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Recommended Practice

for

ELECTRIC INSTALLATIONS ON TEXTILE MACHINERY

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FOREWORD

The Textile Industry is one of the oldest manufacturing industries in existence. It is also one of the first industries to make large-scale use of electricity for power and control purposes and hence has pioneered many applications of electric apparatus.

This pioneering, with the resulting experimental nature of many of the applications, has led to wide variations in types of equipment, installation practices, and methods of driving the machinery, many of which persist today through established precedent. As the use of electric power and automatic control increased, much general-purpose equipment designed for other industries has found its way into textile mills. Much of this equipment is not only unsuited to the applications but creates fire and injury hazards because of the characteristics of the fibers being processed. These fibers range from kinky and greasy wool to the highly-flammable vegetable fibers such as cotton, and many synthetics.

Except for electric equipment sales literature, a few publications by fire insurance organizations and the minimum requirements of the National Electrical Code for Class III—Hazardous Locations, there has not been to date an integrated and comprehensive guide to which the Textile Industry could refer for basic information. The result of inadequate electrical practices has been a poor fire loss record, misapplication of equipment by machinery manufacturers and users, confusion regarding proper equipment and applications, and many electric failures with their attendant accident and fire hazards.

It was for the purpose of helping to correct these inadequate practices, that the AIEE Textile Industry Subcommittee undertook as an industry service project in 1953 the preparation of the Recommended Practice for Electric Installations on Textile Machinery.

The need for such Recommended Practice became apparent at several Conferences on Electrical Applications for the Textile Industry sponsored annually by the Subcommittee in industry centers throughout the country. Encouragement to proceed came from the successful efforts of a joint AIEE-NEMA Committee on Textile Mill Enclosures, which resulted in final specifications of the NEMA Type 12 control enclosure, admirably suited to textile mill use.

The first draft of the Proposed Recommended Practice was distributed and discussed at AIEE Subcommittee sponsored Conferences in Boston, Mass., Raleigh, N. C., and Atlanta, Ga. in 1954 and 1955. As a result of comments received, and meetings with various industry groups, the second draft was completed on June 1, 1956 and distributed again at AIEE Subcommittee sponsored Conferences. Extensive changes resulted from further contact with interested industry groups and meetings with C. M. Park⁵, then

Chairman of National Electrical Code Panel 14. The draft was submitted to the AIEE Standards Committee and, after incorporating their well-conceived suggestions, the Proposed Recommended Practice was printed in October 1959, 'For Trial Use'. Since then, at each of nine Textile Conferences sponsored by the Committee, comment on the Recommended Practice has been solicited. It was also submitted to the Textile Committee of the ASME for its comment. Many helpful suggestions have been received and are incorporated in this revised edition.

This Recommended Practice reflects the best thinking and efforts of past and present members of the IEEE Textile Industry Committee (formerly the AIEE Textile Subcommittee) composed of engineers from textile mills, textile machinery manufacturers, electric equipment manufacturers, colleges and insurance companies.

It is believed that publication and use of the Recommended Practice will aid materially in achieving the purposes as set forth in paragraph 10.1, namely—to promote:

- a. Safety to personnel and equipment, including the reduction of fire and accident hazards.
- b. Uninterrupted production.
- c. Reduced maintenance and increased life of equipment.
- d. Over-all economy in textile mill operation.

The Textile Industry Committee and its predecessor, the Textile Subcommittee of the General Industry Applications Committee, has functioned continuously since 1946. During this period, many engineers representing many firms have contributed their talent and support. Although lack of space prohibits listing all of these individuals and their companies, their contributions are sincerely appreciated.

Listed below is the current membership of the IEEE Textile Industry Committee, together with the names of those who either served as committee officers or participated directly in the preparation of this Recommended Practice. Their status is indicated as follows:

1. Past and present officers of the Subcommittee or Committee.
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Recommended Practice for

ELECTRIC INSTALLATIONS ON TEXTILE MACHINERY

10. GENERAL

10.1 Purpose. The purpose of this Recommended Practice is to define and recommend specifications for electric apparatus and devices, and installation practices to be followed in the application of such apparatus to textile machinery to promote:

- a. Safety to personnel and equipment, including the reduction of fire and accident hazards.
- b. Uninterrupted production.
- c. Reduced maintenance, and increased life of equipment.
- d. Over-all economy in textile mill operation.

This publication is intended to bring to the attention of engineers, management and mill owners in the textile industry, and to equipment suppliers the important features of well-designed electric apparatus and installations to meet the specific requirements of textile machinery.

10.2 Scope. The provisions of this Recommended Practice apply to all electric equipment and wiring connected to machinery and equipment commonly used in the manufacturing areas of textile mills, starting at the place of connection of the power supply to the machine electric equipment. They are intended as minimum requirements whether the electric equipment is a part of the machine or is supplied and installed by the user.

This Recommended Practice shall apply to electric equipment having a supply voltage of 600 volts or less.

10.3 Use of Recommended Practice. It is urged that users and manufacturers cooperate and mutually agree to follow this Recommended Practice to promote the use of proven design, construction and installation practices for economical and safe operation. To meet these objectives, the purchaser should specify adherence to this Recommended Practice.

10.4 Definitions of Textile Machinery. The term textile machinery as used in this Recommended Practice means any machinery having electric equipment attached or used in its operation, and which is used directly or indirectly in the processing of textile filaments and fibers from raw stock through finished cloth or other material.

It is not intended to apply to the machinery used in:

- a. The production of synthetic filaments.
- b. The garment or cutting industries.
- c. Air compressors, fire pumps, air conditioning and similar equipment installed and located in non-hazardous, clean and lint free areas.

10.5 National Electrical Code. (NFPA No. 70-ASA C1). Textile mills processing natural or synthetic

fibers which shed highly combustible lint are especially dangerous to both personnel and property because of the flash-fire hazard; therefore they are considered as Class III Hazardous Locations, as defined by the National Electrical Code. The very minimum electrical installation requirements for such locations are outlined in Article 503, National Electrical Code. These requirements take precedence over those which apply in ordinary, non-hazardous locations. Equipment suitable for use in ordinary locations is generally not suitable for such textile processes.

A few practices peculiar to the industry or of long standing either do not or cannot be made to conform to the National Electrical Code, for various reasons. Each such conflict is clearly identified and the recommended practice is described.

Where reference is made to a paragraph or section of the National Electrical Code, it is understood to mean the latest revision thereof.

10.6 Approved Equipment. The term "approved" as used in this Recommended Practice refers to material and equipment that is acceptable to the inspection authority having jurisdiction. Listing or labeling by Underwriters' Laboratories, Inc., Factory Mutual Laboratories, or other nationally recognized testing agency is usually satisfactory evidence of acceptability.

11. DIAGRAMS AND EQUIPMENT IDENTIFICATION

11.1 Connection Diagrams. Connection diagrams showing panel wiring, line, load, and control connections with identifying numbering, shall be furnished with all equipment.

The diagram shall, where practicable, be permanently secured on the inside of the cover of the control enclosure.

For special-purpose controllers the connection diagram shall include an elementary diagram, and shall show connections to all related motors, control stations, limit switches and other auxiliary equipment.

11.2 Equipment Identification. A permanent nameplate or other identification listing the manufacturer's name, address, and identifying designation of the electric equipment shall be attached to the equipment.

There shall also be provided identification of horsepower, voltage, frequency, phase and current, and in the case of general-purpose controllers, the heater coil selection tables.

11.3 Renewal Parts Record. The electric equipment manufacturer and the machinery manufacturer should maintain records of the equipment throughout a reasonable life expectancy, for purposes of furnishing renewal parts and connection diagrams.

12. CONTROL CIRCUITS

12.1 Source of Control Power. The source of supply for all control circuits shall be taken from the load side of the principal or main disconnecting means.

12.2 Control Voltages

1. Control circuits at other than line voltage shall not be more than 120 volts nominal.
2. Electric stop-motion equipment shall comply with the provisions of Section 20.

12.3 Interlocking. Where operation of control equipment in improper sequence can result in a hazard or damage, sequence interlocking or other effective safeguards shall be provided.

Where two or more controllers are to be electrically interlocked, it shall be done with interlocks or relays so connected that there is no electric connection between the load side of one controller disconnecting device and the load side of the disconnecting device of another controller.

12.4 Undervoltage Protection Circuits. Magnetic controllers and their associated pilot devices shall provide undervoltage protection, as outlined in paragraph 13.4.

Group installation of manual loom starters require special considerations. See paragraphs 13.1.1 and 13.4.2.

13. OVERCURRENT AND UNDERVOLTAGE PROTECTION

13.1 Motor Branch Circuit Overcurrent Protection. In general, motor branch circuits shall be protected against overcurrent in accordance with National Electrical Code, sections 430-51 to 430-59 inclusive. Attention should be given to the following special requirements for textile application.

13.1.1 Group Fused Loom Motor Installations. Manual starters used to control single-motor looms, and where several loom motors are connected to one branch circuit shall be protected in accordance with National Electrical Code, paragraph 430-53. The manual starters with their motor-overload protective devices shall be approved for group fusing (i.e. approved for use with fuses larger than 400 percent of motor current rating. See National Electrical Code paragraph 430-40).

Motor branch circuit fuses shall not have current ratings greater than those which will be found marked on the motor starter. All motor starters approved for "group fusing" will have the maximum branch circuit fuse rating, indicated on the heater table inside of the starter enclosure. See Sections 25.4 and 25.5 for typical circuits.

13.2 Control Circuit Overcurrent Protection

13.2.1 Control Circuits Supplied Directly from Motor Branch Circuit. The conductors of control

circuits at line voltage shall be protected against steady overloads and short circuits in accordance with National Electrical Code paragraphs 240-5 and 430-72.

13.2.2 Control Circuits Supplied through Control Transformer. The control-circuit transformer and conductors shall be protected against secondary overloads and short circuits. Where the circuit is grounded, the protective device shall be located only in the ungrounded line.

13.2.3 Class 2 Lowvoltage Circuits. See Section 20.

13.3 Motor Running Overcurrent Protection

13.3.1 All continuous-duty motors shall be protected against overload by the use of devices responsive to motor current, motor temperature, or both.

Resetting of the overload device shall not restart the motor if restarting can cause injury to persons or damage to property.

Where thermal protection integral with the motor is used and is of the type which leaves voltage on the motor terminals after tripping, arrangements shall be made to minimize possible shock hazard when servicing the motor.

The number and location of such overload protective devices shall conform with National Electrical Code Sections 430-36 and 430-37.

13.4 Undervoltage Protection

13.4.1 Undervoltage protection shall be provided for all equipment which can cause injury to persons or damage to property should a motion be initiated upon return of power after an undervoltage condition.

13.4.2 For group-fused installations, such as single-motor looms protected in accordance with paragraph 13.1.1, the user shall install undervoltage protection. See Sections 25.4 and 25.5 for typical methods.

14. MOTOR-CONTROL EQUIPMENT

14.1 General.

14.1.1 All motor-control equipment shall conform with the latest issue of the National Electrical Manufacturers' Association (NEMA) Standards for Industrial Control; and shall be installed in accordance with the requirements of the National Electrical Code.

14.2 Alternating-Current Manual Starters.

14.2.1 The starter enclosure shall be gasketed, lint tight. There shall be no unused holes through the enclosure. If conduit knockouts are supplied they shall not be concentric or eccentric. The cover shall be held closed by captive fasteners.