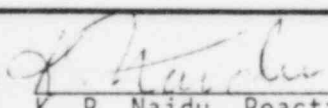
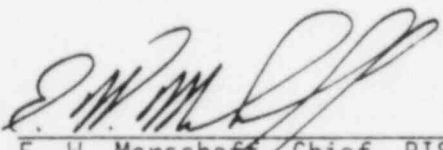


ORGANIZATION: SQUARE D COMPANY
PERU, INDIANA

REPORT NO.: 99900367/85-01	INSPECTION DATE(S): 10/1-3/85	INSPECTION ON-SITE HOURS: 15
CORRESPONDENCE ADDRESS: Square D Company Power Equipment Division ATTN: Mr. L. West Quality Assurance Manager 252 North Tippicone Peru, Indiana 46970		
ORGANIZATIONAL CONTACT: TELEPHONE NUMBER: (317) 472-3382		
PRINCIPAL PRODUCT: Motor Control Centers NUCLEAR INDUSTRY ACTIVITY: Less than one percent of total effort.		
ASSIGNED INSPECTOR:  K. R. Naidu, Reactive Inspection Section (RIS)		1/9/86 Date
OTHER INSPECTOR(S):		
APPROVED BY:  E. W. Merschoff, Chief, RIS, Vendor Program Branch		1/15/86 Date
INSPECTION BASES AND SCOPE: A. <u>BASES</u> : Appendix B of 10 CFR 50 and 10 CFR Part 21 B. <u>SCOPE</u> : This inspection was made to obtain additional information on a Part 21 report issued by Long Island Lighting Company on July 23, 1985 to the NRC; to review documentation on Motor Control Centers supplied to Shoreham, San Onofre Units 2 & 3, and V. C. Summer; and to review corrective action taken on inspection findings documented in NRC inspection report 99900367/81-01.		
PLANT SITE APPLICABILITY: Shoreham (50-322), San Onofre 2 and 3 (50-361 and 50-362), V. C. Summer (50-395)		

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99900367 PDR

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A. Inspection Issues

On July 23, 1985, Long Island Lighting Company (LILCo), the owner of Shoreham nuclear power plant, reported a potential 10 CFR Part 21 defect relative to the size 1 starters installed in Motor Control Centers. LILCo stated that they may have size 1 motor starters with operating coils which are only capable of picking up at 85% of the rated voltage instead of the required 77.5%. The objective of this inspection was to obtain additional information relative to this potential defect.

B. Background Information

Square D Company (Square D) located in Peru, Indiana, manufactured and supplied the 480 Motor Control Centers (MCCs) to Shoreham nuclear power plant. A combination of various sizes of circuit breakers and motor starters are installed in each MCC. Specification SH-1-115 developed by Stone and Webster (S & W), the architect engineer for Shoreham, provides the technical details for each MCC. Square D also supplied MCCs to San Onofre Units 2 & 3 and V. C. Summer nuclear power plants.

C. Inspection Findings and Other Comments

1. Review of Technical Specifications.

S & W issued specification SH-1-115 for the MCCs. This specification required the starter coils to be capable of pickup and operation at a minimum voltage of 85% of the rated voltage (the rated voltage is 120 volts). Subsequently, S & W determined that the degraded voltage could be as low as 77.5% of rated voltage. Correspondence between S & W and Square D indicates that Square D tested the starter coils for operation with 77.5% of rated voltage and determined that all starter coils except size 1 reversing starter coils picked up and operated at 77.5% of the rated voltage. The confidence level for the operating coils of size 1 reversing starters to operate at 77.5% rated voltage was low since the coils had to overcome the additional burden of interlock mechanisms and auxiliary contacts. Subsequently, Square D developed a coil capable of pickup and operation at 77.5% rated voltage in size 1 reversing starters. At that time, several MCCs had already been shipped to the Shoreham site.

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Square D shipped the special coils type 31041-400-41 to Shoreham and requested S & W to arrange the replacement of the existing coils type 31041-400-42 installed in size 1 reversing starters. The Specification SH-1-115 Revision 1 dated November 13, 1980, on page 1-10 specifies that the coils for combination starters for all class 1E MCCs are to be tested for pickup at 77.5% of rated voltage. Furthermore, the coils were required to withstand 110% of rated voltage continuously without damage.

2. Review of Documentation

a. Requirements

The specification required Square D to furnish the following documents:

- (1) Design test report documentation for class 1E MCCs
- (2) Certified factory test reports for class 1E MCCs
- (3) Statements of compliance with referenced specifications, codes and procedures
- (4) Seismic testing documentation
- (5) Certificate of seismic compliance
- (6) Calculations of Class II equipment
- (7) Anchorage systems.

b. Documentation package 12-01219-58 for MCC marked 1R 24 MCC 1128 was reviewed. The documentation package consisted of the following:

- (1) A quality control inspection checklist which verified that the following attributes complied with data sheet drawing 12-01219-58A 1, structural key sheet 12-01219-58:
 - (a) Physical inspection of the enclosure, doors, gasketing, internal barriers and other hardware.

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- (b) Inspection of the size of the bus system including the neutral, horizontal ground joints, short circuit bracing, and other electrical hardware.
- (c) Inspection of the general wiring.
- (d) Location of the starters and circuit breakers are as specified in the layout drawings.
- (e) Verification of the voltage ratings of the devices used in the assembly are correct.
- (f) Verification that the various specified electrical tests were performed.

The above checklist indicated that the inspection was completed on 10/13/76 and identified no unacceptable findings.

- (2) Assembly plant work sheets.
- (3) The Certificate of Compliance dated October 18, 1976, stated that the equipment was constructed in compliance with those specifications, codes, and procedures referenced in specification SH 1-115.
- (4) The Certificate of Seismic Compliance stated that equipment of similar design was tested in accordance with the seismic requirements in SH 1-115 and the test results were approved by Stone and Webster per letter dated November 17, 1975. The summary of test method stated that a combination of testing and analysis was used in the qualification of the equipment. Structures with devices installed were tested and data obtained from the test results were used to evaluate the response levels of a typical structure. Devices were also tested individually.
- (5) The Certification of Factory Tests dated October 12, 1976, stated that the following tests were performed:
 - (a) Dielectric test per ANSI C 19.1 section 15.15-65B operation and mechanical adjustment test per NEMA IC.1-2.40.

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(b) Molded case circuit breaker production test per NEMA AB1-2.22.

(c) Continuity test on all wires from termination to termination.

- c. Review of Documentation Package 12-01219-67 for MCC marked 1R 24-MCC-112Y. This package contains all the documents mentioned in the previous paragraph including a checklist, which was revised on November 23, 1976, to include the 77½% pickup voltage test.

3. Review of Test Procedure for Contact Pickup Voltage

Quality Control Procedure (QCP) #167 dated 12/19/79 was developed to test all starters intended for Shoreham nuclear power plant. QCP 167 adequately describes the test to verify that the coil picks up and operates at 77½% of the rated voltage and lists the test equipment to be used. A table furnishes the values of fixed resistances to be used in series with coils of various starter sizes. The series resistor was selected to simulate a "hot coil" assuming that the coil under test was at room temperature.

4. Review of Seismic Qualification Records

The specification SH-1-115 specifies that the MCC should be capable of withstanding the following events: Operating Basis Earthquake $g=0.26$ horizontal, $g=0.20$ vertical; Design Basis Earthquake $g=0.48$ horizontal, $g=0.28$ vertical. (g =acceleration as a fraction of acceleration due to gravity.)

Documents indicate that seismic withstandability tests were performed to determine the characteristics and limits of eleven common devices used in Model 4 Motor Control Center. The tests were conducted in accordance with test plan #8998-10.02 at Dayton T. Brown Inc. of Bohemia, Long Island, New York from October 17 through November 6, 1973. The eleven common devices consisted of five different types of circuit breakers, four starters - NEMA size 1 through 4, and two relays.

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All the specimens performed as anticipated. The number of mounting screws which fasten these starters to the enclosure were changed from three to five for size 3 and size 4 starters.

Agastat relays were qualified on June 22, 1981. A seismic simulation test was performed to determine the dynamic characteristics of Model 4 MCC with various unit and short circuit bracing levels. These tests were conducted in accordance with the test plan identified as 108-1.01 dated 02/20/74 at Wyle Laboratories in Huntsville, Alabama from May 13 through May 22, 1974. A total of 229 test runs were conducted.

Conclusions

The test demonstrated that the Model 4 MCC would operate properly in nuclear power plants under a variety of earthquake conditions. The test plan was designed to be conservative by incorporating several worst case conditions such as:

- a. Deceleration response and contact chatter were monitored on the unit mounted in the uppermost position.
- b. Single and multiple frequency test inputs were used; thus, the control center was subjected to more simulated seismic excitation than it would be expected to experience during its lifetime.

The seismic withstandability parameters of the devices monitored during this test were determined in phase I of the seismic test program. These devices were size 1 through size 4 starters, circuit breakers and relays. The seismic performance of any device in the event of an earthquake can be determined by comparing the dynamic environment of each device mounting location to the acceleration qualification level "AQL" of each device.

The difference in the natural frequencies of structures braced for 65 Kilo Amperes (KA) and 42KA and those for a standard 22KA braced structure is minor and was not considered.

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5. Review of Inspector Qualification Records

The Quality Assurance (QA) staff consists of a QA manager, five Quality Control inspectors and eight Quality Assurance analysts.

Review of the qualification records of five QC inspectors and three QA analysts identified no unacceptable findings.

6. Review of Documentation on MCCs Supplied to San Onofre Nuclear Generating Station

Specification SO 23-302-4 dated August 16, 1974, issued by Bechtel Power Corporation, Norwalk, California, established the following test requirements for MCCs.

- (1) Paragraph 4.6.3.2 requires the completely assembled MCC to be tested in accordance with UL Standard for Safety 845 and NEMA publication No. ICS-1970.
- (2) Paragraph 4.6.3.2 requires dielectric tests to be made on each assembled unit at the vendor's factory prior to shipment.
- (3) Paragraph 4.6.3.3 requires the vendor to demonstrate that endurance tests were performed in accordance with NEMA ICS-1970 on circuit breakers.

- b. Review of the documents associated with MCC 3BJ supplied for the San Onofre nuclear generating plant indicates that tests were performed to satisfy the specification requirements enumerated in the preceding paragraph. The documents were filed in two separate folders, one to comply with Bechtel's requirements and the other to reflect Square D manufacturing requirements.

The review identified no unacceptable findings.

7. Review of Documentation on MCCs Supplied to V. C. Summer Nuclear Generation Station

- a. Requirements for MCCs.

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Specification SP-555-044461-000 dated August 14, 1974 issued by Gilberts Associates, specifies the requirements for 480 volt MCCs. The following are the highlights relative to the starters and circuit breakers:

- (1) Paragraph 2:05.7.2.a requires the holding coil to be rated for 120 volts 60 hertz per ICS.2-110.41. In addition, the coil shall have a drop out voltage of less than 65% of the rated voltage.
- (2) Paragraph 2:07.2 specifies the following tests:
 - (a) With all of combination starters and circuit breakers in place, the equipment shall successfully pass the dielectric test for 600 volt equipment performed in accordance with NEMA ICS Part 1-109.05.
 - (b) All testing requirements specified in items 2:03 and 2:04 shall be carried out and documented. (2:03 lists several Gilbert requirements; 2:04 lists several applicable codes and standards).
 - (c) Copies of all test documents shall be submitted to the OWNER and ENGINEER before shipment of the equipment.
 - (d) The bidder shall submit with his proposal a list of all design and production tests to be performed on the equipment quoted.

b. Seismic requirements for MCCs.

The specification describes the seismic requirements which the MCCs should withstand without deleterious effects.

- (1) Operating Base Earthquake (OBE) shall mean that earthquake which is of sufficient probability of occurrence to require its resulting ground accelerations at a site to be considered for operational loadings. The maximum horizontal ground acceleration for OBE is 0.10 g for foundations in rock and 0.15 g for foundations in soil. The corresponding vertical acceleration is 2/3 of the horizontal acceleration.

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(2) Design Basis Earthquake (DBE)

Maximum horizontal ground acceleration for DBE is 0.15 g for rock and 0.25 g for soil. Vertical acceleration is 2/3 of horizontal acceleration.

- c. The inspector reviewed two documentation packages identified as 12-01219-07 and 12-01219-058. The following documents stated that each MCC was acceptable.

- (1) A QC inspection checklist verified that all the attributes in the MCC were in compliance with the applicable drawings.
- (2) The Certificate of Compliance stated that the MCC is in compliance with the requirements of the purchase order, including all acknowledged revisions and deviations.
- (3) The Certificate that Factory Tests were performed indicated that no unacceptable conditions were identified.

8. Inspection Results

The results of the inspection indicate that Square D performed adequate tests on the replacement starters supplied to Shoreham to assure that the coils in size 1 reversing starters would pick up and operate at 77½% rated voltage. Square D shipped coils separately to Shoreham for installation in size 1 reversing starters which had been furnished prior to the 77½% rated voltage operation requirement. Review of the documentation packages for MCCs supplied to San Onofre and VC Summer nuclear power stations identified no unacceptable findings.

D. Action Taken on Previous Inspection Findings

The inspector reviewed action taken by Square D on the nonconformances identified during an inspection conducted during November 30 through December 4, 1981, and documented in Inspection Report 99900367/81-01.

1. (Closed) Item A identified that Quality Control Procedure #187 dated February 18, 1980 was not completely followed. The reportability portion of the form had not been completed for Problem Report No. 1980-2 which related to coating on rubber bumpers for size 3 starters which was initially reported on February 28, 1980. The Master Form was revised on October 3, 1981 to clarify the reporting section.

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2. (Closed) Item B identified that design control measures were not adequately implemented for field changes related to relocation of switchgear within cabinets to eliminate the problem of pinched wires. The corrective action was in the form of a letter dated 02/24/82 to the Square D Utility Sales Group and the Design Engineering Group to stress the importance of documenting reviews of all design changes including field changes.
3. (Closed) Item C identified that contrary to Square D Standard Practice Bulletin (SPB) 512.406 dated December 6, 1976, corrective action had not been reviewed within the prescribed time limits for each finding identified in the QA Program Audit conducted during July 13 and 14, 1978. The corrective action taken was to place all audit finding reports on a 30 day or less followup schedule.
4. (Closed) Item D identified that contrary to SPB 521.307 dated November 10, 1977, Paragraph III.B, Route Change Form No. PE-1014 was not being used to change Master Record Routings. Instead, the inspector was informed that the Operational Routing Manual, dated September 28, 1981, (which was not an approved document at that time) was being used to change Master Record Ratings. Corrective action taken was to review the Standard Practice Bulletins and require internal audits to review these procedures for correctness and accuracy.
5. (Closed) Item E identified that contrary to SPB 500.020 dated September 20, 1976 and Quality Control Procedure 200-9, Revision C, dated October 15, 1981, personnel had not satisfactorily performed the electrocoat paint process to comply with applicable procedures and the records maintained on the electrocoat paint process did not verify control of equipment settings, chemical tests and gauge readings. Corrective action taken was to revise the control record to document the set up ranges rather than the upper and lower limits for the temperatures at various stations, the pressure, the ph and the free alkali.
6. (Closed) Item F identified that contrary to SPB 500.12 dated June 22, 1973, the location of a drawing removed from the Master File was not identified prior to removal and revision marks were not placed on some drawings to indicate the latest changes made on those drawings. SPB 500.12 was revised and now requires a reproducible copy to be placed in the Master File whenever Master drawings are removed. The

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reproduced copy is to be stamped and will contain the design notice number, date and the name of the draftsman or engineer. The revised procedure requires that the revision marks not be removed.

7. (Closed) Item G identified that contrary to SPB 512.407 dated May 11, 1976, neither the Peru Plant QC Supervisor nor his designate had reviewed each written QCP annually as evidenced by the lack of records of QCP reviews. Corrective action taken was to revise SPB 512.407 to simplify the review documentation by providing for the reviewer to sign on the QCP contents page that the review was completed.

E. Persons Contacted

A. B. Sagersee, Manager, Utility Marketing

L. West, Manager, Quality Assurance

R. B. Wiley, Product Qualification Engineer

D. Rogers, Product Specialist

S. Higgins, Q.C. Supervisor

A. Birkmire, Q.C. Analyst

F. Exit Interview

The inspector met with the Quality Assurance Manager at the conclusion of the inspection and discussed the scope and findings.

INSPECTOR Naidu
SCOPE _____

DOCUMENTS EXAMINED

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ITEM NO.	TYPE OF DOCUMENT	DOCUMENT NO.	REV.	DATE	TITLE / SUBJECT
1	Specification	SH-1-115			Specification for Motor Control Centers for Shoreham Nuclear Station.
2	DWG	12-01219-SBA			Data Sheet Drawing.
3	DWG	12-01219-58			Structural key sheet.
4	Doc Package	12- 01219 ⁰¹²¹⁹ -67			Documentation Package
5	QC List	12-01219-67			QC check list
6	C.O.C			6/21/67 June 21, 1967	Certificate of Conformance
7	COFC			6/21/77 June 21, 1977	Certification of Factory Tests
8	QCP			12/19/79	QCP Procedure to test starter coils
9	SPEC	SO23-302-4		8/16/74	Specification for the supply of MCCs to San Onofre Nuclear Station
10	COFC			1/31/77	Certificate of Factory tests for MCCs for San Onofre
11	QC Verification list			1/2/77	Verification documentation list.
12	12-02690 Doc Package				Documentation package for MCC 3BJ installed at San Onofre Nuclear Station.
13	SPEC	SP-555-044 661		8/14/74	Specification for MCCs for V.C. Summer.
14	Doc Package	12-0219-07			Documentation packages for MCCs installed at V.C. Summer
15	Doc Package	12-0219-58			Documentation packages for MCCs installed at V.C. Summer.

TYPE OF DOC:

DWG - DRAWING
SPEC - SPECIFICATION
PRO - PROCEDURE
QAM - QA MANUAL
QCD - QC DOCUMENT
PO - PURCHASE ORDER

LTR - LETTER

