Omaha Public Power District

1623 HARNEY ■ OMAHA, NEBRASKA 68102 ■ TELEPHONE 536-4000 AREA CODE 402

December 1, 1982
LIC-82-390

Mr. Robert A. Clark, Chief
U. S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Division of Licensing
Operating Reactors Branch No. 3
Washington, D.C. 20555

Reference: Docket No. 50-285

Dear Mr. Clark:

Adequacy of the Fort Calhoun Station
Electrical Distribution System Voltages

Omaha Public Power District's letter to the Commission dated May 21, 1982 identified three Class 1E engineered safeguards motors that remained to be evaluated for the subject undervoltage protection issue. The District's evaluation of the raw water pump, charging pump, and containment ventilation fan motors is provided below.

The final concern to be addressed for these Class 1E safeguards motors is the potential for motor damage by undervoltage-induced overcurrent during normal (i.e., non-accident) plant operation. To complete the undervoltage analysis for the raw water pump motors, the motor speed vs. torque/current curves were obtained from our vendor. As stated in our letter dated March 19, 1982, only one of the four raw water pumps is normally in operation and, thus, the effect of bus undervoltage on this operating motor was analyzed. The attached table of protective relaying device setpoints identifies that the bus supplying this motor will trip on undervoltage between 72% and 77.3% for normal plant operation. Please note that for accident situations the bus undervoltage trip setting is 90% and, thus, the undervoltage analysis for normal operations bounds the accident case. Examination of the attached speed vs. torque/current curve #492HA598 demonstrates that the raw water pump motor current would be approximately 200% of full load current for a bus voltage slightly below 72%. This 200% of full load current would result in a motor overload trip after 45 seconds (value obtained from circuit breaker manufacturer's data) as the attached table details. For the 77.3% undervoltage case, interpolation on curve #492HA598 shows that for a bus voltage of 77.3%, the raw water motor current would be approximately 160% of full load and, as the attached table shows, this condition is annunciated in the control room down to 115% of full load current.

A015

Thus, based on the trip protection provided and allowing for operator action as necessary, the District has demonstrated that these motors are protected from possible damage due to undervoltage during all operating conditions.

Speed vs. torque/current curves for the charging pump motors at various voltage levels have also been obtained from our vendor and are attached. However, the District could not obtain the pump speed vs. torque curve for the charging pumps. In order to complete a valid analysis for the charging pumps, the District conservatively approximated the pump curve by utilizing the motor speed vs. torque curve since these are positive displacement pumps and the motor loading will always be greater than the pump loading. It is apparent from examining the attached motor curves that the charging pump motors are in fact the most lightly loaded of all those motors which are auto-started on an ESF signal. For example, based on the approximated pump load torque curve, the motor current at 70% motor terminal voltage is approximately 114% of full load current. This light loading is also apparent from the relatively low settings of the overcurrent protective devices for the charging pump motors (see the attached table). Since these motors have a service factor of 1.15, the one charging pump which normally runs during plant operation is fully protected from an undervoltage situation.

Please note that the May 21, 1982 letter also stated that the District would provide the speed-torque/current curves for the containment ventilation fan motors. The inclusion of these fan motors as an outstanding item was inadvertent, as the discussion regarding the containment vent fans in the District's letter dated March 19, 1982 provides the necessary operability justification.

To summarize the District's position regarding potential damage to any of the Class 1E safeguards loads, it is sufficient to state that all are fully protected at the present voltage relay setpoints and, therefore, no corrective action is necessary.

Sincerely,

R L Dawoski for

W. C. Jones
Division Manager
Production Operations

WCJ/TLP:jmm

Attachments

cc: LeBoeuf, Lamb, Leiby & MacRae
1333 New Hampshire Avenue, N.W.
Washington, D.C. 20036

Summary of Protective Relaying Device Setpoints for Safeguards Loads

% of Motor Full Load Current

Class 1E, Safeguards Load	Instantaneous Trip (A few cycles), Fault Protection	Time Delay Based on Starting Time, Locked Rotor Protection	Time Delay, Overload Protection (> 300 sec)	Longest Delayed Trip (< 10 min)	Maximum Undervoltage Trip 72% (8 sec delay)	Minimum Undervoltage Trip 77.3% (17 sec delay)	Undervoltage Trip During SIAS 90% (5 sec delay)
SI-1A,B Low Pressure S.I. Pps. 4160v	976	466 (17.5 sec)	200 (45 sec)	115 (Alarm Only)	162	145	110
SI-3A,B,C High Press. S.I. Pps. 480v	1770	531 (14-55 sec)	177	160	160	142	110
SI-3A,B,C Contain. Spray Pps. 480v	1765	529 (14-55 sec)	177	160	225	200	110
AC-3A,B,C Comp. Cooling Water Pps. 480v*	1695	509 (15-55 sec)	170	153	145	125	100
AC-10A,B,C,D Raw Water Pumps 4160v*	893	460 (16.9 sec)	200 (45 sec)	115 (Alarm Only)	180	160	115
VA-3A,B Contain. Vent Fans 480v*	2679	536 (14-59 sec)	179	160	N/A	N/A	N/A
VA-7C,D Contain. Vent Fans 480v*	2622	524 (14-59 sec)	175	157	N/A	N/A	N/A
CH-1A,B,C Charging Pumps 480v* (see note)	1823	547 (13-46 sec)	146	128	N/A	N/A	N/A

Overcurrent Devices

Non-Accident Normal Operation

SIAS Condition

Undervoltage Devices

N/A - Curves Not Available

* Running during normal plant operation

NOTE: The charging pumps are not Class 1E, but are auto-started during SIAS.

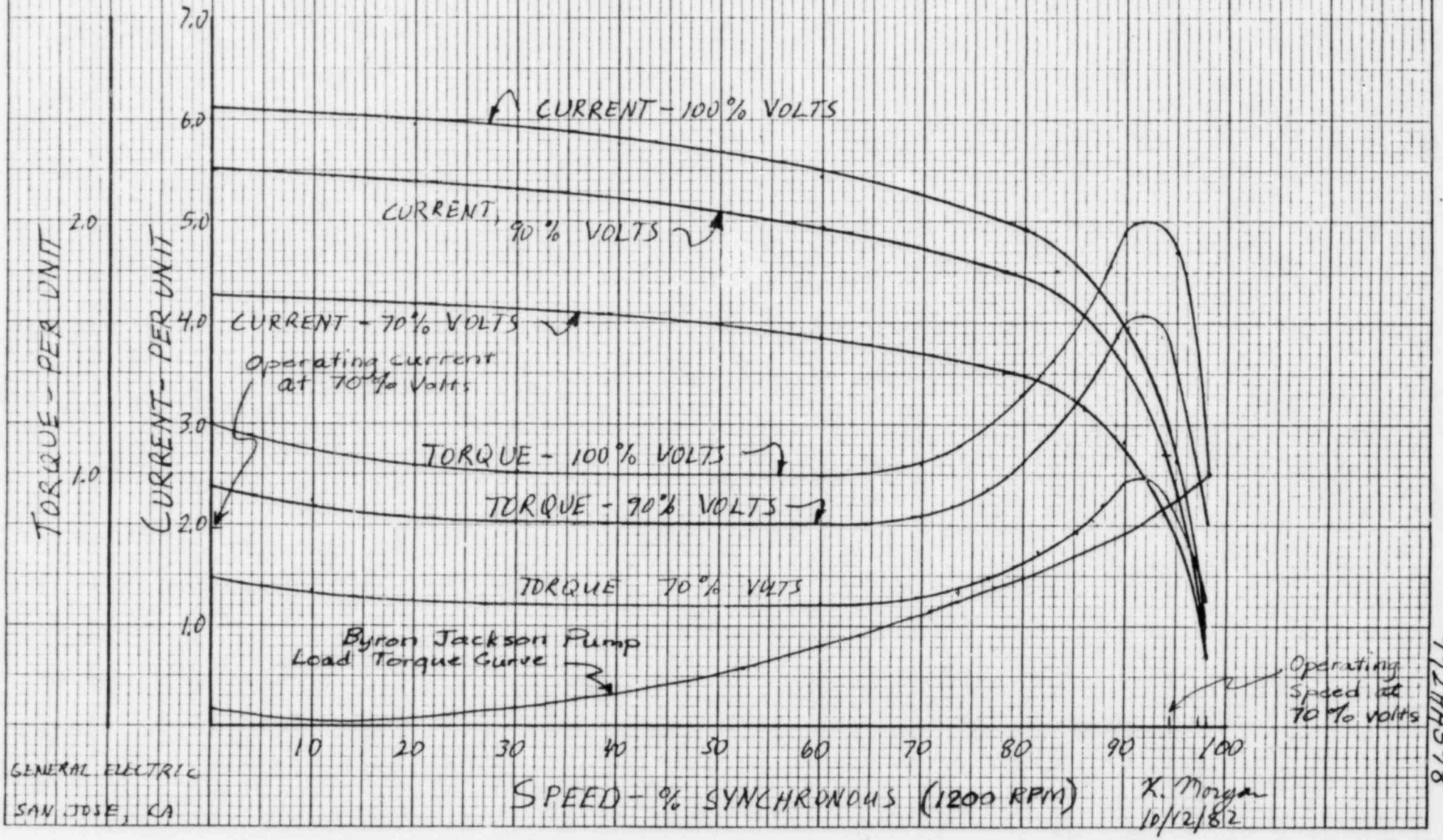
Raw Water Pumps, AC-10A, B, C, D

492HA598

SPEED VS TORQUE & CURRENT CURVES

TYPE K, 6325 FRAME, 6 POLE, 200 H.P.

1200 R.P.M., 3 PH., 60 HZ., 4160 VOLTS



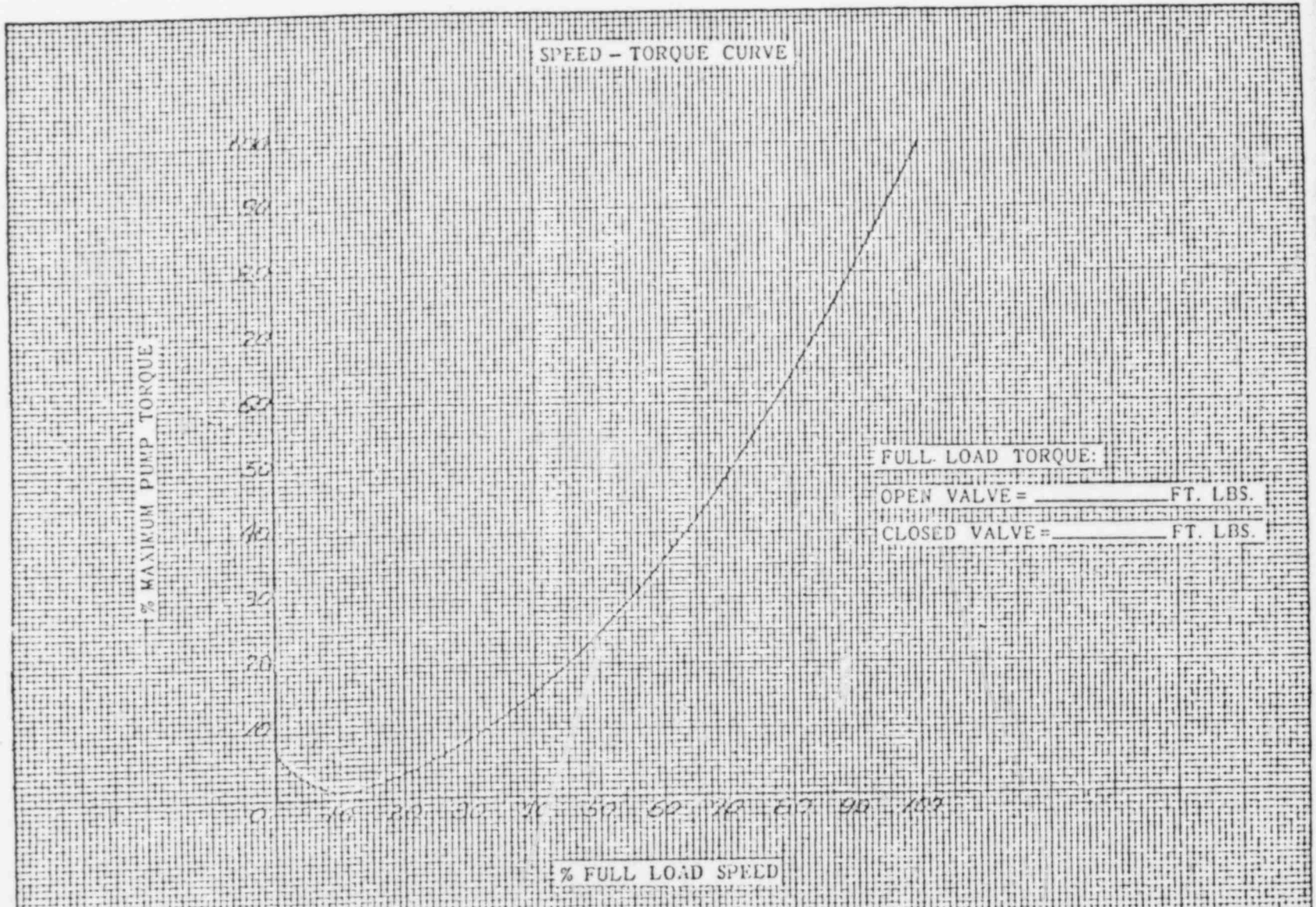
GENERAL ELECTRIC
SAN JOSE, CA

K. Morgan
10/12/82

492HA598

ENGINEERING DATA — WATER DATA

SPEED TORQUE CURVE



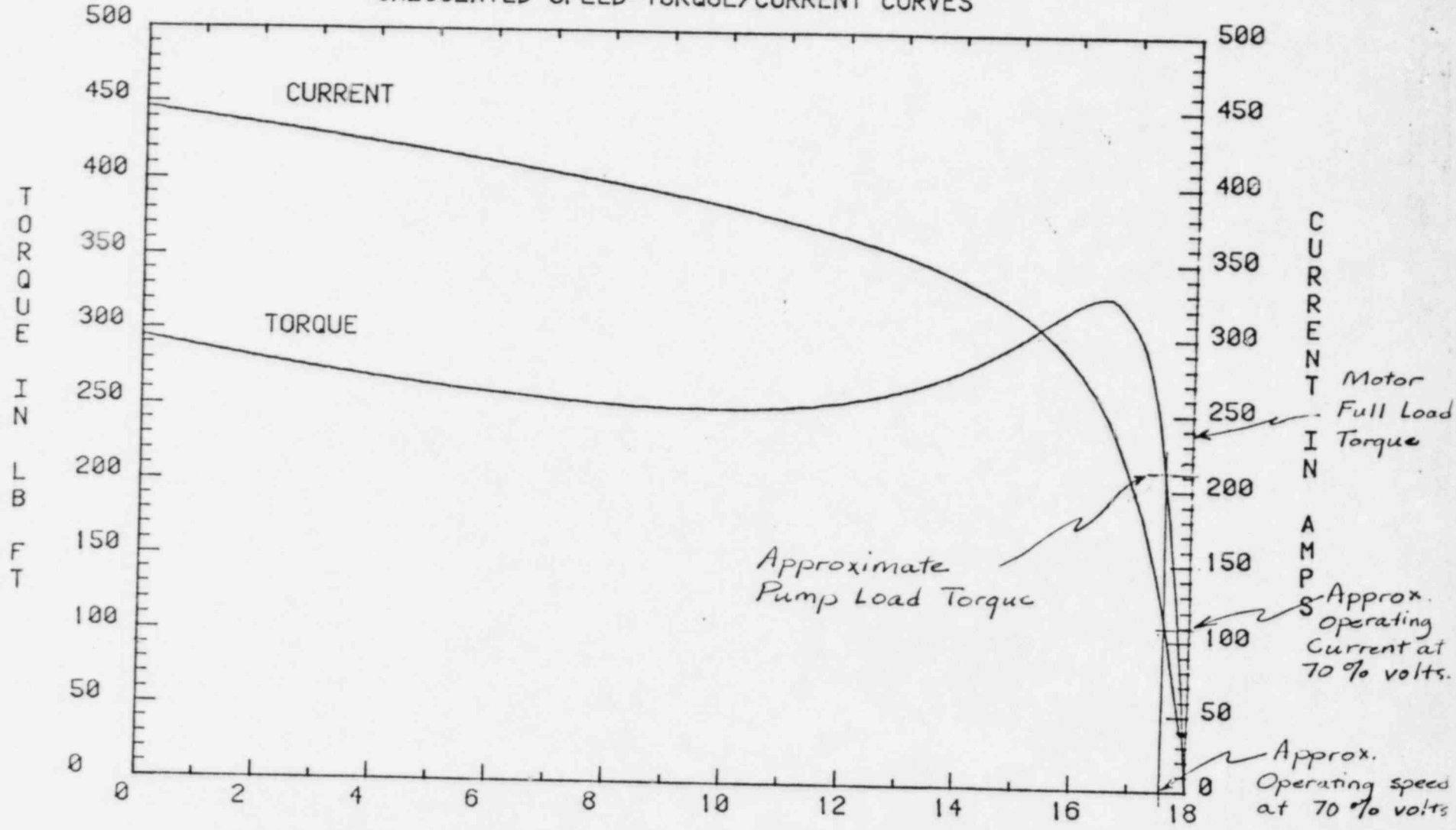
PUMP SIZE AND TYPE	RPM	CUSTOMER NO.	SALES NO.	SALES ENG.	DATE	BYRON JACKSON NUMBER
RAW WATER PUMPS, AC-10A,B&D FORT CALHOUN #1.	1180	G.S.	BRANCH NO.	DATA BY	DRAWN BY	PC

QUALITY PUMPS SINCE 1872

Charging Pumps CH-1A,B,C

GENERAL ELECTRIC CO.

CALCULATED SPEED-TORQUE/CURRENT CURVES



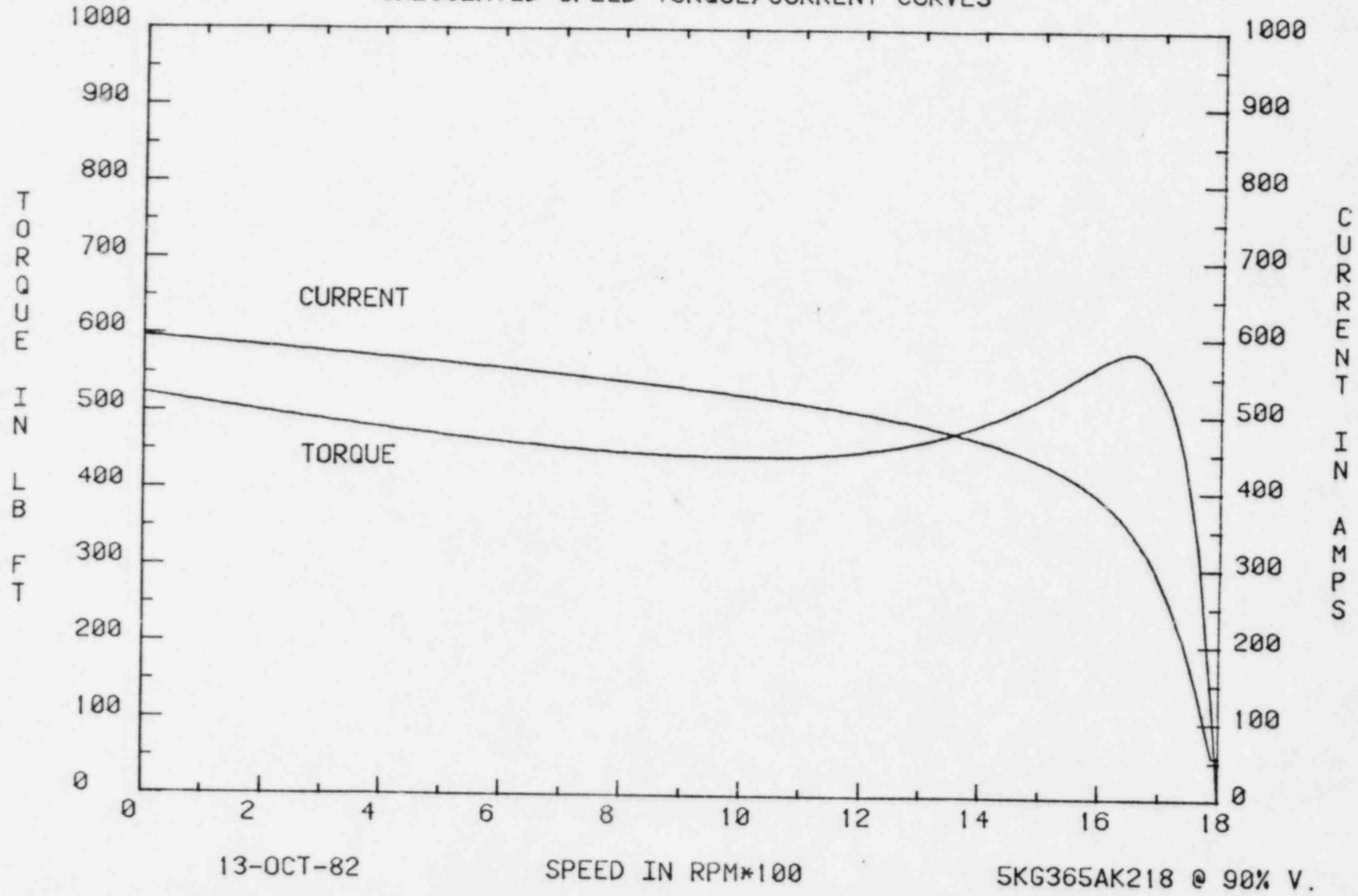
5KG365AK218 @ 70% V.

Motor Full Load Current = 96 Amps

Charging Pumps , CH-1A,B,C

GENERAL ELECTRIC CO.

CALCULATED SPEED-TORQUE/CURRENT CURVES



Charging Pumps, CH-1A,B,C

GENERAL ELECTRIC CO.

CALCULATED SPEED-TORQUE/CURRENT CURVES