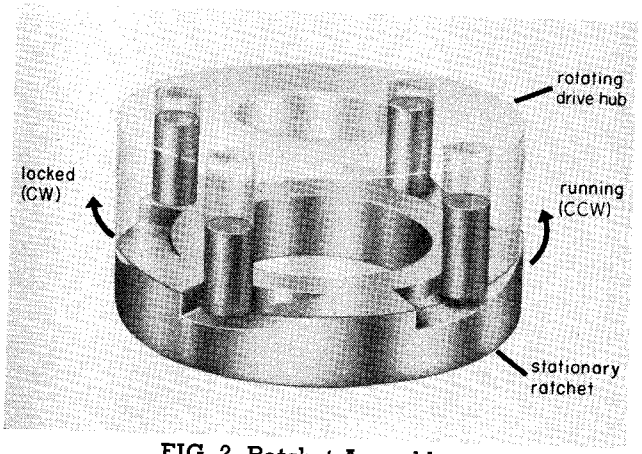


FIG. 2. Ratchet Assembly

OPERATION

Before starting motor fill both top and bottom oil reservoirs; refer to section on lubrication and to lubrication instruction plate on motor.

Run the motor without load to check the connections and direction of rotation. Motors suitable for only one direction of rotation will have a directional arrow denoting proper rotation.

The motor will operate satisfactorily with a 10 percent variation in voltage, a 5 percent variation in frequency or a combined voltage and frequency variation of 10 percent, but not necessarily in accordance with the standards of performance established for operation at normal rating.

Description of Bearings. The thrust bearing is located in the top bracket. It may be an angular contact ball bearing mounted singularly in duplex tandem or duplex back to back but more likely it will be a spherical roller thrust bearing. In general, motors with speed of 1200 rpm or less will have spherical roller bearings while those with higher speeds will have angular contact ball bearings. To obtain very high thrust capacities spherical roller bearings are required and are used with water cooling at speeds up to 1800 rpm. Bearings are normally cooled by the motor cooling air drawn in over the bearing pot. Where water cooling is required it is accomplished with a continuous copper tube immersed in the oil with water connections brought out the bottom of the pot so that the coil will drain. Where water cooling is necessary approximately three gallons per minute of water is required; either connection can be used as the inlet.

Spherical roller thrust bearings require a small thrust load at all times to prevent separation of the bearing and smearing of the rollers. This thrust load is provided by die springs inserted in a plate which forms the seat of the outer race of the bearing. These springs are compressed during assembly and tend at all times to lift the outer race of the bearing thus placing a thrust load on the bearing. If the spring load is greater than the rotor weight the excess is taken on the guide bearing. This arrangement also permits taking momentary up thrust on the bottom bearing. When operating normally with down thrust the springs under the bearing are completely compressed and the lower guide bearing is fully relieved and runs free and the springs impose no extra load on the thrust bearing; they merely form part of its seat. Where the thrust bearing is an angular contact ball bearing, springs are used under it to provide a light thrust load during up thrust operation to prevent looseness and vibration of the bearing.

Caution. Motors with spherical roller thrust bearing must never be operated unless the springs under the bearing are in place and the lower bearing cap is securely bolted down with the proper number of shims in place under it.

The lower or guide bearing in these motors is a standard radial type ball bearing. It is oil lubricated and air cooled.

Lubrication. All bearings are oil lubricated. Where the thrust bearing is a spherical roller type a good quality lubricating oil with a viscosity of 1000 to 1300 SSU at 100 degrees F should be used. If the thrust bearing is an angular contact ball bearing the oil should have a viscosity of 180 to 220 SSU at 100 degrees F. The lubrication instruction plate on the motor will specify the correct grade of lubricant. The upper bearing requires approximately three gallons of oil and the lower bearing approximately two quarts. The oil level when running will vary from that at standstill. The oil level should be checked only at standstill or a comparison of the levels at standstill and running should be made and noted. The oil should be changed at six month intervals. There should be no need to add oil between changes; if a drop in oil level is noted then the motor should be carefully examined for signs of a leak.

Caution. Do not fill beyond the level marked on the gauges. Overfilling may result in syphoning of oil around the shaft with consequent soaking of the windings with oil and possibly failure of the bearing.

Disassembly of motor.

1. Remove hood (only center piece need be removed), top cover plate, ratchet hub or drive hub, and ratchet plate or splash plate. Do not remove the plate supporting water coils in water-cooled bearings unless coils need repair.

2. Loosen the lower bearing cap and support the lower end of the shaft with a jack or blocks.

3. Remove nut and lock washer from upper end of shaft and pull runner with bearings from the shaft. Runner fit on shaft is a light tapping to sliding fit .0005 to .0022″ loose. Remove key from shaft.

4. Remove bolts securing upper bracket to stator frame and lift upper bracket from frame.

5. Lift shaft, rotor and lower bearing assembly out of stator, and separate frame and lower bracket.

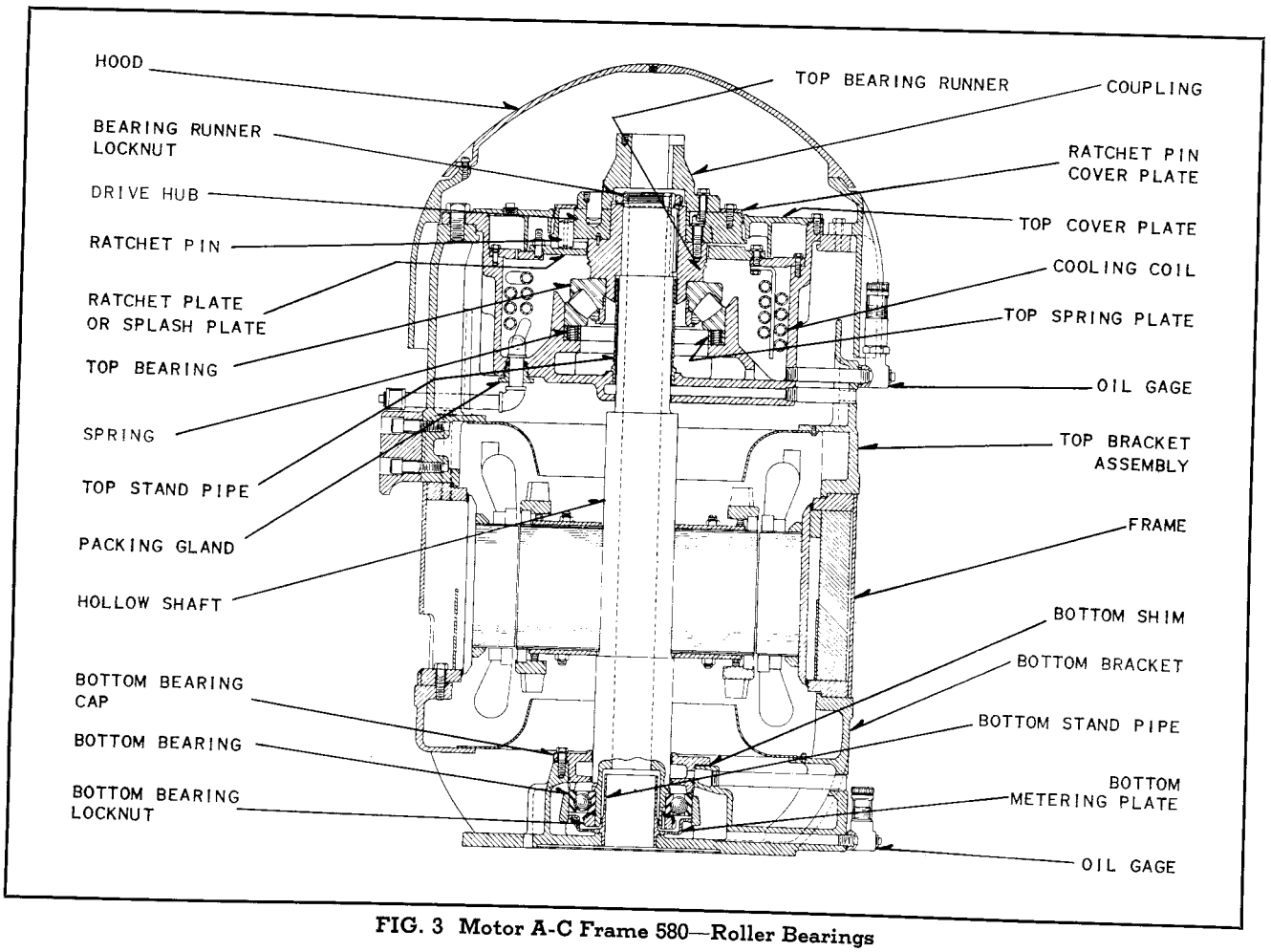


FIG. 3 Motor A-C Frame 580—Roller Bearings

Assembly of Motor.

1. Bolt frame to lower bracket.

2. If lower bearing was removed from shaft make sure bearing cap is slipped over shaft before bearing is replaced. To replace bearings heat in a bearing oven or oil bath for ½ hour at temperature of approximately 190 degrees F but not exceeding 212 degrees F. Slip hot bearing on shaft or runner and hold bearing in place until it cools enough to grip shaft or runner. Do not proceed with assembly until completely cooled.

3. Place shaft, rotor, and lower bearing assembly in stator and put upper bracket in place and bolt to frame.

4. Remove springs from under outer race of upper bearing leaving the spring plate in place. Replace bearing and runner and with a jack under lower end of shaft raise shaft until lower bearing cap lifts approximately ¼ inch, tighten nut holding runner to shaft to pull runner snug against shaft shoulder; do not bend lock washer to lock in place.

5. Release jack; rotor assembly is now in normal running position. Check to be sure bearing is seated, can be made through feeler gauge holes inside of upper bearing seat. Pull O-ring back over top of lower bearing cap so that it is out of the way and remove all shims. Let bearing cap rest on lower bearing making sure that it touches bearing. With a feeler gauge check gap between lower bearing cap and bracket and record value. Check at several spots around to insure that cap is even. To the value obtained with the feeler gauge add .025″ and divide by .016″; the resultant, dropping any fraction, gives the number of .016″ thick shims required for correct end play adjustment. Example: The gap between cap and bracket measures 0.037″; .037″ + .025″ = 0.062″; 0.065″ ÷ 0.016″ = 3⅞″. Use three 0.016″ thick shims under bearing cap to give correct end play. This system will give a clearance of 0.010″ to 0.025″ between lower cap and bearing.

6. Replace jack under shaft, remove upper bearing runner and bearing, replace springs in spring plate under upper bearing and put upper bearing runner and bearing back on shaft. Put the drive or

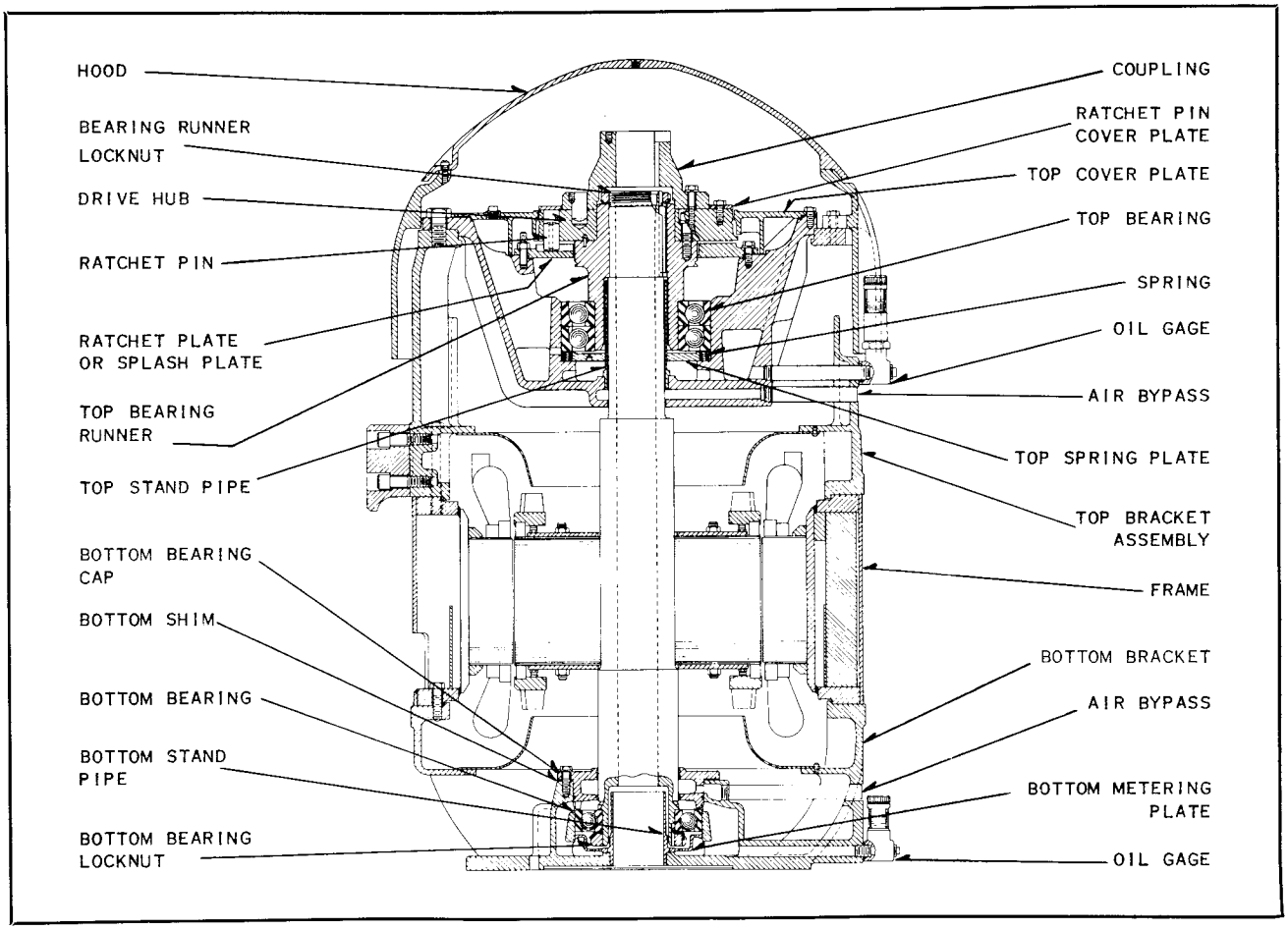


FIG. 4. Motor A-C Frame 580—Ball Bearings

ratchet hub on the runner but do not bolt to runner; put the ratchet plate or splash plate over the runner letting it rest on the drive hub. Put six 4½″ long ½″ bolts through the holes in the ratchet plate and engage them in the corresponding holes in the bearing pot arms. Tighten these bolts evenly to draw the runner down on the shaft against the springs to a snug seat on the shaft shoulder. When the runner is seated tighten the lock nut holding it to the shaft and lock the lock washer and remove the jack.

7. Replace the O-Ring in its groove on the lower bearing cap, insert the proper number of shims under the cap as determined in step 5 and bolt the lower bearing cap in place.

8. Remove the bolts holding ratchet plate down and remove ratchet plate. Using a dial indicator check the runout of both inner and outer bearing races. For ball bearings the runout should not exceed 0.001″ on the inner race or 0.0025″ on the outer race. For roller bearings the runout should not exceed 0.003″ on the inner race; runout of outer race of roller bearings need not be checked.

9. Install ratchet plate or splash plate in correct position; bolt drive hub to runner (it is extremely important that drive hub and runner be bolted together securely), replace ratchet pins and ratchet pin cover plate and replace bearing housing cover, coupling, and hood.

MOTOR MAINTENANCE

Although Life Line motors require a minimum of attention in service, they should be inspected at regular intervals to guard against excessive (1) dirt, (2) moisture, and (3) vibration, which account for 90% of all motor failures.

1. Guard Against Dirt. Keep the insulation and mechanical parts of the motor clean. Dust that is free from oil or grease may be removed by wiping with a clean, dry cloth, or preferably, by suction. Suction is recommended over blowing out because it eliminates the danger of blowing metal chips and etc., into the insulation and also because of the danger of moisture in the compressed air. Dust may be blown from inaccessible parts with clean, dry air of moderate pressure.

When grease or oil is present, wipe with a cloth moistened (but not dripping) with a petroleum solvent of a "safety type" such as Stoddard solvent or similar materials available under various trade names. When a material is difficult to remove, carbon tetrachloride is more effective than petroleum solvents.

Petroleum solvents are flammable and comparatively nontoxic.

Carbon tetrachloride is nonflammable, but is highly toxic. Suitable ventilation should be provided to avoid breathing vapors. When ventilation is not sufficient to prevent a distinct odor or carbon tetrachloride, a chemical cartridge respirator or gas mask must be used.

2. Guard Against Moisture. Drip-proof motors should always be guarded against the accidental intrusion of water from splatter or splashing.

Stand-by motors should be run at least once a week to guard against moisture condensation.

Before starting motors which have been subjected to moisture, megger with a 500 volt megger. If resistance is below 2 megohms dry the winding in oven or circulate safe current. Continue drying until resistance rises to 2 megohms or preferably higher. Drying time will depend on size of machine and amount of moisture absorbed.

3. Guard Against Vibration. To avoid failures due to vibration, a few simple checks should be made regularly.

Check for misalignment such as may be caused by foundation settling or heavy floor loading.

Check to see if vibration from the driven machine is being transmitted to the motor.

Check the motor mounting bolts and bracket bolts to be sure they are tight.

Coils. Revarnishing the windings when motors are overhauled will lengthen their life. Suitable varnish may be obtained from the nearest Westinghouse Sales Office.

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