August 31, 1984

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION



Before the Atomic Safety and Licensing Board

| | | |
|---|---|---|
| In the Matter of | ) | |
| | ) | |
| CAROLINA POWER & LIGHT COMPANY | ) | Docket No. 50-400 OL |
| and NORTH CAROLINA EASTERN | ) | |
| MUNICIPAL POWER AGENCY | ) | |
| | ) | |
| (Shearon Harris Nuclear Power | ) | |
| Plant) | ) | |

APPLICANTS' TESTIMONY OF ROBERT W. PRUNTY AND PETER M. YANDOW IN RESPONSE TO EDDLEMAN CONTENTION 9B (LIMITORQUE VALVE OPERATORS)

Q.1 Please state your names.

A.1 Robert W. Prunty and Peter M. Yandow.

Q.2 Mr. Prunty and Mr. Yandow, are your addresses, occupations, employers, educational backgrounds and professional work experiences described elsewhere in the record of this proceeding?

A.2 (RWP, PMY) Yes, the relevant information is provided in "Applicants' Testimony of Robert W. Prunty and Peter M. Yandow in Response to Eddleman Contention 9 (Environmental Qualification of Electrical Equipment)."

Q.3 What is the purpose of this testimony?

A.3 (RWP, PMY) The purpose of this testimony is to respond to Eddleman Contention 9B, which states:

> There is not sufficient assurance that the concerns with Limitorque valve operators identified in IE Information Notice 83-72 (except for Items C2, C5 and C7) have been adequately addressed.

Q.4 How is your testimony organized?

A.4 (RWP, PMY) First, we provide background information on Limitorque valve operators, including a description of a valve operator and an explanation of the safety functions performed by Limitorque valve operators at SHNPP. Second, we summarize the concerns relating to Limitorque valve operators contained in IE Information Notice 83-72, and describe generally CP&L's field verification program to address those concerns referenced in Eddleman Contention 9B. Third, we discuss in turn each of the following concerns about Limitorque valve

operators referenced in Eddleman Contention 9B: (1) qualification and rating of terminal blocks, (2) qualification of motor insulation material, (3) installation orientation, (4) installation of drain plugs, (5) lack of agreement between purchase order and qualification files and installed components, and (6) qualification of O-rings. With respect to each of these concerns, we describe the concern and the actions CP&L is taking to resolve it.

Q.5 Mr. Yandow, what is a valve operator?

A.5 (PMY) A valve operator (or actuator) is a component of a valve which causes it to open or close. Limitorque valve operators contain electrical motors which, through a series of mechanical gears, cause the valve to change position. Examples of types of valves which use Limitorque operators at SHNPP are globe valves, butterfly valves and gate valves. A typical gate valve with a Limitorque operator is shown in Figure 1 (attached hereto). Figure 2 (attached hereto) provides a more detailed picture of a Limitorque operator.

Q.6 Are Limitorque valve operators used at SHNPP?

A.6 (PMY) Limitorque valve operators are used on a number of valves which perform safety-related functions at SHNPP. Those functions include: isolation of the reactor containment, isolation of the reactor coolant system pressure boundary, operation of the emergency core cooling system, and operation of emergency safeguard systems. Limitorque valve operators are found in various locations in the reactor containment and the reactor auxiliary building.

Q.7 How did CP&L become aware of the concerns about Limitorque valve operators reported in IE Information Notice 83-72?

A.7 (RWP) CP&L, as the holder of a construction permit for SHNPP, receives IE Information Notices issued by the NRC. IE Information Notice 83-72 was received by CP&L's Nuclear Licensing Department and was distributed to the Harris Plant Engineering Section ("HPES") for evaluation.

Q.8 What were the results of CP&L's evaluation of the concerns raised in IE Information Notice 83-72?

A.8 (PMY) Equipment Environmental Qualification Notice No. 24 of IE Information Notice 83-72 (October 28, 1983) provides information on deficiencies related to Limitorque valve operators at Consumer Power Company's Midland Plant, Units 1 and 2 ("Midland"). These deficiencies were construction deficiencies reported to the NRC Staff pursuant to 10 C.F.R. § 50.55(e) by The Bechtel Associates Professional Corporation ("Bechtel"), the Architect/Engineer for Midland.

After reviewing the Information Notice, CP&L contacted the Limitorque Corporation ("Limitorque") for additional information in order to determine possible applicability of the Information Notice to SHNPP. Limitorque in its written response stated that, with one possible exception, all of the deficiencies found at Midland were plant specific. Most of the Midland specific deficiencies were the result of lack of information concerning qualification of the operators on the part of

Midland personnel, rather than hardware deficiencies. The other Midland specific deficiency was a field related problem. The only deficiency which possibly was not limited to Midland was the use of unqualified terminal blocks in some operators supplied to Westinghouse. However, Limitorque indicated that Westinghouse had undertaken to identify and replace all unqualified terminal blocks. Therefore, Limitorque did not recommend that any corrective action be taken by CP&L as a result of IE Information Notice 83-72.

Nevertheless, CP&L is in the process of implementing a field verification program for the 16 active, safety-related valves with Limitorque operators located inside containment at SHNPP. The inspections will be conducted by equipment qualification personnel. The field verification program will provide additional assurance that unqualified terminal blocks, and each of the other concerns raised in Eddleman Contention 9B, have been adequately addressed for SHNPP. The results of the field verification program, and CP&L's evaluation of the those results, will be documented in the environmental qualification packages for the valves of concern.

Q.9 Please describe the concerns at Midland relating to Limitorque terminal blocks.

A.9 (PMY) Items A, B and C9 of IE Information Notice 83-72 were all deficiencies at Midland relating to Limitorque terminal blocks. Item A concerns underrated terminal blocks. While replacing a damaged terminal block on a Limitorque

operator, Bechtel discovered that some of the terminal blocks used for the termination of the leads from the 460-volt motor were rated less than 460 volts. The underrated terminal blocks could have prevented the valves from performing their safety function, and also posed a safety hazard to plant personnel.

According to Limitorque, Bechtel in 1979 had requested that Limitorque replace the terminal blocks in a certain group of operators for the purpose of providing additional terminal points. When the Limitorque field service representative ran out of factory supplied terminal blocks, he obtained additional terminal blocks locally. These terminal blocks were not rated for 460 volt service. Following identification of the error, Limitorque inspected all the operators whose terminal blocks had been replaced, and replaced those that were underrated with terminal blocks rated for 460 volts. To confirm that the underrated terminal blocks were limited to this particular group of operators, Limitorque inspected a random sample of its other operators at Midland and found no other instances of underrated terminal blocks.

Item C9 of IE Information Notice 83-72 involved Midland personnel's inability to identify terminal blocks in the low voltage control circuits of Limitorque operators. Limitorque conducted a random inspection of its operators at Midland and found all control terminal blocks inspected to be identifiable and suitable for their application. Limitorque then instructed Midland personnel on how to identify the terminal blocks by using vendor supplied catalog data sheets.

Item B of IE Information Notice 83-72 was a deficiency at Midland involving the use of unqualified terminal blocks in some Limitorque operators. The terminal blocks in question were Buchanan 0824 nylon terminal blocks, which have never been type tested. In addition, tests have shown that nylon experiences 25 percent degradation at a radiation dose of 4.7 x 10E6 rads. Some Limitorque operators at SHNPP are located in areas that could receive a total integrated dose of greater than 4.7 x 10E6 rads. Limitorque has stated that Buchanan 0824 terminal blocks were used exclusively on operators provided to Westinghouse. Westinghouse has supplied valves with Limitorque operators to SHNPP. However, Westinghouse has notified CP&L that none of those operators has Buchanan 0824 terminal blocks.

Q.10 Is CP&L taking any action to address terminal blocks in Limitorque operators?

A.10 (PMY) As discussed above, CP&L has developed and is in the process of implementing a field verification program for Limitorque valve operators. Active, safety-related Limitorque valve operators located inside containment at SHNPP will be inspected.

Limitorque has provided CP&L with the particular dimensions of the types of terminal blocks which were tested with the valve operators supplied to SHNPP. Those terminal blocks include Buchanan types 0524 and 0222, Marathon types 300 and 1600, Curtis type L, and General Electric type EB-5. Field verification of the terminal blocks consists of measuring the

dimensions of the power and nonpower lead terminal blocks, including the point-to-point distances of the terminal screws, and comparing these measurements with the vendor supplied information. (See, for example, Figures 3 and 4, attached hereto.) To date, all terminal blocks inspected have been environmentally qualified. Any unqualified terminal blocks found will be replaced with qualified terminal blocks.

Q.11 Please describe the concern at Midland involving Limitorque motor insulation material.

A.11 (PMY) Item C1 of IE Information Notice 83-72 concerns identification by Bechtel of Class H insulated motors inside the containment at Midland, for which the motor nameplate ambient temperature rating was 50°C. Bechtel stated that it was not aware that Class H insulated motors had been type tested and found environmentally qualified for inside containment in accordance with the applicable IEEE standard.

Limitorque has explained that prior to the adoption of the Class RH nomenclature for motors whose insulation material is qualified for inside containment, motors of this design characteristically were nameplated as Class H. However, Limitorque must review its records on each Class H insulated motor to confirm that the motor is constructed with a Class RH insulation system. The results of Limitorque's review for Midland Class H motors located inside containment showed that all the motors were properly qualified.

Q.12 What action is CP&L taking to address Limitorque motor insulation material?

A.12 (PMY) CP&L requested Limitorque to conduct a review of its records on valve operators located inside containment at SHNPP. Limitorque's review indicated that the valve operator motors for SHNPP have qualified insulation.

In addition, CP&L is checking Limitorque motor ratings on the nameplates as part of its field verification program. Serial numbers for any motors indicating Class H insulation will be provided to Limitorque in order that Limitorque can confirm that RH insulation was used. To date, all motor insulation material has been identified to be RH. Any valve operator motor found to be unqualified for inside containment will be replaced with a qualified motor.

Q.13 Please describe the concern relating to installation orientation of Limitorque valve operators at Midland.

A.13 (PMY) Item C3 of IE Information Notice 83-72 was based on Bechtel's observation of Limitorque operators installed in various orientations at Midland. Bechtel did not know whether the operators were qualified for all installation orientations.

Limitorque Qualification Report B-0058 provides recommendations for installing Limitorque valve operators. Limitorque recommends against mounting the operator in a position where either the motor or the limit switch compartment is directly beneath the gear case. There is a remote possibility

that a random seal failure could occur, resulting in lubricant leaking into the electrical enclosures and possibly impairing the operability of the equipment.

Q.14 What action is CP&L taking to address installation orientation of Limitorque valve operators?

A.14 (PMY) CP&L and its Architect/Engineer follow specified procedures to assure proper installation orientation of safety-related electrical equipment, including Limitorque valve operators.

CP&L's field verification program for Limitorque valve operators also includes a check of installation orientation. So far, no deviations from Limitorque's recommended orientations have been identified. Orientation of any valve operators installed incorrectly will be modified to conform to Limitorque's recommendations.

Q.15 Please describe the concern relating to installatior of drain plugs in Limitorque valve operators at Midland.

A.15 (PMY) Item C4 includes two related concerns having to do with proper drainage of the valve operator motors. The first was that motor drain plugs (T-drains) were not always in place. The second was that orientation of the operators did not always result in the drain holes being at the lowest point of the operator as installed. Bechtel did not know whether either of these facts was relevant to the environmental qualification of the operators.

Limitorque has informed CP&L that valve operators qualified for inside containment require the installation of motor drain plugs in order to prevent possible moisture buildup in the motor. The drain plugs must be installed in the two lowest drain plug locations. These locations will vary depending on the installation orientation, as determined by SHNPP installation design drawings. Therefore, the drain plugs are placed in the limit switch compartment, with installation instructions, at time of shipment of the operators by Limitorque.

Q.16 What action is CP&L taking to address installation of motor drain plugs?

A.16 (PMY) Installation orientation of Limitorque valve operators is addressed above with respect to Item C3.

To ensure the proper documentation and inspection of the drain plugs, CP&L HPES has specifically instructed construction personnel via a site design document to install the drain plugs. The design document is now part of the work package used to install the equipment. A special note also has been added to the installation design drawing used along with the work package by construction personnel. This note directs the person installing the drain plugs to install them at the lowest oriented points in the motor. Proper installation of the drain plugs will be independently verified in the field by the on-site quality inspection organization. In addition, proper installation will be checked as part of the field verification program for Limitorque valve operators.

Q.17 What was the concern at Midland relating to purchase order and qualification files agreeing with installed components, and what action is CP&L taking to address it?

A.17 (PMY) Item C6 of IE Information Notice 83-72 simply states that "[i]nformation obtained from purchase order files and qualification files does not agree with the installed components."

As part of the procurement process for safety-related electrical equipment at SHNPP, the design engineering organizations at Ebasco and CP&L review the equipment qualification documentation against the requirements contained in the purchase order and specifications for the equipment in order to determine compliance with those requirements. The equipment itself is inspected: (1) prior to shipment, (2) upon receipt at the site, and (3) after installation, in order to verify that the equipment agrees with the purchase order, specifications and other design documents.

CP&L's field verification program for Limitorque valve operators will provide additional assurance that the installed valve operators are identical to those which have been environmentally qualified for SHNPP, as documented in the purchase orders and environmental qualification packages.

Q.18 Please describe the concern regarding qualification of O-rings.

A.18 (PMY) Item C8 of IE Information Notice 83-72 questions the qualification of O-rings used in the Limitorque valve operators at Midland.

The vendor test reports which describe qualification testing of Limitorque valve operators, both for inside and outside containment, identify O-rings as components included in the tests. O-rings thus are qualified as an integral part of the equipment.

Limitorque's valve operator assembly control system, as described to CP&L by Limitorque, assures that the proper O-rings are used in the assembly of each type of valve operator. All components for an operator being assembled are collected in one assembly area. Each component is inspected to affirm that it is the correct type. O-rings are marked by Limitorque with a color code, which facilitates proper identification.

Q.19 What action is CP&L taking to address qualification of O-rings?

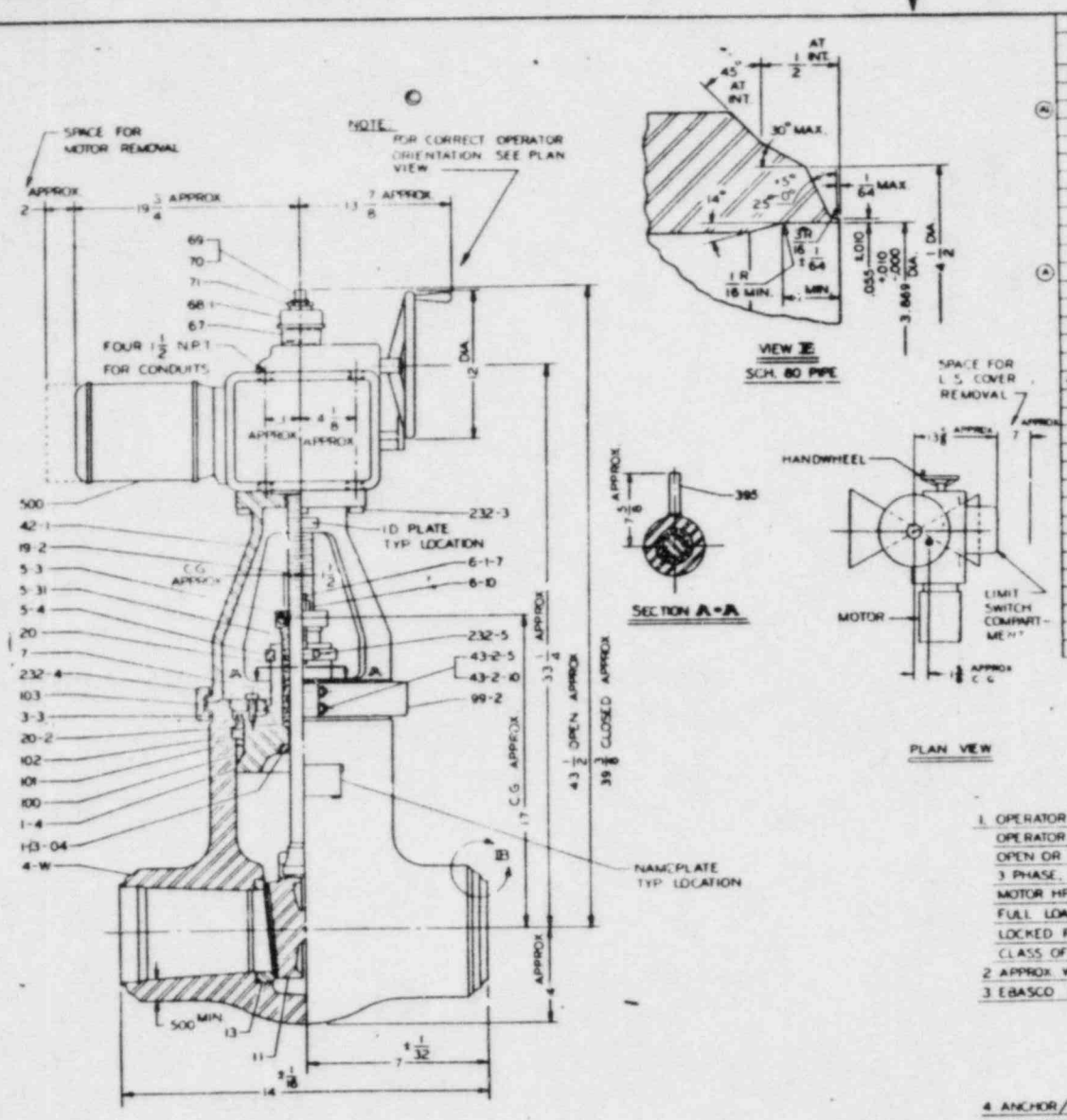
A.19 (PMY) For the reasons stated above, CP&L does not believe that Item 8 of IE Information Notice 83-72 raises a potential concern for SHNPP. Further, O-rings cannot be identified without disassembling the operator. However, if the field verification program identifies any components of an operator for which qualification appears questionable, the operator will be disassembled and all questionable components of the operator, including any unidentifiable O-rings, will be replaced.

Q.20 In conclusion, is there reasonable assurance that the above concerns with Limitorque valve operators identified in IE

Information Notice 83-72 have been adequately addressed by the environmental qualification program for SHNPP?

A.20 (RWP, PMY) Yes.

Figure 1







VIEW E
SCH. 80 PIPE




SECTION A-A




PLAN VIEW

| PART NO. | NO. REQ'D | PART NAME | MATERIAL |
|---|---|---|---|
| 1-3-04 | 1 | STOP RING WITH STELLITE | SA 515 GRADE 70 |
| 1-4 | 1 | BONNET | SA 105 GRADE 2 |
| 3-3 | 1 | CANOPY RING | SA 106 GRADE B |
| 4-W | 1 | WELD ENDS BODY | SA 216 GRADE WCB |
| 5-3 | 1 | FOLLOWER FLANGE | A 36 |
| 5-31 | 1 | FOLLOWER GLAND | A 582 TYPE 416 |
| 5-4 | 1 | GLAND CLAMP | A 36 |
| 6-1-7 | 2 | FOLLOWER BOLTS | A 193 GRADE B7 |
| 6-10 | 2 | FOLLOWER NUTS | A 194 GRADE 2H |
| 7 | 1 | LANTERN GLAND | A 582 TYPE 416 |
| 11 | 1 | DISC WITH STELLITE | SA 216 GRADE WCB |
| 13 | 2 | SEAT RINGS WITH STELLITE | SA 519 GRADE 1026 |
| 19-2 | 1 | STEM | A 582 TYPE 416 COND. T |
| 20 | 1 SET | UPPER PACKING | JOHN CRANE 187 I |
| 20-2 | 1 SET | LOWER PACKING | JOHN CRANE 187 I |
| 42-1 | 1 | YOKE | A 216 GRADE WCB |
| 43-2-5 | 2 | YOKE CLAMP STUDS | A 193 GRADE B7 |
| 43-2-10 | 4 | YOKE CLAMP NUTS | A 194 GRADE 2H |
| 67 | 1 | STEM PROTECTOR | COMMERCIAL STEEL |
| 68-1 | 1 | PIPE CAP | COMMERCIAL IRON |
| 69 | 1 | INDICATOR ROD | A 582 TYPE 416 COND. T |
| 70 | 1 | JAM NUT | A 165 TYPE NS |
| 71 | 1 | SERVICE ENTRANCE CONNECTOR | STEEL AND RUBBER |
| 99-2 | 1 | YOKE CLAMP | A 36 |
| 100 | 1 | PRESSURE SEAL GASKET | COMMERCIAL IRON |
| 101 | 1 | SPACER RING | A 519 GRADE 1015 |
| 102 | 1 | GASKET RETAINING RING | SA 105 GRADE 2 |
| 103 | 1 | BONNET RETAINING RING | A 36 |
| 232-3 | 4 | LIMITORQUE CAP SCREWS | A 574 |
| 232-4 | 6 | BONNET CAP SCREWS | COMMERCIAL STEEL |
| 232-5 | 2 | GLAND CAP SCREWS | A 574 |
| 395 | 1 | LEAKOFF PIPE | SA 106 GRADE B |
| 500 | 1 | LIMITORQUE OPERATOR | COMMERCIAL |

| | DESCRIPTION | BY | DATE |
|---|---|---|---|
| A | PART NO 13 MAT'L WAS SA 564 GR 630 | | |
| A1 | PART NO 33 MAT'L WAS SA 105 2 | | |
| B | REVISED OPERATING TIME - NOTE 1 | | |
| B1 | REVISED TAG NOS. - NOTE 3 | | |
| B2 | ADDED NOTE 5 | | |
| B3 | ADDED 11B AND 13B C.G. DIMENSIONS | | |
| C | ROTATED OPERATOR 90° AND ADDED NOTE | | |

NOTES

1. OPERATOR MANUFACTURER = PHILA. GEAR CORP.
   OPERATOR SIZE = SMB-00 WITH 15 FT. LB. MOTOR
   OPEN OR CLOSING TIME = 24 SECONDS.
   3 PHASE, 60 CYCLES, 460 VOLTS
   MOTOR HP = 1 RPM = 1800
   FULL LOAD AMPS = 2.8
   LOCKED ROTOR AMPS = 16
   CLASS OF INSULATION = B
2. APPROX. WEIGHT = 440 LBS.
3. EBASCO TAG NO. 2AF-V105A-1, 2AF-V105A-2, 2AF-V195A-1, 2AF-V195A-2, 2AF-V235A-1, 2AF-V235A-2, 2AF-V116SB-1, 2AF-V116SB-2, 2AF-V117SB-1, 2AF-V117SB-2, 2AF-V118SB-1, 2AF-V118SB-2
4. ANCHOR/DARLING SO E5796 ITEM 1.
5. LIMITORQUE OPERATOR DWG. 02-403-0012-3 REV. E
   LIMITORQUE WIRING DIAGRAM 15-477-3421-3 REV. A

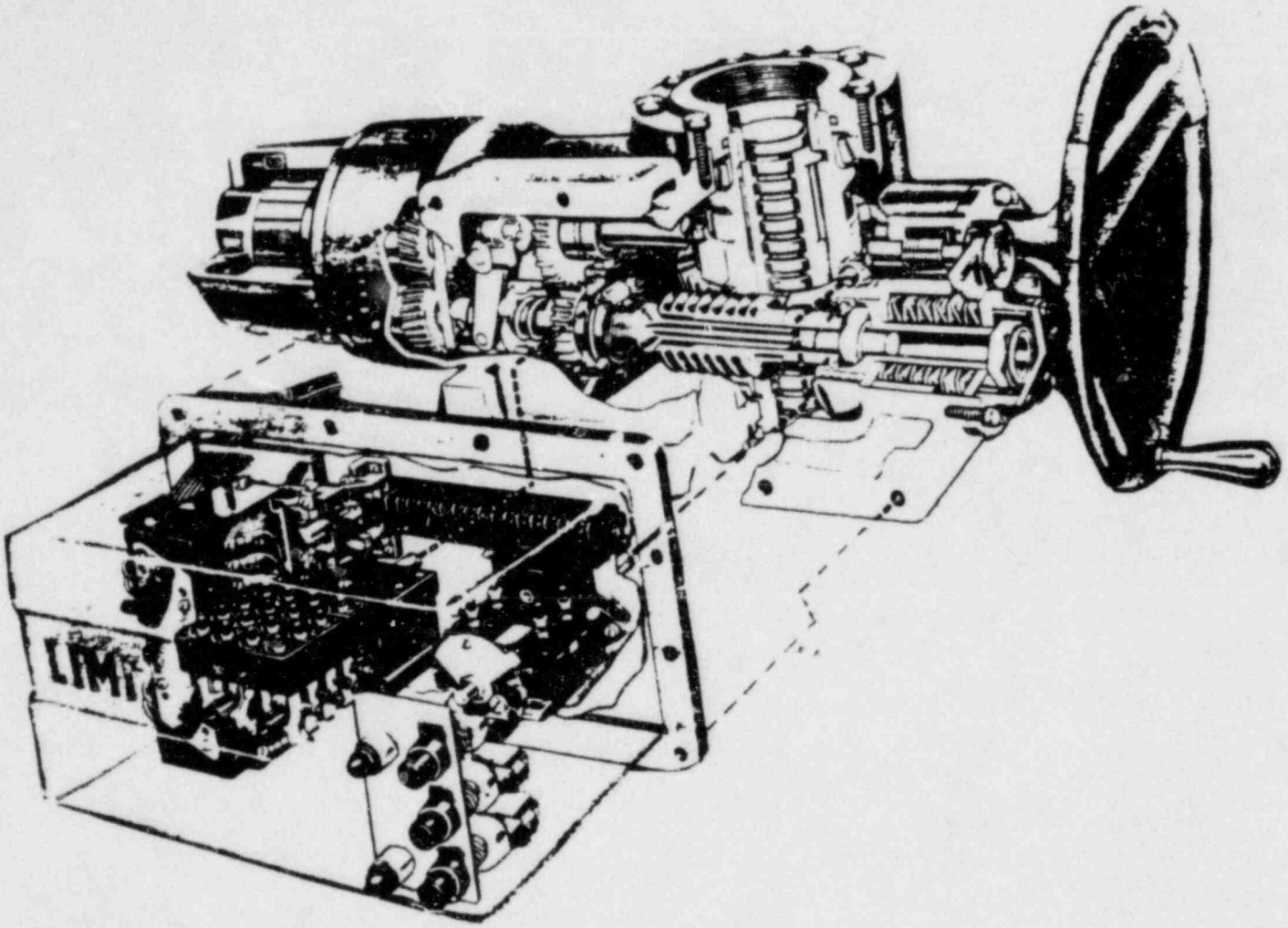
EBASCO SERVICES INC.
SHEARON HARRIS 1 AND 2
EBASCO PO NY-435013

ANCHOR / DARLING VALVE COMPANY
WILLIAMSPORT, PA. U.S.A. 17701

4" - 900 WELDING ENDS, CARBON STEEL, FLEX WEDGE GATE VALVE WITH SMB-00 LIMITORQUE OPERATOR

| DRAWN | CHECKED | ENGINEER | APPROVED | DRAWING NO. | REV. |
|---|---|---|---|---|---|
| 12-12-73 | 1-7-74 | 1-8-74 | 1-7-74 | 94-13576 | C |

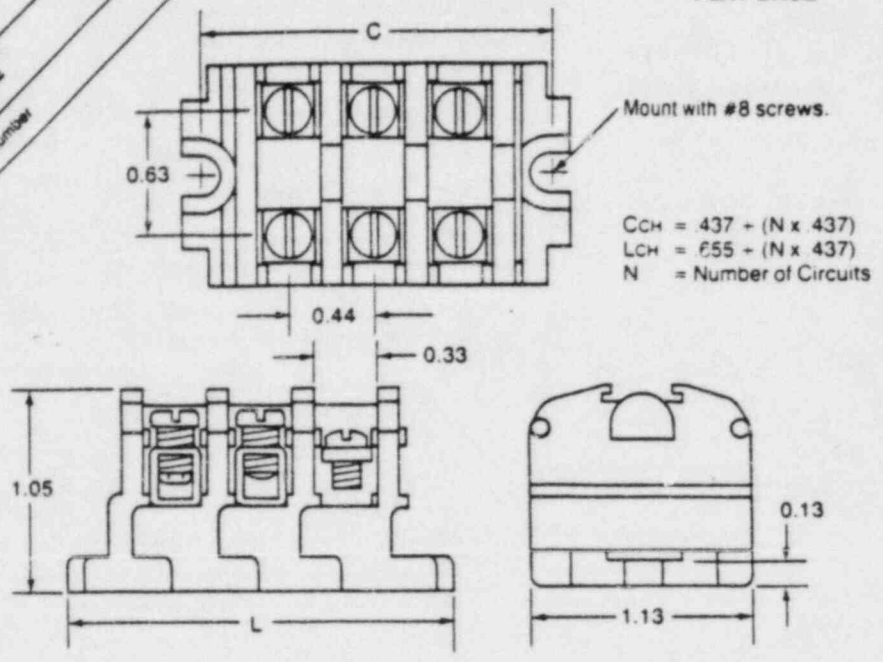
Figure 2



## Accessories

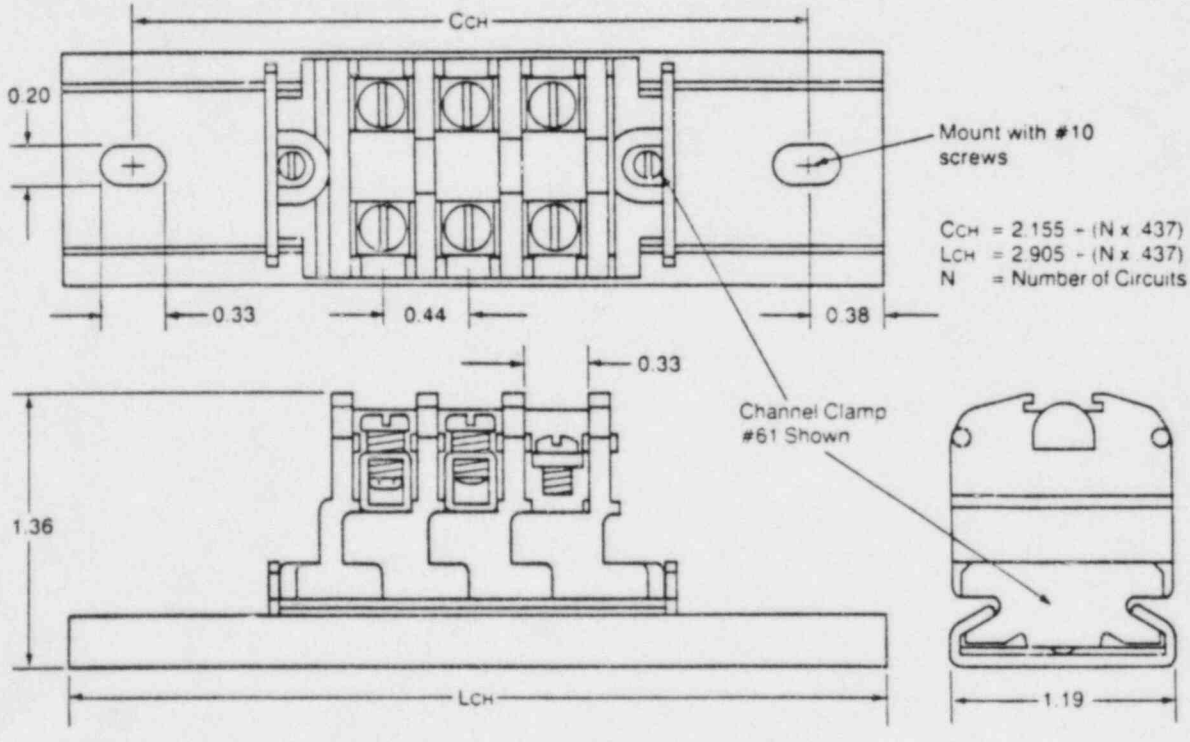
| | STANDARD PACKAGE | Catalog Number |
|---|---|---|
| Vinyl Marking Strip<br>Use #65 holding plug | 25 ft. Coil | 50 |
| Elevated Marking Strip | 18 in. | 52 |
| Nylon Holding Plug<br>For marking strip | 100 plugs | 65 |
| Marking Pen<br>Black Ink | 12 pens | 99 |

### FLAT BASE



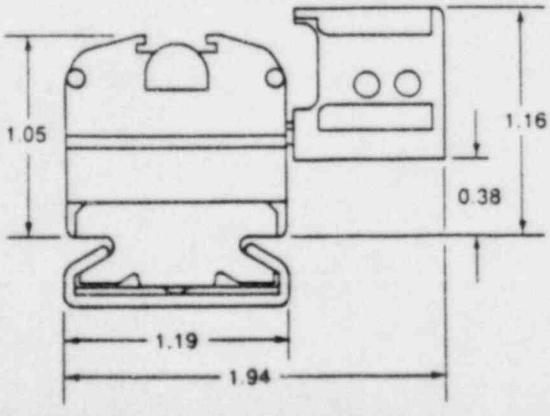

$C_{CH}$ = .437 ÷ (N x .437)
$L_{CH}$ = .655 ÷ (N x .437)
N = Number of Circuits

### DOVETAIL BASE MOUNTED ON STANDARD #60 CHANNEL




$C_{CH}$ = 2.155 ÷ (N x .437)
$L_{CH}$ = 2.905 ÷ (N x .437)
N = Number of Circuits

### SECTIONAL FANNING STRIPS




Scale 1:1

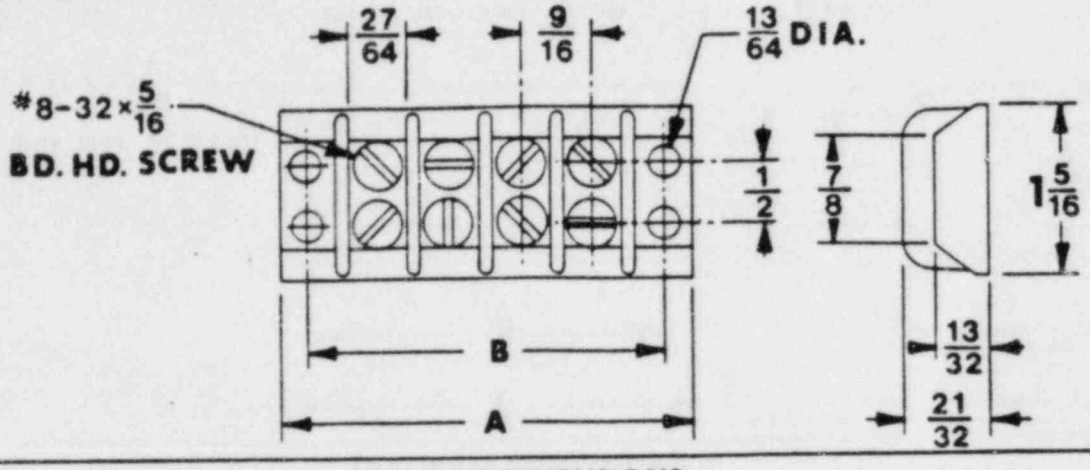
*Controlead* **BULLETIN**

**MARATHON** special products

4

**MEDIUM DUTY**

# DIMENSIONS: 300 Series



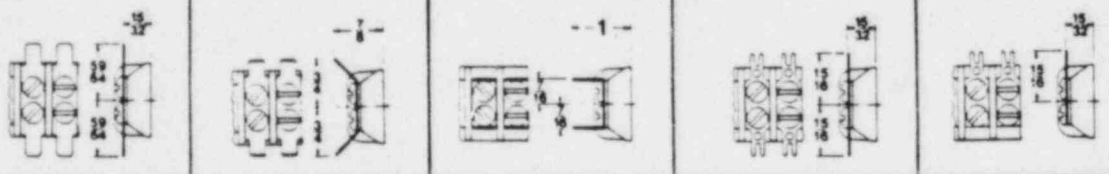

## DIAGRAM DIMENSIONS

| NO. OF TERM. | DIMENSIONS A | DIMENSIONS B | NO. OF TERM. | DIMENSIONS A | DIMENSIONS B |
|---|---|---|---|---|---|
| 1 | 1-17/32 | 1-1/8 | 13 | 8-9/32 | 7-7/8 |
| 2 | 2-3/32 | 1-11/16 | 14 | 8-27/32 | 8-7/16 |
| 3 | 2-21/32 | 2-1/4 | 15 | 9-13/32 | 9 |
| 4 | 3-7/32 | 2-13/16 | 16 | 9-31/32 | 9-9/16 |
| 5 | 3-25/32 | 3-3/8 | 17 | 10-17/32 | 10-1/8 |
| 6 | 4-11/32 | 3-15/16 | 18 | 11-3/32 | 10-11/16 |
| 7 | 4-29/32 | 4-1/2 | 19 | 11-21/32 | 11-1/4 |
| 8 | 5-15/32 | 5-1/16 | 20 | 12-7/32 | 11-13/16 |
| 0 | 6-1/32 | 5-5/8 | 21 | 12-25/32 | 12-3/8 |
| 10 | 6-19/32 | 6-3/16 | 22 | 13-11/32 | 12-15/16 |
| 11 | 7-5/32 | 6-3/4 | 23 | 13-29/32 | 13-1/2 |
| 12 | 7-23/32 | 7-5/16 | 24 | 14-15/32 | 14-1/16 |

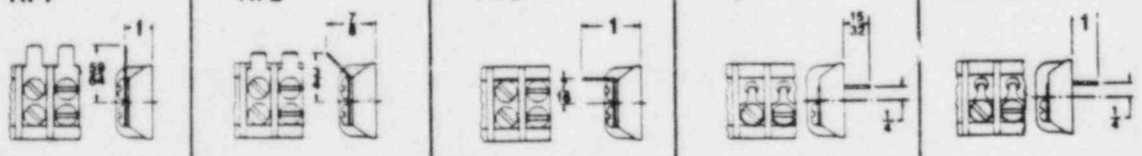
(Catalog dimensions are for guidance only and are not to be construed as inspection standards.)

## DIMENSIONS ON STANDARD MODIFICATIONS

F1 F2 F3 S HS

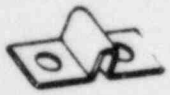


HF1 HF2 HF3 L LWW



## SPECIAL ORDER MODIFICATIONS

(Consult Factory)



LL

## SPECIAL ORDER MODIFICATIONS DEFINITIONS

LL—Line to line jumper

**PRINTED BLOCKS, MARKING STRIPS AND COVERS REFER TO BULLETIN 4-20.**

Subject to change hout notice.

MARATHON SPECIAL PRODUCTS
DIVISION OF MARATHON ELECTRIC
BOWLING GREEN, OHIO 43402