

IEEE Recommended Practice for Cement Plant Electric Drives and Related Electrical Equipment

Circuits and Devices

Communications Technology

Computer

*Electromagnetics and
Radiation*

Energy and Power

Industrial Applications

Sponsored by the
Cement Industry Committee of the
IEEE Industry Applications Society

*Signals and
Applications*

*Standards
Coordinating
Committees*

ANSI/IEEE Std 499-1989



Published by the Institute of Electrical and Electronics Engineers, Inc., 345 East 47th Street, New York, NY 10017, USA.
October 6, 1989 SH12757

**ANSI/IEEE
Std 499-1989
(Revision of
ANSI/IEEE Std 499-1983)**

An American National Standard

**IEEE Recommended Practice for
Cement Plant Electric Drives and
Related Electrical Equipment**

Sponsor

**Cement Industry Committee
of the
IEEE Industry Applications Society**

Approved April 14, 1989
IEEE Standards Board

Approved September 13, 1989
American National Standards Institute

©Copyright 1989

**The Institute of Electrical and Electronics Engineers, Inc
345 East 47th Street, New York, NY 10017**

*No part of this publication may be reproduced in any form,
in an electronic retrieval system or otherwise,
without the prior written permission of the publisher.*

IEEE Standards documents are developed within the Technical Committees of the IEEE Societies and the Standards Coordinating Committees of the IEEE Standards Board. Members of the committees serve voluntarily and without compensation. They are not necessarily members of the Institute. The standards developed within IEEE represent a consensus of the broad expertise on the subject within the Institute as well as those activities outside of IEEE which have expressed an interest in participating in the development of the standard.

Use of an IEEE Standard is wholly voluntary. The existence of an IEEE Standard does not imply that there are no other ways to produce, test, measure, purchase, market, or provide other goods and services related to the scope of the IEEE Standard. Furthermore, the viewpoint expressed at the time a standard is approved and issued is subject to change brought about through developments in the state of the art and comments received from users of the standard. Every IEEE Standard is subjected to review at least once every five years for revision or reaffirmation. When a document is more than five years old, and has not been reaffirmed, it is reasonable to conclude that its contents, although still of some value, do not wholly reflect the present state of the art. Users are cautioned to check to determine that they have the latest edition of any IEEE Standard.

Comments for revision of IEEE Standards are welcome from any interested party, regardless of membership affiliation with IEEE. Suggestions for changes in documents should be in the form of a proposed change of text, together with appropriate supporting comments.

Interpretations: Occasionally questions may arise regarding the meaning of portions of standards as they relate to specific applications. When the need for interpretations is brought to the attention of IEEE, the Institute will initiate action to prepare appropriate responses. Since IEEE Standards represent a consensus of all concerned interests, it is important to ensure that any interpretation has also received the concurrence of a balance of interests. For this reason IEEE and the members of its technical committees are not able to provide an instant response to interpretation requests except in those cases where the matter has previously received formal consideration.

Comments on standards and requests for interpretations should be addressed to:

Secretary, IEEE Standards Board
P.O. Box 1331
445 Hoes Lane
Piscataway, NJ 08855-1331
USA

IEEE Standards documents are adopted by the Institute of Electrical and Electronics Engineers without regard to whether their adoption may involve patents on articles, materials, or processes. Such adoption does not assume any liability to any patent owner, nor does it assume any obligation whatever to parties adopting the standards documents.

Foreword

(This Foreword is not a part of IEEE Std 499-1989, IEEE Recommended Practice for Cement Plant Electric Drives and Related Electrical Equipment.)

Electrical equipment is the major factor in the powering and control of cement plants. As management demands more precision for quality control, greater production capacity, and less production cost, more and more emphasis is placed on the performance of the plant's installed electrical equipment.

The Cement Industry Committee has analyzed many areas pertaining to such requirements, and through the working groups recommended practices have evolved for this industry. The Electrical Distribution Group published their analysis of plant power system practice, ANSI/IEEE Std 277-1983.

The recommended practices listed herein pertain to the Drives and Related Products Working Group. This evaluation update is in a form of an agreement reached by all members of the working group and the committee in general. Certainly, specific plant conditions could and probably would alter such a recommendation in a certain area; however, in general, it is hoped the practices are a good guideline for the industry.

This recommended practice is a revision of ANSI/IEEE Std 499-1983.

At the time this recommended practice was approved, the membership of the Drives and Related Products Working Group was:

R. W. Englund, *Chairman*

U. K. Alsguth
D. Babel
C. F. Gerald

Blair D. Dixon, *Vice Chairman*

*R. J. Meta
H. S. Robinson
D. C. Salzborn

R. L. Smith
R. F. Timpson
J. Wynen

*Standards Liaison

The following persons were on the balloting committee that approved this document for submission to the IEEE Standards Board:

Jack Alacchi
Walter Allen
Ulf Alsguth
Detlev Babel
Ib Bentzen Bilkvist
Neal Biege
Patrick Brady
Werner Buech
Ed Buelher
Elroy Cook
Robert Curran
James Dargis
Ennio Dezorzi
Blair Dixon
Randolph Englund
Jerry Farr
Charles Gerald

Jose Gonzalez
David Griffith
Robert Haas
David Hansen
Warren Holmes
Richard Kistler
John Kline
Fred Koester
Raymond Krekel
David Maars
George MacDonald
William McCormick
Russ Meta
Adrien Morneau
Ronald Palmer
Edward Parker
Joseph Pintor
Paul Riley

Dennis Rigas
Arthur Rochelle
D. C. Salzborn
Jeff Sautin
Stephen Sheridan
W. Siemering
Roderick Simmons
Donald Simpson
Robert Smith Jr
Munn Steelman
Robert Timpson
Robert Toedter
Bruce Tompkins
John Vidergar
Larry Warner
Ray Worthington
John Wynen

When the IEEE Standards Board approved this standard on April 14, 1989, it had the following membership:

Dennis Bodson, *Chairman*

Marco W. Migliaro, *Vice Chairman*

Andrew G. Salem, *Secretary*

Arthur A. Blaisdell
Fletcher J. Buckley
Allen L. Clapp
James M. Daly
Stephen R. Dillon
Donald C. Fleckenstein
Eugene P. Fogarty
Jay Forster*
Thomas L. Hannan

Kenneth D. Hendrix
Theodore W. Hissey, Jr.
John W. Horch
David W. Hutchins
Frank D. Kirschner
Frank C. Kitzantides
Joseph L. Koepfinger*
Edward Lohse

John E. May, Jr.
Lawrence V. McCall
L. Bruce McClung
Donald T. Michael*
Richard E. Mosher
Stig Nilsson
L. John Rankine
Gary S. Robinson
Donald W. Zipse

*Member Emeritus

Contents

SECTION	PAGE
1. General	7
1.1 Purpose	7
1.2 Scope	7
1.3 Use of Recommendations	7
1.4 References	7
1.5 Drawings	8
1.6 Nameplates or Identification Plates	8
2. Voltage Ratings	8
2.1 General Plant	8
2.2 Plant Wiring	9
3. Overcurrent and Undervoltage Protection	10
3.1 Motor Branch-Circuit Overcurrent Protection	10
3.2 Motor Overload Protection	10
3.3 Undervoltage Protection	10
4. Control Circuits	10
4.1 Source of Control Power	10
4.2 Control Voltages	10
4.3 Interlocking	10
4.4 Control Circuit Overcurrent Protection	10
5. Motor Control Equipment	11
5.1 General	11
5.2 AC Manual Starters — 600 V or Less	11
5.3 AC Magnetic Controllers — 600 V or Less	12
5.4 Medium Voltage AC Magnetic Controllers	12
5.5 DC Power Supplies	13
5.6 Operator's Panels or Control Cubicles (Other than Motor Control)	14
5.7 Individual Pilot Devices, Pushbutton Stations, and Related Devices	14
6. Motors and Generators	15
6.1 Enclosures — General	15
6.2 Shaft Extensions	15
6.3 Bearings	15
6.4 Adjustable Speed	15
6.5 Efficiency	16
6.6 Service-Factor	16
6.7 Power Factor	16
6.8 Torsional Vibrations	16
6.9 Surge Protection	16
7. Specific Applications	16
7.1 General	16
7.2 Grinding Mills	16
7.3 Kiln Drives	17
7.4 Feeder Drives	17
7.5 Crusher Drives	18
7.6 Fan Drives	19
7.7 Conveyor Drives	19
7.8 Clinker Coolers—General	19
7.9 Coal Mills	20
7.10 Storage Cranes	20
7.11 Stacker-Reclaimers	20
7.12 Vibrating Screens	20
8. Bibliography	21

IEEE Recommended Practice for Cement Plant Electric Drives and Related Electrical Equipment

1. General

1.1 Purpose. The purpose of these recommendations is to define and recommend practice for electric drives and related electrical equipment for installation in the cement industry in order to promote

- (1) Safety to personnel and equipment
- (2) Maximum reliability with minimum loss of production
- (3) Reduced maintenance and increased life of equipment
- (4) Clarification of needs and conditions to reduce special engineering and chance of error in specification
- (5) Overall economy.

1.2 Scope. These recommendations apply to all electric drives and include motors, control, and control wiring associated with machinery or equipment commonly used in the manufacturing areas of cement plants. They are intended as a guide and may be supplemented where special needs exist. They are not intended to apply to power distribution circuits.

These recommendations apply to electrical equipment having a supply voltage of 13 800 V or less. Voltages higher than this are not being covered at this time.

1.3 Use of Recommendations. It is urged that users and manufacturers cooperate with the working group to help formulate recommendations which will ensure the use of proven equipment and methods. The objective is to establish recommendations which will assist in preparing specifications for electric drives for cement plant equipment and their installation.

1.3.1 Definitions. Certain words used throughout these recommendations are defined as follows:

nominal. An approximate or rated value. For purposes of this standard within $\pm 10\%$.

should. Intended to indicate that which, at the present time, is considered a recommendation, that is, advised but not required.

1.3.2 Special Use of Terms. The terms suitable, adequate, effective, and securely denote conditions determined by the user or his representative after taking cognizance of all codes, standards, or practices applicable to the situation.

1.4 References. This guide shall be used in conjunction with the following publications. It is assumed that apparatus mentioned herein shall comply with the latest edition of the National Electrical Code. Cognizance of local codes must also be taken by the user to ensure that equipment involved complies therewith. Compliance with NEMA and American National Standards is also assumed where applicable to the equipment involved.

[1] ANSI/IEEE Std 113-1985, IEEE Guide on Test Procedures for DC Machines.¹

[2] ANSI/IEEE Std 277-1983, IEEE Recommended Practice for Cement Plant Power Distribution.

[3] ANSI/IEEE Std 519-1981, IEEE Guide for Harmonic Control and Reactive Compensation of Static Power Converters.

[4] ANSI/NEMA/ICS 1-1983, Industrial Control and Systems.²

[5] ANSI/NEMA/ICS 2-1983, Industrial Control Devices, Controllers, and Assemblies.

¹ ANSI/IEEE publications are available from the Institute of Electrical and Electronics Engineers, Service Center, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331, or the Sales Department, American National Standards Institute, 1430 Broadway, New York, NY 10018.

² ANSI/NEMA publications are available from the Sales Department, American National Standards Institute, 1430 Broadway, New York, NY 10018, or from the National Electrical Manufacturers Association, 2101 L Street, NW Washington, DC 20037.