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MAINTENANCE OF ELEVATOR HOISTING MACHINES AND BRAKES

By

Executive Committee for the American Standard Safety Code for Elevators, Dumbwaiters, and Escalators

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PREFACE

Accidents resulting from the failure of machinery, although infrequent, are usually severe. Accidents due to faulty brake setting are fairly common and sometimes are serious. Adequate maintenance of elevator machinery is of primary importance.

This is the fourth of a group of Bureau Circulars on elevator maintenance. The first, Elevator Wire Rope Maintenance, National Bureau of Standards Circular C441; the second, Maintenance of Elevator Mechanical Safety Appliances, Circular C442; and the third, Maintenance of Elevator Hoistway and Car Enclosures and Equipment, Circular C443, may each be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 5 cents a copy.

This draft was prepared by the Executive Committee of the ASA Sectional Committee for the Safety Code for Elevators, Dumbwaiters, and Escalators, and embodies comments of the Sectional Committee.

LYMAN J. BRIGGS, *Director.*

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ABSTRACT

This Circular covers certain suggestions for the inspection and checking of elevator hoisting equipment, including motors, gearing, brakes, and driving sheaves and drums. The inspection of belted machines is covered briefly and there is a paragraph devoted to overhead sheaves and bearings. Motor-generator sets are covered by cross reference to similar equipment used in hoisting machines.

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I. INTRODUCTION

In June 1941 the Sectional Committee for the American Standard Safety Code for Elevators, Dumbwaiters, and Escalators voted to

discontinue work on the revision of that code for the duration. A supplement containing a few necessary modifications and all interim interpretations was issued in April 1942 in lieu of a revision.

By the time the annual meeting of the Sectional Committee was held in June 1942, it was evident that the acute shortage of repair and replacement parts would result in a marked decrease in elevator safety unless the utmost care was used in maintaining, as effectively as possible, such important items as wire rope, undercar safeties and their associated mechanisms, interlocks, hoisting engines, etc. The Sectional Committee therefore suggested that the Executive Committee prepare a series of service bulletins covering such equipment.

There is an old proverb that "A stitch in time saves nine." Periodic inspection, with the tightening of loose parts, correction of misalinement and prompt attention to slightly worn equipment should decrease the possibility of serious accident, and result in the maximum obtainable use of the equipment. Further, such maintenance should materially decrease the number of minor service interruptions and increase the periods between major overhauls.

The Inspectors' Manual [1] prepared by the Sectional Committee for the Safety Code for Elevators, Dumbwaiters, and Escalators covers in considerable detail the methods of inspecting elevator equipment. Occasional references to the manual may be found in this publication.

As these bulletins are not intended for legal adoption or enforcement, they have not been given the status of an American Standards Association project but have been prepared quite informally by the Executive Committee as its contribution toward elevator safety during the emergency.

Adequate maintenance service will do much to prolong the life of elevator equipment, and somewhat greater expenditure for this purpose will pay handsome dividends, particularly during the present emergency, when repair and replacement parts are at a premium.

It is the hope of the Executive Committee that these bulletins may be of value to owners of elevators, and that they may, by calling attention to certain work that should be done and certain precautions that should be taken, be a means of maintaining the excellent safety record made by vertical transportation during the last two decades.

II. ELEVATOR HOISTING MACHINES AND BRAKES

1. CONSTITUENT PARTS OF MACHINE

1. Elevator machines generally consist of a motor (with or without gearing), brake, and drive sheave or drum, with necessary bearings and shafts assembled on a bedplate or base.

(a) INSPECTION OF BASE

2. The machine base should be checked for cracks or broken lugs. Defective bases should be repaired or replaced.

(b) ALINEMENT OF MACHINE

3. It is important that the base and assembly be in correct alinement. If there is any evidence of misalinement, the manufacturer should be consulted.

[1] The Inspectors' Manual may be obtained from the American Society of Mechanical Engineers, 29 West 39th Street, New York, N. Y., for 75 cents a copy.

2. OUTLINE OF WEEKLY MOTOR INSPECTION

(a) OIL LEVEL

4. Check oil level. An excessively high or low level may cause operating difficulties. Oil should be of a grade recommended for the equipment by the motor manufacturer.

(b) OIL RINGS AND CHAINS

5. Check oil rings and chains to see that they revolve freely. Chains should be examined for wear to be sure that they have not stretched to the point that the chain will touch the bottom of the oil reservoir.

(c) COMMUTATION

Check commutation as follows:

1. *Brushes and Brush Rigging.*

6. Brush holders must clear the commutator and be securely fastened on the holding stem. Flexible leads should be securely attached to the brush and brush holder. Spring tension on the brushes should be just sufficient to hold the brush in contact with the commutator without chatter or vibration. Spring tension on individual brushes should be equalized by using a spring balance. Excess pressure causes rapid wear on the commutator and brushes. Brushes that do not make full contact with the commutator should be seated with fine sandpaper. Emery paper should not be used, as emery is a conductor and may cause damage. Excessively worn or defective brushes that cannot be properly reseated should be replaced with the grade and size of brush recommended by the original motor manufacturer. New brushes must be properly seated. If, after properly adjusting brushes, there is still excessive sparking, a motor service man should be called in, as the use of abrasive stones, undercutting of commutator, or adjusting of brush spacing and setting by inexperienced mechanics may result in destruction of electric equipment.

3. OUTLINE OF ANNUAL MOTOR INSPECTION

(a) MOTOR BEARINGS

7. Examine motor bearings. If wear is excessive, replace bearing.

(b) OIL RESERVOIRS

8. Drain oil reservoir, flush and refill.

(c) POLE PIECES

9. Check fastening of pole pieces.

(d) MOTOR WINDINGS

10. Examine motor windings. If necessary, have repairs made by competent motor service man. Check for loose terminals.

(e) END PLAY

11. Check motor for end play. If insufficient or excessive, the condition should be corrected by a competent elevator mechanic.

(f) FASTENINGS

12. Tighten loose bolts, keys, setscrews, etc., in fixed and rotating parts of motor.

(g) COUPLINGS

13. Tighten loose bolts, keys, setscrews, etc., in couplings. Defective fastenings should be replaced.

4. BRAKE INSPECTION

(a) TYPES OF BRAKES

14. Elevator brakes are, generally, electrically or mechanically released. The mechanically released brakes are usually confined to elevators with hand-rope operation.

(b) BRAKE CLEARANCE

15. When in the released position the brake drum should run free of the brake shoes. The clearance will vary with the type of machine, but should, in all cases, be kept as low as practical in order to insure smooth brake operation and prevent damage to equipment, such as that due to excess heating with alternating-current brakes. This requires the brake drum to run true. Brake shoes should apply evenly to the drum. It is important that the brakes should be readjusted for uniform bearing shortly after brakes have been relined or other adjustment made to the brake shoes. This is particularly important in the case of automatic operation.

(c) PERIODIC ADJUSTMENT

16. Brakes should be adjusted periodically to keep clearances to a minimum and to keep the bearing of brake shoes uniform. Brake pins should be examined for wear and be replaced if necessary. All pins and bearing surfaces should be kept well, but not excessively, lubricated. Solenoid cores and sleeves should be kept free from gummed oil to assure proper lifting and setting of the brake.

(d) BRAKE DRUMS

17. Oil, grease, and rust should be removed from the brake drum. A cracked brake drum must be replaced. Two piece (split) brake drums must be examined periodically to make sure that the two halves are in proper alinement.

(e) BRAKE-HOLDING POWER

18. Brakes should be set to stop at least 120 percent of contract load, but excessive spring pressure is undesirable.

(f) BRAKE-LINING MAINTENANCE

19. To prevent damage to brake and loss of braking power, brake linings should be examined to see that they are not wearing to the point where rivet heads or wire reinforcement may come in contact with the drum. Leather linings should receive an occasional application of neat's-foot oil. Do not use mineral oil. Where grease or oil

has reached the brake mechanism, the linings should be thoroughly cleaned with a suitable solvent, and, if necessary, the surface slightly roughened with a steel brush.

5. GEARING

(a) LUBRICATION

20. Elevator gears must have adequate lubrication if reasonable life is to be secured. Ordinary lubricating oils are not satisfactory for this purpose; only lubricants recommended by the elevator manufacturer should be used.

(b) GEAR ALINEMENT AND WEAR

21. Gear alinement should be checked periodically. Bolts holding the ring gear to the spider must be kept tight. When a worm and gear are correctly alined, the wear on the tooth surface is practically uniform and distributed equally on both sides of the center line of the gear. In case of uneven tooth wear or in case of excessive backlash in starting and stopping, an elevator company, preferably the one making the original installation, should be consulted, as the method of making adjustments varies from manufacturer to manufacturer.

6. DRIVE SHEAVE AND DRUM MAINTENANCE

(a) DRIVE SHEAVES

22. Drive sheaves should be examined for cracks[2] and for wear of grooves. The bolts holding the sheave rim to its spider should be checked periodically to be sure that they are all tight. The effect of worn grooves and misalinement was discussed at some length in Circular C441. Bearings should be examined most carefully for play of the shafts.

(b) WINDING DRUMS

23. Winding drums should be examined for cracks or other signs of failure and for worn ridges between rope grooves. Anchorage of ropes inside of the drum should be checked, and if the ropes are long enough, it is desirable, in addition, to secure the ropes around the drum shaft. Drum machines are also equipped with a slack-cable mechanism. This should be examined and tested for proper operation.

7. INSPECTION OF BELTED MACHINES

24. On belted machines the condition of the belt or belts should be examined to see that they are not cut or torn and that there is no appreciable slippage. Belt-shifter forks should be examined for wear. If belt-shifter parts are badly worn or belts are cut or torn, they should be replaced. Where belt machines are suspended from the ceiling, the suspension members and their anchorage should be thoroughly examined and those that are defective should be replaced. Machine-holding bolts should be checked for tightness.

[2] For method, see Inspectors' Manual mentioned in footnote 1.

III. INSPECTION OF OVERHEAD SHEAVES AND BEARINGS

25. Overhead sheaves should be checked for cracked rims or arms and for worn rope grooves. A method of testing for cracked sheaves is outlined in the Inspectors' Manual (see footnote 1).

IV. INSPECTION OF MOTOR-GENERATOR SETS

26. Individual checking of motor, generator, and exciter will be similar to that already detailed for hoisting-machine motors.

WASHINGTON, February 8, 1943.

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