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ATTACHMENT SPECIFICATION

CLASS IE
460 VOLT INDUCTION MOTORS 200 HORSEPOWER
AND BELOW SUPPLIED WITH DRIVEN EQUIPMENT

PERRY NUCLEAR POWER PLANT - UNITS 1 AND 2

SP-551-4549-00 OCTOBER 25, 1973

INFORMATION ONLY

SAFETY RELATED
QUALITY PROGRAM
REQUIRED

THE CLEVELAND ELECTRIC ILLUMINATING COMPANY
CLEVELAND, OHIO

LRWeissir 7/31/75
ORIGINATOR DATE

H. A. Manning 8/5/75
REVIEWED - QUALITY ASSURANCE DATE

JM Smith 8/6/75
APPROVED - PROJECT ENGINEER DATE

GILBERT ASSOCIATES, INC.
525 LANCASTER AVENUE
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L.R.W.-I.W.E.
W.O. 044549-000
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8-7-75

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INFORMATION ONLY

ATTACHMENTS

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1:01 Equipment, Material, and Services to be Supplied by the Vendor

1:01.1 This specification sets forth the essential information required by manufacturers for the design, fabrication, testing and delivery of Class IE integral horsepower 460 volt squirrel cage induction motors for the Perry Nuclear Power Plant - Units 1 and 2, of the Cleveland Electric Illuminating Company.

1:01.2 The equipment, to be supplied shall include, but not necessarily be limited to integral horsepower motors 200 horsepower and smaller, to be furnished by the supplier of the driven equipment, complete with all features and accessories as specified herein, said equipment and accessories to be mounted and shipped with the equipment.

1:01.3 The characteristics of the motors, as affected by the driven equipment, will be determined by the driven equipment manufacturer. In addition, the driven equipment manufacturer shall assume the responsibility for the engineering coordination with the motor suppliers.

1:02 Applicable Codes and Standards **INFORMATION ONLY**

The motors furnished shall be designed and manufactured in accordance with accepted current standards for electric utility equipment. The latest revision of the standards shall be adhered to as applicable. The following shall apply:

1. NEMA Standards Publication No.:

   a. MG-1, "Motors and Generators" parts 1, 2, 10, 11, 12, 14, 18, and 20.

   b. MG-2, "Safety Standard for Construction and Guide for Selection, Installation and Use of Fractional - and Integral - Horsepower Motors and Generators."

2. IEEE Standards

	Number	Title
a.	308	IEEE Standard Criteria for Class IE Power Systems for Nuclear Power Generating Stations
*b.	323	Qualifying Class I Electric Equipment for Nuclear Power Generating Stations, General Guide for

2. IEEE Standards (Cont'd)

	Number	Title
*c.	334	IEEE Guide for Qualification of Continuous Duty Class IE Motors for Nuclear Power Generating Stations
d.	DELETED	
*e.	344	Seismic Qualification of Class I Electric Equipment for Nuclear Power Generating Stations, Guide for

*Class IE Equipment is defined in IEEE-308 and replaces the term "Class I Electric Equipment."

3. ANSI Standards

INFORMATION ONLY

B3.15, "Load Ratings and Fatigue Life for Ball Bearings" (AFBMA Standard 9).

1:03 General Design Requirements

1:03.1 The motors shall be rated for 460 volt, 3 phase, 60 hertz operation. The maximum horsepower requirements of the driven equipment shall not exceed the nameplate rating of the motors.

1:03.2 Motors located within the containment building and inside the drywell shall be suitable for operation under the following conditions without loss of function:

1. Non-Accident:

a.	Duty,	continuous
b.	Exposure to Nuclear Radiation (accumulated dose over 40 years),	1.8×10^7 Rads
c.	Temperature,	135 F
d.	Pressure,	2.0 psig
e.	Relative Humidity,	90%

INFORMATION ONLY

2. Accident:

a. Exposure to Nuclear Radiation (accumulated dose during design basis event and post event) — 2.6×10^7 Rads

b. Exposure to Steam and Spray:

(1) Steam Exposure:

Time	Temperature (F)	Pressure (psig)
(a) 0 sec to 10 sec	135 to 280	0 to 62
(b) 10 sec to 5 min	280 to 340	62
(c) 5 min to 3 hr	340	40
(d) 3 hr to 6 hr	320	40
(e) 6 hr to 4 days	250	25
(f) 4 days to 100 days	200	10

(2) Spray Exposure:

Uniform spray of demineralized water during entire period.

1:03.3 Motors located within the containment building but outside the drywell shall be suitable for operation under the following conditions without loss of function:

1. Non-Accident:

a. Duty, — continuous

b. Exposure to Nuclear Radiation (accumulated dose over 40 years), — 7.0×10^6 Rads

c. Temperature, — 120 F

d. Relative Humidity, — 90%

2. Accident:

a. Duty, — 100 days

b. Exposure to Nuclear Radiation (accumulated dose during design basis event and post event), — 6×10^4 Rads

c. Temperature, — 120 F

d. Relative Humidity, — 90%

1:03.3A Motors located outside the containment building shall be suitable for operation under the environmental conditions specified in the Parent Specification.

1:03.4 Motors shall have service factors related to their horsepower rating and type of enclosure in conformance with NEMA MG 1-1972.

1:04 Electrical Design Features

INFORMATION ONLY

1:04.1 Motors shall be capable of starting from rest and accelerating their specified load with 75% of rated nameplate voltage existing (during acceleration) at the motor terminals.

1:04.2 Motors shall deliver their rated horsepower continuously without injury, when the voltage at the terminals is 10% above or below rated voltage at rated frequency.

1:04.3 Motors shall deliver their rated horsepower continuously without injury, when the frequency at the terminals is 5% above or below rated frequency at rated voltage.

1:04.4 Motors shall deliver their rated full load torque without injury when the voltage at the terminals drops to 70% of rated voltage for infrequent five-minute intervals.

1:04.5 Motors shall deliver not less than 90% of their full load torque at 85% of rated voltage and 92% of rated frequency. The motors shall be able to sustain this combination of low voltage and low frequency for at least ten minutes without injurious heating.

1:04.6 Motors when operating at rated voltage shall be capable of developing a maximum breakdown torque of not less than 200% of their rated full load running torque.

1:04.7 Motors shall be designed so that the locked rotor current shall not exceed 700% of rated full load current for drip-proof construction and shall not exceed 800% of rated full load current for totally enclosed construction. Motors under 3 horsepower may have a locked rotor current of 1000% of rated full load current.

1:04.8 Motors shall have a sealed insulation system.

1:04.9 Motors shall, with rated voltage and frequency, have the capability of starting from rest and accelerating their rated load to rated speed the number of times indicated below without injurious heating:

	Motor Horsepower Range	Number of Starts in Any One Hour Period Under Rated Ambient Conditions
1.	1-5	30
2.	6-50	15
3.	51-200	5

1:05 Structural Design Features

1:05.1 Motors shall be designed, built, and adequately braced for starting with 110% of rated voltage applied at the motor terminals.

1:05.2 Motors shall have lifting lugs or provision for attachment of lifting slings. Location of lifting points and lifting instructions shall be shown on the VENDOR'S drawings.

1:05.3 Motors shall have drip-proof enclosures unless otherwise required by the nature of the driven equipment or by the environment of the installation.

INFORMATION ONLY

1:05.4 The motor fans shall be designed and braced for vibrational and magnetic stresses during stalled rotor, starting and running conditions. Nondirectional cooling fans are required. Unidirectional fans will be approved by the ENGINEER upon special request.

1:05.5 Motors shall be supplied either with end shield-mounted anti-friction bearings made to Anti-friction Bearing Manufacturers' Association (AFBMA) Standards or with ring-lubricated sleeve type bearings depending on the suppliers standard for the given motor size. For motors equipped with anti-friction bearings, bearing rating life as defined by AFBMA Standard 9 dated June 1972 (ANSI B3.15-1972) shall be not less than 130,000 hours equivalent.

1:05.6 On anti-friction bearings, the housing shall be large enough to hold sufficient lubricant to minimize the need for frequent relubrication, but facilities shall be provided for adding new grease and draining out old grease without motor disassembly. The bearing housing shall have long, tight, running fits or rotating seals to protect against the entrance of foreign matter into the bearings, or leakage of grease out of the bearing cavity.

1:05.7 Bearing brackets and bearings, where applicable, shall be horizontally split and designed for easy maintenance and inspection.

1:05.8 Shaft and bearing housings shall be constructed with oil deflectors and seals so that the lubricant will not leak along the shaft or be thrown into the windings.

1:05.9 Motors rated above 50 horsepower with sleeve bearings and end shields, exclusive of totally enclosed motors, shall be provided with four access holes in at least one end shield opposite the air gap to permit insertion of an air gap feeler gauge between the rotor and stator. The difference between the largest and smallest air gap measurement shall not exceed 10% of the average gap.

1:05.10 The end of the shaft opposite the driving end shall be centered and accessible for taking speed readings with a portable tachometer. (Horizontal Motors Only)

1:05.11 Motors shall be balanced and aligned to have shaft runout tolerances as specified in MG1-11.08.

1:05.12 Oil level sight gauges shall be furnished for each bearing, where applicable, with oil level clearly marked for motor running and standstill conditions. Unless otherwise specified, the motor manufacturer shall furnish all motor lubrication equipment and auxiliaries. Type of oil or other lubricant to be used shall be included in the motor data drawing.

1:05.13 All motors shall be provided with a grounding connector permanently attached to the motor frame on the same side of the motor as the motor main lead terminal box. The grounding connector shall be a noncorrodible metal pad, welded or brazed to the motor frame, with a 3/8 in. threaded hole, having 16 threads per inch.

1:05.14 Terminal leads to windings shall be brought to terminal boxes of sizes considered standard by the manufacturer for the motor rating. If another size is required, the manufacturer will be so notified. The boxes shall be of sheet steel or cast construction with diagonal-split construction or equally convenient means of access to the motor terminals. The terminal box cover shall be gasketed or otherwise protected against dripping fluids.

1:05.15 The conduit openings shall be tapped for the following conduit size:

	Horsepower Rating	Conduit Size (in.)
1.	1 - 25	1-1/2
2.	30 - 50	2
3.	60 - 75	2-1/2
4.	100 - 200	3

INFORMATION ONLY

1:05.16 The terminal box mounting shall be so designed that the box can be rotated 360° from the vertical at 90° increments. The entrance shall be located so that the conduit will clear the motor frame without bending. Compression type terminal lugs shall be attached to the winding terminal leads for connection to the service cable. The opening in the motor frame through which the winding terminal leads pass shall be rounded off and smoothly finished, or provided with a grommet to prevent abrasive action on the cables.

1:05.17 All metal material, covers, screws, bolts, nuts, springs, studs, and other miscellaneous fittings shall be of corrosion resistant material or finish.

1:06 Sound Levels

All motors shall have sound levels not to exceed those permitted by NEMA Standard MG1-12.49.

1:07 Accessories

All motors rated 50 horsepower up to and including 200 horsepower, with sleeve type of bearing, shall have a chromel-constantan bearing thermocouple provided and mounted in the fixed half of each bearing. The bearing thermocouples shall be tip grounded, spring loaded, stainless steel sheathed with standard accuracy. 200 Hp motors shall be equipped with 6 standard accuracy chromel-constantan thermocouples to monitor stator temperature. The thermocouple leads shall be wired to terminal blocks located in a separate terminal box mounted on the motor frame.

1:08 Testing and Acceptance Criteria

INFORMATION ONLY

1:08.1 Qualification Tests:

1. A prototype of each Class IE motor shall have been qualified to meet its performance requirements during and following a Design Basis Event in accordance with the following publications:

   a. IEEE-323, "General Guide for Qualifying Class I Electric Equipment for Nuclear Power Generating Stations."

   b. IEEE-334, "Guide for Qualification of Continuous Duty Class IE Motors for Nuclear Power Generating Stations."

   c. IEEE-344, "Guide for Seismic Qualifications of Class I Electric Equipment for Nuclear Power Generating Stations."

2. The results of qualifying tests shall be documented by the VENDOR for future verification and reference by the OWNER.

1:08.2 Two CERTIFIED copies of the routine motor tests per IEEE No. 112A Section 2-2.1.1 or NEMA MG1 shall be forwarded to the ENGINEER for review, and later distribution to the OWNER. These tests shall consist of current and speed measurements at light load and no load, locked rotor current, and high potential test in accordance with NEMA MG1-1972-12.02 and 12.03.

1:08.3 The OWNER and ENGINEER shall have the right of witnessing all shop tests. The VENDOR shall notify the OWNER and ENGINEER at least one week in advance of all shop tests.

1:09 Painting

Outer surfaces of frame shall be filled where necessary and primed and then finished with one or more coats of suitable paint as required to give a smooth durable finish. Specific types of paint shall be as required in the Parent Specification.

1:10 Tagging, Packing, Shipping and Storage

Motors shall be tagged, packed, shipped and stored in compliance with the Parent Specification.

1:11 Drawings

INFORMATION ONLY

1:11.1 The supplier shall submit drawings for approval in accordance with Section 1:00 "INSTRUCTIONS AND INFORMATION," of the Parent Specification.

1:11.2 The drawings shall detail the general arrangements and principal dimensions of the motors, anchor bolt locations, and such details as may be required.

1:12 Data Required from the Vendor

The information listed on the Motor Data Form attached hereto shall be submitted as follows:

1. Three copies to:

The Cleveland Electric Illuminating Company
P. O. Box 5000
Cleveland, Ohio 44101

Attention: Mr. L. O. Beck
Project Engineer

2. One copy to:

Gilbert Associates, Inc.
P. O. Box 1498
Reading, Pennsylvania 19603

Attention: Project Services Dept.
W. O. No. 044549-000
Perry Nuclear Power Plant

1:13 Seismic Requirements

Seismic requirements and documentation shall be as set forth in the Parent Specification.

1:14 Quality Assurance

Quality Assurance requirements and documents shall be as set forth in the Parent Specification.

INFORMATION ONLY

MOTOR DATA FORM

INFORMATION ONLY

1. Manufacturer _____
2. Model No. _____
3. Frame No. _____
4. Type _____
5. Code (NEMA) _____
6. Enclosure _____
7. Insulation class and type _____
8. Horsepower (continuous or as noted) _____
9. Rated Voltage _____
10. Synchronous Speed (rpm) _____
11. Equipment WR^2 _____
12. Type of Bearing and Lubricant _____
13. Rated Full Load Current _____
14. Rated Full Load Torque _____
15. Rated Full Load Power Factor _____
16. Rated Full Load Efficiency _____
17. Rated Full Load Speed (rpm) _____
18. Rated Inrush Current _____
19. Breakdown Torque _____
20. Accelerating Time _____
21. Temperature rise by resistance (C) at Service Factor _____
22. Bearing temperature detector (type) _____