

ZYTOR, INC.

FINAL REPORT

PALO VERDE STATION HPSI SYSTEM
ELECTRICAL AND INSTRUMENTATION
CONSTRUCTION AUDIT INSPECTION

Prepared for:

PARAMETER, INC.
13380 WATERTOWN PLANK ROAD
ELM GROVE, WI 53122
Contract NRC-IE-82/83-46C

Prepared by:

ZYTOR, INC.
SUITE 101
2542 SOUTH EASCOM AVENUE
CAMPBELL, CA 95008
(408) 559-4061
Job Number PAR-0003

Revision: 0
Date: October 04, 1983

Reviewed: *Ken Bailey*

Approved: _____

HSB:PAR0003.P11

840214004B 831220
PDR FOIA
BERNABEE83-598 PDR

#170

Table of Contents

Section -----	Title -----	Page ----
VI.5	CABINETS AND PANELS	6.5-1
6.5.1	Procurement Records	6.5-1
	Equipment and Records Inspected	6.5-2
6.5.2	Storage Records	6.5-3
6.5.3	Installation Records	6.5-3
6.5.4	Maintenance Records	6.5-3
6.5.5	Internal Wiring, Controls, and Displays	6.5-3
6.5.6	Cabinet to Cabinet Wiring Tracing	6.5-3
	Storage, Install., Maint. Records	6.5-4
6.5.7	Cabinet and Panel Conclusions	6.5-6
VI.7	BATTERIES AND RACKS	6.7-1
6.7.1	Intercell and Terminal Detail Resistance	6.7-1
6.7.2	Maintenance Data and Acceptance Criteria	6.7-3
6.7.3	Battery Rack Spring Nut Alignment	6.7-3
	Battery Test Data Discrepancies	6.7-4
6.7.4	Battery Load Capacity Test Results	6.7-5
6.7.5	Battery, Charger, and Inverter Conclusions	6.7-6
	Document References	6.7-7
	Personnel Interviewed	6.7-8

VI.5 Cabinets and Panels

The NRC Construction Appraisal Team (CAT) performed an inspection of the HPSI system main control room panels; solid-state and relay panels; PPS cabinets; isolation cabinets; analog instrument cabinets, and the remote shutdown panel. Cabinets and panels for both HPSI train A and train B were inspected for mounting arrangements; internal wire routing for separation; cable markings; termination connections; module mountings; operator controls and displays, and general workmanship and cleanliness. The specific cabinets and panels inspected are "highlighted" in the following list:

NSSS Analog Instrument Cabinets A, B, C, and D;
 1-J-SBA-C02A 1-J-SBB-C02A 1-J-SBC-C02A 1-J-SBD-C02A
 1-J-SBA-C02B 1-J-SBB-C02B

Plant Protection System Cabinets A, B, C, and D;
 1-J-SBA-C01 1-J-SBB-C01 1-J-SBC-C01 1-J-SBD-C01

Main Control Room Panels;
 1-J-RMA-B02 1-J-RMB-B02 1-J-RMC-B02 1-J-RMD-B02
 1-J-RMA-B05 1-J-RMB-B05 1-J-RMC-B05 1-J-RMD-B05
 2-J-RMA-B02 2-J-RMB-B02 2-J-RMC-B02 2-J-RMD-B02
 2-J-RMA-B05 2-J-RMB-B05 2-J-RMC-B05 2-J-RMD-B05

ESFAS Auxiliary Relay Cabinets A and B;
 1-J-SAA-C01 1-J-SAB-C01

BOP ESFAS Cabinets A and B;
 1-J-SAA-C02A 1-J-SAB-C02A
 1-J-SAA-C02B 1-J-SAB-C02B

Isolation Cabinets A, B, C, and D;
 1-J-SAA-C04 1-J-SAB-C04 1-J-SAC-C04 1-J-SAD-C04

Status Display Panel Inserts A and B;
 1-J-ESA-C01 1-J-ESB-C01

Remote Shutdown Panel Sections (HPSI Valve Controls)
 1-J-ZJA-E01 1-J-ZJB-E01
 1-J-ZJC-E01 1-J-ZJD-E01

In addition to the physical inspection of equipment and tracing of a portion of interconnecting cable, procurement records, equipment storage records, installation records, and maintenance records were also examined as shown on page 6.5-2.

6.5.1 Cabinet and Panel Procurement Records

Technical requirements were reviewed for the main control room panels and the relay panels contained in procurement specifications 13-JM-200 to Comsip, Inc. and 13-EM-022 to Harlo Corp. respectively. These records are acceptable, and are maintained in a controlled and current status manner.

EQUIPMENT AND RECORDS INSPECTED

```

INSPECTION OF EQUIPMENT (CAT)-----I
MAINTENANCE RECORDS-----I
INSTALLATION RECORDS-----I
STORAGE RECORDS-----I
                                I      I      I      I

```

```

1-J-CHA-HV531 SUCTION VALVE                                X
SIB-UV616,-626,-636,-646                                X
SIA-UV617,-627,-637,-647                                X
J-SBA-C02A INSTRUM.RACK                                X
J-SBA-C02B "                                X
J-SBB-C02A "                                X
J-SBB-C02B "                                X
J-SBC-C02A "                                X
J-SBD-C02A "                                X
J-SBA-C01 CABINET                                X
J-SBB-C01 "                                X
J-SBC-C01 "                                X
J-SBD-C01 "                                X
J-SAA-C02A "                                X
J-SAA-C02B "                                X
J-SAB-C02A "                                X
J-SAB-C02B "                                X
J-SAA-C01 "                                X
J-SAB-C01 "                                X
J-RMA-B02 "                                X
J-RMA-B05 "                                X
J-RMB-B02 "                                X
J-RMB-B05 "                                X
J-RMC-B02 "                                X
J-RMC-B05 "                                X
J-RMD-B02 "                                X
J-RMD-B05 "                                X
J-SAA-C04 "                                X
J-SAB-C04 "                                X
J-SAC-C04 "                                X
J-SAD-C04 "                                X
J-ESA-C01 "                                X
J-ESB-C01 "                                X
E-PKA-F11 BATTERY                                X
E-PKB-F12 "                                X
E-PKC-F13 "                                X
E-PKD-F14 "                                X
E-PNA-N11 INVERTER                                X
E-PNB-N12 "                                X
E-PNC-N13 "                                X
E-PND-N13 "                                X
E-PKA-H11 CHARGER                                X
E-PKB-H12 "                                X
E-PKC-H13 "                                X
E-PKD-H14 "                                X

```

6.5.2 Cabinet and Panel Storage Records

Storage records for cabinets and panels prior to their installation were inspected to the extent that they were available. These records were found to be incomplete as illustrated by the listing on page 6.5-4. (Finding 6.5.1)

6.5.3 Cabinet and Panel Installation Records

An installation specification for instrumentation and control equipment, 13-JM-702 revision 8 dated April 1, 1983, was reviewed relative to cabinets and panels. Installation and installation modification records for these cabinets and panels during the 1980 through 1983 period were also inspected. These records are controlled, complete, and kept in a current status.

6.5.4 Cabinet and Panel Maintenance Records

Cabinet and panel maintenance record problems were addressed by an April 1981 NRC audit and an internal APS QA audit in August 1981. Post-installation maintenance procedures and records, involving cabinet protective covers, space heating, and humidity monitoring, were inspected for the period from November 1981 up to where the equipment was turned over to Bechtel Startup. These records were controlled and complete. Once turnover has occurred, this type of monitoring is not continued as the panels are considered to be "energized."

An internal separation barrier cover was missing from the 1-J-ZJB-E01 Remote Shutdown Panel, and no status tag noting its removal was observed. (Finding 6.5.2)

Periodic maintenance data records for the 1-J-SAA-C02A, BOP ESFAS Cabinet "A", do not contain an identification that the humidity indicator was either blue or pink for the period between November 21, 1979 and June 13, 1981. Subsequent data indicates that the humidity indicator was blue (normal). These records precede the internal APS QA audit performed in August 1981.

6.5.5 Cabinet and Panel Internal Wiring, Controls, and Displays

Physical inspection of internal wire routing and separation, cable markings, termination connections, module mountings, and overall workmanship was performed at approximately 75% of the cabinets and panels housing HPSI components. Operator controls and displays for the HPSI system were examined at the B02 and B05 main control room benchboards. The interface between the HPSI system and the remote shutdown panel was also examined.

6.5.6 Cabinet to Cabinet Cable Tracing

Using the USNRC low-level signal tracer probe, one control circuit involving MOV 1-J-SIA-UV637 thermal overload bypass was temporarily

ZYTOR, INC.

Cabinet and Panel Storage, Installation, and Maintenance Records

Name -----	Number -----	Received -----	Installed -----	Maintenance -----
NSSS Analog Inst. Rack	1-J-SBA-C02A	122179	100680	110981
NSSS Analog Inst. Rack	1-J-SBA-C02B	122179	100680	
NSSS Analog Inst. Rack	1-J-SBB-C02A	122179	100680	110981
NSSS Analog Inst. Rack	1-J-SBB-C02B	122179	100680	
NSSS Analog Inst. Rack	1-J-SBC-C02A	122179	020981	050980-110981
NSSS Analog Inst. Rack	1-J-SBD-C02A	122179	020981	050980
PPS Cabinet A	1-J-SBA-C01	051980	060780	070280
PPS Cabinet B	1-J-SBB-C01	051980	060780	070280
PPS Cabinet C	1-J-SBC-C01		061780	070280
PPS Cabinet D	1-J-SBD-C01	051980	061780	070280
BOP ESFAS Cabinet A	1-J-SAA-C02A		012480	042579-060882
BOP ESFAS Cabinet A	1-J-SAA-C02B		020880	110981-060982
BOP ESFAS Cabinet B	1-J-SAB-C02A		012480	042579-060882
BOP ESFAS Cabinet B	1-J-SAB-C02B		020880	110981-060782
ESFAS Aux. Relay A	1-J-SAA-C01	051580	061780	070280-020982
ESFAS Aux. Relay B	1-J-SAB-C01		061780	110981-020782
ESF Main CR Panel ABCD	1-J-RMN-B02	012279	082580	082780-110981
Main CR Benchboard	1-J-RMN-B05	041279	100980	110981
Isolation Cabinet A	1-J-SAA-C04		012480	110981-060782
Isolation Cabinet B	1-J-SAB-C04			110981-050882
Isolation Cabinet C	1-J-SAC-C04		012480	110981-060782
Isolation Cabinet D	1-J-SAD-C04		012480	110981-060782
Status Display A	1-J-ESA-C01		012480	110981-080682
Status Display B	1-J-ESB-C01		012480	110981-080682

removed from service and traced for proper cable routing from MCC 1-E-PHA-M3322 at elevation 100' in the Auxiliary Building through conduit, cable trays, and cable risers to the designated K308-3 relay located in panel 1-J-SAA-C0103 at elevation 140' of the Control Building. Measurements using the signal probe were directly compared with the cable pull card for this selected circuit. A number of measurements of other separation division cable trays and non-safety-related cable trays were also made to confirm the absence of the injected signal in these locations. Correct cable routing up to the point of entry into the cabinet was observed for this example.

An error was noted in FSAR Table 6.2.4-2 regarding the "EA" and "EB" power assignments for HPSI isolation valves SIA-UV617, SIA-UV627, SIA-UV637, SIA-UV647, and SIB-UV616, SIB-UV626, SIB-UV636, and SIB-UV646. Physical inspection of the installed equipment relative to electrical schematic and one-line drawings confirmed the proper motor control center assignment for each valve and that correct markings were provided on installed electrical conduit. APS initiated an FSAR Change Notice to correct this minor documentation error. (Observation)

The RWT suction valve to the HPSI system, 1-J-CHA-HV531, was physically inspected for its PHA-M3515 MCC power source and electrical conduit designations relative to plant drawings.

At cabinet 1-J-SBA-C02B, confusion in the labelling of one cable gutter conduit relative to the cable pull card was observed. The routing via 1EZJ3AAKSBPG would cause the cable to enter cabinet 1-J-SBA-C02A rather than its designated destination of cabinet 1-J-SBA-C02B. Markings on the cable gutters match the installation drawings; however, time and access limitations prevented resolution of the inter-cabinet cable routing. (Unresolved item 6.5.1)

During the inspection, it was observed that PVNGS drawings readily depict the assignment of 120 volt Vital AC power sources to particular NSSS analog instrument cabinets, but do not explicitly identify the internal 15 to 40 volt DC instrument loop power source required for individual HPSI transmitters on either Bechtel or Combustion Engineering drawings. This information was subsequently determined from a Foxboro technical manual and its related maintenance instruction. (Observation)

The following cable tray hangers were inspected and found to conform with the installation detail drawings:

Cable Tray	Hanger Number	Detail	Drawing Number and Revision
1EZJ2ABTYCJ	1EZJ2AH74	39-1	13EZJC-006 R20;-042 R12;-027 R10
1EZJ2ABTYCK	1EZJ2AH76	39-1	13EZJC-042 R12
1EZJ2ABTYAM	1EZJ2AH75	12-3	13EZJC-022 R13
1EZJ2ABTYCK	1EZJ2AH80	39-3	13EZJC-027 R10
1EZJ2ABTYAW	1EZJ2AH79	12-2	13EZJC-022 R13
1EZJ2ABTYAP	1EZJ2AH60	12-1	13EZJC-022 R13
1EZJ2ABTYBH	1EZJ2AH61	12-1	13EZJC-022 R13
1EZJ2ANTYVD	1EZJ2AH62	12-1	13EZJC-022 R13
1EZJ2ABTYAM	1EZJ2AH77	12-2	13EZJC-022 R13

During the inspection, the following cables were physically traced using cable pull cards and cabling diagrams:

Cable Number	From	To	Cable Feet
-----	-----	-----	-----
1EBC64BC1XD	1-J-ZJB-E02 Remote Shutdown Panel	1-J-SBB-C02A NSSS Analog Cabinet	284
1ESB01AC1RM	1-E-PNA-D25 Power Dist. Panel	1-J-SBA-C02B NSSS Analog Cabinet	318
1ESB01AC1RS	1-E-PNA-D25 Power Dist. Panel	1-J-RMA-B02B ESF Control Room Panel	442
1EPN02AC1RB	1-J-SAA-C04 Isolation Panel	1-E-PNA-N11 Vital AC Inverter	298

6.5.7 Cabinet and Panel Conclusions

The overall impression for the construction phase for the cabinets and panels is high quality and excellent conformance with industry and regulatory criteria. Within the panels, considerable effort has been expended by Combustion Engineering, Bechtel, and the other panel vendors to achieve the needed electrical separation requirements. Outside the panels, the cable tray and conduit arrangement is considered to be excellent in terms of meeting electrical separation requirements, providing sufficient access space, general workmanship, and identification legibility requirements.

Maintenance records since November 1981 appear adequate and controlled to the point of turnover to Startup.

As installation, modification, and testing work is continuing throughout the plant, the missing separation barrier cover in the Remote Shutdown Panel appears to be an isolated occurrence. In other panels, extensive tagging was observed for temporary modifications needed to support the Startup program.

Module calibration stickers within cabinets and panels were current.

Improved integration of Combustion Engineering drawings with the Bechtel cabling diagrams may be necessary to enhance plant operation. Extraction of design configuration information, using the Bechtel drawings as a starting point, is more cumbersome than that encountered at other PWR and BWR plants.

VI.7 Batteries and Racks

The four main DC batteries, battery chargers, and Vital AC bus inverters were inspected for electrical separation aspects, fluid levels, termination connections, bolting materials, spacers, mounting arrangements, and general workmanship and cleanliness. Equipment that was inspected is "highlighted" in the following list:

DC Batteries and Mounting Racks A, B, C, and D;			
1-E-PKA-F11	1-E-PKB-F12	1-E-PKC-F13	1-E-PKD-F14

DC Battery Chargers A, B, C, and D;			
1-E-PKA-H11	1-E-PKB-H12	1-E-PKC-H13	1-E-PKD-H14
1-E-PKA-H15	1-E-PKB-H16		

Vital AC Bus Inverters A, B, C, and D;			
1-E-PNA-N11	1-E-PNB-N12	1-E-PNC-N13	1-E-PND-N14

Technical requirements for the batteries, battery chargers, and inverters contained in procurement specifications 13-EM-050 to Exide, 13-EM-051 to Power Conversion Products, Inc., and 13-EM-054 respectively were reviewed.

Each battery was physically inspected for adequate fluid levels, conductor termination connections, bolting materials used, and absence of battery case cracks. Each battery rack was inspected for battery-to-end plate spacing, battery-to-battery spacers, alignment of frame spring-nuts, and frame welding to the battery room floor imbeds. The location, floor mounting, panel displays, and electrical conduit configuration for each battery charger and Vital AC inverter were inspected.

Revisions 0 and 1 of the PM-410 Startup Generic Maintenance Procedure for Station Batteries were reviewed for technical requirements and test acceptance criteria. Records were inspected for each of the four safety-related batteries, such as on-site receiving records, mid-1981 test results during warehouse storage, and periodic maintenance test result records during construction for the period from February 1982 through September 1983.

Installation, in-situ modification, and periodic maintenance records for each battery charger and Vital AC inverter prior to turnover to Startup were also inspected.

6.7.1 Battery Intercell and Terminal Detail Resistance

Despite a PVNGS FSAR licensing commitment on pages 8.3-96 and 8.3-105 to meet IEEE Std. 450-1972, baseline and periodic annual tests of cell-to-cell and terminal detail connection resistance have not been performed as specified in sections 3.3.3 (2) and 3.4.6 of the IEEE

Standard. During the inspection, APS indicated that their FSAR commitment to IEEE Std. 450-1972 is limited to those pre-operational tests identified in Section 14.2 and page 14.B-6 (which do not describe battery resistance tests), and subsequent tests identified in Section 16.3/4.8 (which describe battery resistance testing on a 92 day basis if visible corrosion is detected and on an 18 month basis regardless of visible corrosion).

The following specifications and requirements have been noted:

Document/Test Condition	Cell-Cell Res	Battery Res.
-----	-----	-----
IEEE Std. 450-1972	Within 20% of value at installation	
EM-050 Purchase Spec.	.00014 ohms	.0084 ohms
Exide Acceptance/Performance Test Specification	not specified	
Exide Factory Test Results	not available	
Exide "oral" commitment	.000107 ohms	.00642 ohms
Installation Baseline Tests	not available	
PM-410 Maintenance Procedure	not specified	
FSAR page 16.3/4.8-10	.000150 ohms or within 20% of (later)	
EG-212.1 Pre-req. Procedure	within 20% of average value	
32ST-9PK03 Maint.Procedure	.000150 ohms	

Preoperational Test Procedure 93PE-1PK02, revision 0 dated October 22, 1982, requires that Pre-requisite Startup Test Procedure EG-212.1 be completed. This latter procedure requires that intercell resistance values be measured and recorded with corrective action for any cells that exceed 10% of the average resistance for non-operating batteries or 20% of the average for batteries in service at the time of the test. An absolute value for the maximum intercell resistance at the time of battery installation, as specified in IEEE Std. 450-1972, is not assured by this acceptance criterion.

A "baseline" value for cell-to-cell resistance has not yet been established for any of the four 125 VDC batteries from which subsequent degradation can be assessed. Using the present preoperational test schedule for PVNGS, the first baseline data will be obtained four years after initial battery installation. (Finding 6.7.1)

6.7.2 Battery Maintenance Test Data and Acceptance Criteria

Battery maintenance program requirements, specified in PM-410 revision 1 dated April 5, 1983, exceed the test frequency commitment provided in FSAR Appendix page 8A-8. However, acceptance criteria are provided only for cell float voltage (not more than .04 volts below the average and -2.13 volts minimum) and corrected specific gravity (1.200 to 1.220), but annual test requirements, such as the terminal resistance measurements, are not specified. (Observation)

Battery test data taken in accordance with PM-410 from November 1981 to the present exhibit a number of instances where battery cell voltage variations slightly exceeded the acceptance criteria value. During the inspection, APS initiated CAR S-83-234D to resolve these discrepancies. These results, identified on page 6.7-4, were accepted rather than being rejected and then technically justified:

- a. acceptance criteria of 0.05 volt difference with respect to the cell average is used at times rather than 0.04 volts;
- b. in some instances, cells exceeding the 0.04 volt difference have been accepted rather than being rejected;
- c. ambiguity in battery identification is present on two data sheets;
- d. cell voltage acceptance criteria of 2.13 volts minimum is listed as 2.19 volts on one data sheet.

Battery periodic maintenance records were found at two locations (i.e. APS Maintenance and Bechtel Startup areas) rather than being controlled at one location. (Finding 6.7.2)

In the September to November 1981 period, APS Maintenance took battery data using a work order and data sheet. No procedure or acceptance criteria were used, nor was any justification provided that the data was indeed acceptable. (Finding 6.7.3)

During the responsibility transition for battery maintenance from APS Maintenance to Bechtel Startup, battery data was not taken for the months of December 1981 and January 1982. APS initiated CAR S-83-233D during the inspection to technically assess these data omissions. (Finding 6.7.4)

6.7.3 Battery Rack Spring-Nut Alignment

Battery rack spring-nuts were found improperly installed near cell 24 of battery 1-E-PKC-F13A and near cell 58 of battery 1-E-PKA-F11. NCR SM 2889 has been prepared by APS with an interim disposition to re-align the spring-nuts. (Observation)

STATION BATTERY TEST DATA DISCREPANCIES

BATTERY	DATE	DISCREPANCY
1-E-PKA-F11	05-24-82	CELL 30 VOLT>.04 DIFFERENCE
"		CELL 45 VOLT>.04 DIFFERENCE
1-E-PKA-F11	06-18-82	CELL 29 IDENTIFIED AS 39
1-E-PKA-F11	07-16-82	CELL 60 VOLT>.04 DIFFERENCE
1-E-PKA-F11	07-30-82	CELL 17 ACCEPTED>.04 DIFF.
"		CELL 29 ACCEPTED>.04 DIFF.
1-E-PKA-F11	01-11-83	CELL 02 ACCEPTED>.04 DIFF.
1-E-PKA-F11	04-18-83	CELL 45 VOLT>.04 DIFFERENCE
1-E-PKA-F11	06-16-83	CELL 17 ACCEPTED>.04 DIFF.
"		CELL 49 ACCEPTED>.04 DIFF.
"		CELL 57 ACCEPTED>.04 DIFF.
1-E-PKB-F12	07-01-83	CELL 45 VOLT>.04 DIFFERENCE
"		CELL 60 VOLT>.04 DIFFERENCE
1-E-PKB-F12	07-14-83	CELL 01 VOLT>.04 DIFFERENCE
"		CELL 30 VOLT>.04 DIFFERENCE
"		CELL 45 VOLT>.04 DIFFERENCE
"		CELL 60 VOLT>.04 DIFFERENCE
1-E-PKB-F12	11-04-82	UNCLEAR BATTERY DESIGNATION
"		BETWEEN -F12 AND -F14
1-E-PKB-F12	09-21-82	CELL 01 ACCEPTED>.04 DIFF.
"		CELL 20 ACCEPTED>.04 DIFF.
"		CELL 45 ACCEPTED>.04 DIFF.
"		CELL 54 ACCEPTED>.04 DIFF.
"		ACCEPTANCE CRITERIA .05 VDC
1-E-PKB-F12	05-21-82	CELL 01 VOLT>.04 DIFFERENCE
1-E-PKB-F12	05-04-82	CELL 01 VOLT>.04 DIFFERENCE
"		CELL 45 VOLT>.04 DIFFERENCE
1-E-PKB-F12	04-08-82	ACCEPTANCE CRIT 2.19 VOLTS
1-E-PKC-F13	04-18-83	CELL 24 ACCEPTED>.04 DIFF.
"		CELL 51 ACCEPTED>.04 DIFF.
"		CELL 58 ACCEPTED>.04 DIFF.
1-E-PKD-F14	06-02-83	CELL 30 VOLT>.04 DIFFERENCE
1-E-PKD-F14	10-18-82	CELL 01 VOLT>.04 DIFFERENCE
1-E-PKD-F14	09-23-82	CELL 04 VOLT>.04 DIFFERENCE
"		CELL 12 VOLT>.04 DIFFERENCE
"		CELL 16 VOLT>.04 DIFFERENCE
"		CELL 25 VOLT>.04 DIFFERENCE
"		CELL 26 VOLT>.04 DIFFERENCE
"		CELL 36 VOLT>.04 DIFFERENCE
"		CELL 48 VOLT>.04 DIFFERENCE
"		CELL 51 VOLT>.04 DIFFERENCE
"		CELL 58 VOLT>.04 DIFFERENCE
"		CELL 59 VOLT>.04 DIFFERENCE
"		ACCEPTANCE CRITERIA .05 VOLT
1-E-PKD-F14	06-02-82	CELL 60 VOLT>.04 DIFFERENCE
1-E-PKD-F14	02-26-82	CELL 07 ACCEPTED>.04 DIFF.
"		CELL 22 ACCEPTED>.04 DIFF.
"		CELL 24 ACCEPTED>.04 DIFF.
"		CELL 26 ACCEPTED>.04 DIFF.
"		CELL 54 ACCEPTED>.04 DIFF.
"		CELL 57 ACCEPTED>.04 DIFF.

6.7.4 Battery Load Capacity Test Results

IEEE Std. 450-1972 requires a factory or initial installation acceptance test at a specific discharge rate and duration, and a performance test of battery capacity within the first two years of service and at periodic intervals afterward. Battery "C" did not quite meet the required minimum cell voltage criterion during the factory test. Bechtel issued SDDR 2763 to accept the battery with a stated disposition that the tests would be performed at the PVNGS. The November 1983 scheduled battery preoperational test using procedure 32ST-9PK03 requires a 2 hour capacity test using the load profiles contained in the EM-050 battery purchase specification. These test conditions closely approximate, but do not entirely envelope, the commitment provided in FSAR Table 8.3-6. However, section 4.9.1.3 of the 13-EM-050 purchase specification requires that written documentation and certified test reports be provided by the vendor to demonstrate that the battery meets the PVNGS load profile requirements. (Finding 6.7.5)

Variations in the acceptance test and performance test requirements for the "A" and "B" batteries were noted during the inspection:

Document/Test Condition -----	Current -----	Duration -----	Frequency -----
IEEE Std 450-1972(acceptance)	rating	rating	installation
(performance)	rating	rating	within 2 yrs. then 60 months
EM-050 Purchase Spec.	load profiles	2 hours	once
Exide Acceptance/Performance Test Specification	605 amp.	2 hours	once
Exide Factory Test Results	605 amp.	2 hours	once
PM-410 Maint. Procedure	none	none	none
FSAR 16.3./4.8-10(service)	loads	duty	18 months
(capacity)	none	none	60 months
EG-212.1 Pre-req. Procedure	none	none	none
93PE-1PK02 Preop Test Proc.	load profiles	2 hours	once
32ST-9PK03 Maint. Procedure	load profiles	2 hours	18 months
32ST-9PK04 Maint.Procedure	225 amp.	8 hours	60 months

6.7.5 Battery, Charger, and Inverter Conclusions

The number of relatively small individual problems identified with the batteries during the past several years could easily be a cause for concern regarding their ability to perform adequately in the future. One deviation is the decision to obtain intercell and terminal detail resistance baseline values several years after the initial installation, as described in Finding 6.7.1. To compensate for this elapsed time period, the November 1983 acceptance criterion for the "baseline" resistance measurements should be closer to the recent Exide oral commitment of 107 micro-ohms than the APS procedure maximum value of 150 micro-ohms.

Turnover of battery maintenance to Bechtel Startup in late 1981 was evidently not skillfully executed by either party. Once the Bechtel Startup group gained control of this situation, maintenance records from February 1982 indicate that adequate oversight is being applied to minimize battery degradation with time. The observed battery data discrepancies shown on page 6.7-4 should prove to be technically insignificant; nevertheless, acceptance of test data outside of acceptance criteria limits and the total absence of technical justification statements on the data sheets remains a cause for concern.

Problems noticed with APS Maintenance practices during the fall of 1981 with regard to procedures and acceptance criteria appear to have been fully resolved by the Pre-requisite and Preoperational test procedures now in place. The controls presented by APS QA and Maintenance groups during the inspection appear sound and complete. Planned periodic testing using the 2 hour load profile for battery capacity tests is considered to be excellent.

Physical inspection of the batteries, chargers, and AC inverters indicated that the installation was satisfactory. Electrical separation and conduit routing for each of the four divisions was also satisfactory. The battery cases were free from cracks observed at another plant, and the battery rack installation is considered acceptable.

The probability of battery, charger, or AC inverter inadequacy is judged to be extremely remote based on the results of this inspection given that the planned pre-requisite and preoperational test results confirm that no degradation has taken place since installation.

References

No.	Document Type	Title/Subject	Number	Rev	Date
6.01	BECHTEL DWG	CONDUIT/TRAY NOTES	13-E-ZAC-050	16	06-06-83
6.02	BECHTEL DWG	SEPARATION GUIDE	13-E-ZAC-077	2	06-06-83
6.03	BECHTEL P&ID	CHEM/VOLUME CONTROL	13-M-CHP-002	9	08-12-83
6.04	BECHTEL P&ID	SAFETY INJECTION	13-M-SIP-001	9	06-08-83
6.05	BECHTEL P&ID	HVAC CONTMT BLDG	13-M-HCP-001	10	08-02-83
6.06	BECHTEL ISO	HPSI PUMP DISCH/RWT	13-P-SIF-203	12	ILLEGIBLE
6.07	BECHTEL	MAIN SINGLE LINE	13-E-MAA-001	6	08-06-83
6.08	SINGLE LINE	UNIT SINGLE LINE	13-E-MAA-002	7	09-24-82
6.09	DIAGRAMS	4KV SWITCHGEAR	13-E-PBA-001	5	12-02-82
6.10		480V MCC PHA-M33	13-E-PHA-003	9	ILLEGIBLE
6.11		480V MCC PHB-M36	13-E-PHA-006	8	ILLEGIBLE
6.12		120V DP PNA-D25	13-E-PNA-001	6	07-06-83
6.13		120V DP PNB-D26	13-E-PNA-002	5	09-23-82
6.14	BECHTEL	SAFETY INJ. PUMPS	13-J-SIL-009	0	07-07-83
6.15	CONTROL	SAFETY INJ. VALVES	13-J-SIL-010	0	07-20-83
6.16	LOGIC DIAG.	SAFETY INJ. VALVES	13-J-SIL-013	0	07-22-83
6.17		SAFETY INJ. VALVES	13-J-SIL-016	0	07-07-83
6.18	BECHTEL	SI HPSI FLOW TO RC	13-E-SIB-009	4	ILLEGIBLE
6.19	ELEMENTARY	SI HPSI FLOW TO RC	13-E-SIB-010	4	ILLEGIBLE
6.20	DIAGRAMS	SI HPSI FLOW TO RC	13-E-SIB-011	4	ILLEGIBLE
6.21		SI HPSI FLOW TO RC	13-E-SIB-012	4	ILLEGIBLE
6.22		HPSI RECIRC TO RWT	13-E-SIB-016	6	ILLEGIBLE
6.23		HPSI RECIRC TO RWT	13-E-SIB-018	2	05-05-83
6.24		RWT TO HPSI VALVES	13-E-CHB-029	4	05-23-83
6.25		HPSI PUMP P02	13-E-SIB-001	4	ILLEGIBLE
6.26		HPSI PMP DIS VALVE	13-E-SIB-039	2	03-11-83
6.27	BECHTEL	125VDC/VITL ONELINE	13-E-PKA-001	2	03-24-82
6.28	125VDC	125VDC CC PKA-M41	13-E-PKA-002	5	11-12-82
6.29	SINGLE	125VDC DP PKA-D21	13-E-PKA-003	6	12-10-82
6.30	LINE	125VDC CC PDC-M43	13-E-PKA-004	6	ILLEGIBLE
6.31	DIAGRAMS	125VDC CC PKB-M42	13-E-PKA-005	5	12-02-82
6.32		125VDC DP PKB-D22	13-E-PKA-006	6	06-08-83
6.33		125VDC CC PKD-M44	13-E-PKA-007	6	08-25-83
6.34		125VDC BRKR PKA-F11	13-E-PKB-001	5	12-08-82
6.35		125VDC BRKR PKC-F13	13-E-PKB-002	5	ILLEGIBLE
6.36		125VDC REV STARTER	13-E-PKB-003	1	10-11-79
6.37		480VAC BATT. CHGRS	13-E-PKB-004	7	02-07-83
6.38	BECHTEL	CVCS INST LOOP	13-J-CHE-OC3	5	06-13-83
6.39	INSTRUMENT	HPSI LOW FLOW ALARM	13-J-SIE-OAO	3	08-04-83
6.40	LOOP	SAFETY INJECTION	13-J-SIE-079	1	04-01-83
6.41	DIAGRAMS	REACTOR COOLANT SYS	13-J-RCE-064	5	08-01-83
6.42		HVAC SYSTEM-CNTMT	13-J-HCE-061	4	03-11-83
6.43		CABINET POWER DIST	13-J-ZZE-051	1	05-16-83
6.44	BECHTEL	PROC. PROT. CAB. A1	B-14273-412-502	3	ILLEGIBLE
6.45	WIRING	PROC. PROT. CAB. B1	B-14273-412-504	4	10-03-82
6.46	CONNECTION	REMOTE SHUTDOWN PNL	B-14273-412-515	2	06-12-82
6.47	DIAGRAMS	MISC. PROC. CABINET	C-14273-412-501	3	05-17-83

ZYTOR, INC.

Personnel Interviewed

Name	Title	Organization
-----	-----	-----
L. Souza		APS Construction QA
S. Penick		APS Construction QA
W. Wessala		Bechtel Construction
M. Alexander	Lead Elec Engineer	Bechtel Construction
R.L. Anderson		Bechtel Construction
J. Kearns		Bechtel Construction
I. Williams	Maintenance Engineer	Bechtel Construction
J. Black	Resident Engineer	Bechtel Construction
K. Hurty	Resident Engineer	Bechtel Construction
E.C. Laner	Resident Engineer	Bechtel Construction
W. Bingham		
G. Aasen	Resident Engineer	Combustion Engineering
D. Boling		APS Operations
J. Kolski	Startup QA Supervisor	APS Startup
D. Deruiter	Planner-Coordinator	APS Maintenance
L. Barlow	Elec.Maint.Supervisor	APS Maintenance
C. Russo	Mgr.,Operations QA/QC	APS Quality Assurance
C. Lewis	Quality Eng'g. Supervisor	APS Quality Assurance
J. Behm	Quality Engineer III	APS Quality Assurance
N. Howe	Operations QC Supervisor	APS Quality Assurance

ATTN: MR. JOHN BURDOIN

RECEIVED 10/7/83
~~10/11/83~~

ATTACHED IS MY DRAFT FOR THE A.P.S. REPORT. I DID NOT INCLUDE THE SECTION ON THE ITEMS OF NONCOMPLIANCE WITH RESPECT TO THE AWS WELDING CODE. THOSE ARE BEING SENT TO LOU VORDERBRUGGEN AT THE SITE FOR INCLUSION IN HIS SECTION OF THE REPORT. HOWEVER, IF YOU WANT A COPY I WILL BE HAPPY TO SUPPLY YOU WITH ONE.

IF YOU SHOULD NEED TO CONTACT ME ON ANY MATTER, I WILL BE IN THE TOLEDO OFFICE UNTIL ABOUT THE FIRST OF NOVEMBER (PHONE # (419) 535-5743), AFTER WHICH YOU CAN GET A HOLD OF ME THROUGH YOUR BETHESDA OFFICE AS I WILL BE ON THE C.A.T. TEAM AT A REGION I PLANT STARTING ON NOVEMBER 7TH. MR. BOB HEISHMAN (492-9644) WILL KNOW WHERE TO FIND ME.

I TRIED TO KEEP THE WRITE-UP SHORT AND TO THE POINT, SO IF YOU NEED ADDITIONAL INFORMATION, PLEASE CALL ME.

William S. Marin

①

CABLE INSTALLATION

10/4/83

① SAMPLE : FIVE INSTRUMENTATION CABLES, TALLING APPROXIMATELY 1512 FEET, AS LISTED BELOW

<u>CABLE No.</u>	<u>"FROM" END</u>	<u>"TO" END</u>
IERC64AC1XB	PT-102A	IESAAZ47I
IERC64BC1XA	PT-102B	IESFBZ38I
IERC64BC1XB	IESFBZ38O	IJZJBE02
IEHC61AC1XA	PT-351A	IJSBAC02A
IEHC61BC1XA	PT-351B	IJSBBC02A

② INSPECTION CRITERIA :

- CABLES ARE OF SPECIFIED TYPE AND SIZE.
- CABLES ARE ROUTED PER REQUIREMENTS.
- CABLE INSULATION/JACKET HAS NOT BEEN DAMAGED.
- SEPARATION CRITERIA HAVE BEEN ADHERED TO.
- BEND RADIUS CRITERIA HAVE BEEN ADHERED TO.
- INSTALLATION AND INSPECTION DOCUMENTATION IS COMPLETE AND ACCURATE.
- CABLES ARE CORRECTLY IDENTIFIED AND COLOR CODED.

③ FINDINGS :

- DURING INSPECTION OF CABLE IEHC61BC1XA, IT WAS DISCOVERED THAT SPARE CABLE IEZSO1BC2XD, COILED AT TRAY RISER IEZJ2ABTY6L, IS IN CONTACT WITH A SHARP TRAY EDGE, CAUSING AN INDENTATION IN THE CABLE JACKET. (NCR-EJ-3404 WAS SUBSEQUENTLY ISSUED)
- IN THE CABLE SPREADING ROOM, NUMEROUS SEPARATION GROUP 2 CABLES ARE APPROXIMATELY 3" FROM CONDUIT IEZJ2ANRX43, WHICH CONTAINS NON-SAFETY RELATED CABLE IECHAINC2XA, INSTEAD OF THE REQUIRED 12" SEPARATION. (REFERENCE FSAR PARAGRAPHS 8.3.1.4.1.1.C.6 AND 8.3.1.4.1.1.C.7)

(CONTINUED ON PAGE 2)

① CABLE INSTALLATION (CONT.)

② FINDINGS (CONT.)

- IN TRAY 1E2T4AATSCE, CABLES ARE PILED ABOVE THE LEVEL OF THE TRAY SIDERAILS, ARE IN PHYSICAL CONTACT WITH FIRE PROTECTION PIPE, AND ARE IN PHYSICAL CONTACT WITH TWO HVAC DUCTS. (NCR-EJ-3403 WAS SUBSEQUENTLY ISSUED)

II CABLE TERMINATIONS

A SAMPLE : CABLE No.	LOCATION
1EHCG1BC1XA	PRESS. XMTR. PT-351B
"	PANEL 1JSBBCO2A
1ERC64BC1XA	INST. RACK 1JSBBA01
"	E.P.A. 1ESFBZ38I
1ERC64AC1XB	INST. RACK 1JSBAA01
"	E.P.A. 1ESAAZ47I
1ERC64AC1XC	PANEL 1JSBACO2A
"	E.P.A. 1ESAAZ47D
1ERC64BC1XB	PANEL 1JZJBEO2
"	E.P.A. 1ESFBZ38D
1EHCG1AC1XA	PRESS. XMTR. PT-351A
"	PANEL 1JSBACO2A

B INSPECTION CRITERIA :

- CABLES TERMINATED AS SHOWN ON ENGINEERING DOCUMENTS.
- CABLES CORRECTLY IDENTIFIED WITHIN ENCLOSURES.
- SEPARATION CRITERIA ADHERED TO.
- BEND RADIUS CRITERIA ADHERED TO.
- PROPER TERMINAL LINES USED.
- TERMINAL LINES EXHIBIT EVIDENCE OF PROPER CRIMP TOOL USAGE.
- GENERAL NEATNESS AND WORKMANSHIP WITHIN ENCLOSURES.
- INSTALLATION AND INSPECTION DOCUMENTATION IS COMPLETE AND ACCURATE.

C FINDINGS :

NO DEFICIENT ITEMS WERE NOTED.

III RACEWAYS AND SUPPORTS

(A) SAMPLE: 13 CONDUITS

84 CABLE TRAY SECTIONS

20 CONDUIT SUPPORTS

27 CABLE TRAY HANGERS

(HANGERS H6, H8, H7, H212, H10, H11 AND H12 ON DWG. 13-E-ZTC-044 REV. 9; HANGERS H29, H33, H37, H41, H45, H49 AND H53 ON DWG.

13E-ZAC-037 REV. 6; HANGERS H1 AND H2 ON DWG.

13-E-ZCC-054 REV. 2; HANGER H7 ON DWG. 13-E-ZAC-016

REV. 20; AND HANGERS H75, H13, H14, H76, H77, H16,

H94, H79, H62, AND H61 ON DWG. 13-E-ZCC-053 REV. 9)

(B) INSPECTION CRITERIA:

- CONDUIT SIZE AND ROUTING AS PER DESIGN DRAWINGS.
- TRAY ROUTING AS PER DESIGN DRAWINGS.
- RACEWAY BEND RADII CONFORM TO CRITERIA.
- RACEWAYS PROPERLY IDENTIFIED AND COLOR CODED.
- SUPPORT SPACING AND CONFIGURATION IS AS SPECIFIED.
- BOLTED CONNECTIONS ARE TIGHT.
- WELDS CONFORM TO APPLICABLE REQUIREMENTS.
- RACEWAYS ARE FREE OF DEBRIS AND SHARP EDGES.
- INSTALLATION AND INSPECTION DOCUMENTATION IS COMPLETE AND ACCURATE.

(C) FINDINGS:

- ✓ - CABLE TRAY 1EZA1DBTXCF CONTAINS A TEMPORARY I.D. MARKER INSTEAD OF THE REQUIRED PERMANENT MARKER. (NCR-EA-3332 WAS SUBSEQUENTLY ISSUED)

- ✓ - THE BOLTED CONNECTIONS ATTACHING TRAY 1EZA1BBTXCV TO HANGER H7 ON DRAWING 13-E-ZAC-016 REV. 20 ARE DISCONNECTED AND HANGING LOOSE. (NCR-EA-3331 WAS SUBSEQUENTLY ISSUED)

(CONTINUED ON PAGE 5)

III RACEWAYS AND SUPPORTS (CONT.)

C FINDINGS (CONT.)

✓ THE FOURTH SUPPORT FROM JUNCTION BOX J-RCA-PT-190A FOR CONDUIT IEZCAAARX08 CONTAINS A DAMAGED P1001A3 UNISTRUT MEMBER WHICH PROHIBITS THE FULL ENGAGEMENT OF A UNISTRUT SPRING NUT WITHIN THE UNISTRUT CHANNEL. (NCR-EC-3321 WAS SUBSEQUENTLY ISSUED)

✓ THE FIFTH SUPPORT FROM INSTRUMENT RACK ITSBA01 FOR CONDUIT IEZCIAARX-10 WAS FOUND TO ~~CONTAIN~~ CONTAIN WELDS WHICH EXHIBITED OVERLAP, WHICH IS PROHIBITED BY AWS D1.1-72. NCR-WC-817 WAS ISSUED TO CORRECT THIS CONDITION. HOWEVER, DURING CORRECTION OF THE OVERLAP, THE BASE METAL NEAR ONE WELD WAS DAMAGED BY GRINDING.

✓ THE AS-INSTALLED CONFIGURATION OF THE WELDS ATTACHING THE LONGITUDINAL BRACING FOR HANGERS H212, H10, H11 AND H12 ON DRAWING 13-E-ZJC-044 REV. 9 TO EMBEDDED PLATES IS NOT AS SPECIFIED BY DETAIL 2, ALTERNATE, ON DRAWING 13-E-ZAC-043 REV. 18. IN ADDITION, SLAG REMAINS ON THE REFERENCED WELDS FOR HANGER H12. THE RACEWAY INSTALLATION CARDS FOR TRAYS IEZT4AATXHA AND IEZT4AATXHB INDICATE THAT THESE WELDS HAVE BEEN INSPECTED AND ACCEPTED BY Q.C.

IV INSTRUMENTATION

(A) SAMPLE: (4) PRESSURE TRANSMITTERS

PT-102A

PT-102B

PT-351A

PT-351B

(4) INSTRUMENT SENSING LINES (FOR ABOVE TRANSMITTERS)

(2) INSTRUMENT RACKS

ITSBAA01

ITSBBA01

(2) ELECTRICAL PENETRATION ASSEMBLIES

IESAA247

IESFB238

(4) PRESSURE INDICATORS

PI-102A

PI-102B

PI-351A

PI-351B

(B) INSPECTION CRITERIA:

- RECEIVING INSPECTION DOCUMENTATION FOR PRESSURE TRANSMITTERS, PRESSURE INDICATORS AND ELECTRICAL PENETRATIONS, INCLUDING THE REQUIRED VENDOR DOCUMENTATION, IS COMPLETE AND ACCURATE.
- INSTRUMENT NAMEPLATE DATA CONFORMS TO REQUIRED SERVICE CONDITIONS.
- RECORDS OF STORAGE AND MAINTENANCE ACTIVITIES FOR ELECTRICAL PENETRATIONS ARE COMPLETE AND ACCURATE.
- INSTRUMENT CALIBRATION RECORDS ARE COMPLETE AND ACCURATE.
- INSTRUMENT INSTALLATION/MOUNTING CONFORMS TO DESIGN DETAILS.
- INSTRUMENT RACK INSTALLATION/MOUNTING CONFORMS TO DESIGN DETAILS.
- INSTRUMENT SENSING LINES CONFORM TO DESIGN CRITERIA FOR ROUTING AND SLOPE.
- SUPPORTS FOR INSTRUMENT SENSING LINES CONFORM TO DESIGN CRITERIA FOR LOCATION AND CONFIGURATION.

(CONTINUED ON PAGE 7)

④ INSTRUMENTATION (CONT.)

⑧ INSPECTION CRITERIA (CONT.)

- BOLTED CONNECTIONS ARE TIGHT.
- WELDS CONFORM TO APPLICABLE CRITERIA.
- INSTALLATION AND INSPECTION RECORDS FOR PRESSURE TRANSMITTERS, INSTRUMENT SENSING LINES AND SUPPORTS, INSTRUMENT RACKS, AND ELECTRICAL PENETRATIONS ARE COMPLETE AND ACCURATE.

⑨ FINDINGS :

- THE "HIGH CONTAINMENT PRESSURE" SENSING LINES FOR TRAINS "A" AND "B" WERE FOUND TO BE CAPPED, THUS RENDERING THE HIGH PRESSURE SAFETY INJECTION (HPSI) SYSTEM ACTUATION CIRCUIT INOPERABLE.
- THE INSTRUMENT SENSING LINE SUPPORT SHOWN IN DETAIL 1 ON DRAWING 13-J-01D-105 REV. 4 ^{HAS} ~~CONTAINS~~ A WELD WHICH CONTAINS UNDERCUT MEASURING APPROXIMATELY $\frac{1}{32}$ " IN DEPTH. THIS CONDITION IS ACCEPTABLE FOR VISUAL ACCEPTANCE CRITERIA AS STATED IN SPECIFICATION 13-CM-320 REV. 8, HOWEVER, THE $\frac{1}{32}$ " VALUE IS IN VIOLATION OF THE .01 INCH CRITERIA FOR UNDERCUT TRANSVERSE TO THE PRIMARY TENSILE STRESS OF THE MEMBER IN QUESTION AS STATED IN AWS D1.1-72, REV. 1973, AS COMMITTED TO IN FSAR SECTION 3.8.1.6.6.

William L. Marini
10-4-83

CABLE NUMBER	TYPE	AREA EXAMINED						COMMENTS / FINDINGS
		CABLE INSTALLATION	CABLE INST. RECORDS	CABLE TERMINATIONS	CABLE TERM. RECORDS	CONDUITS INSTALLED (Qty)	TRAYS INSTALLED (Qty)	
1EHCG1AC1XA	2/C w/SHLD	✓	✓	✓	✓	4	23	ALL TRAY WELDS NOT PER DETAIL & SLAG TRAY OUTFRILL
1EHCG1BC1XA	2/C w/SHLD	✓	✓	✓	✓	2	25	ALL TRAY JURY TAPE TRAY MARKER SEE NCR-E-A-3332 COILED CABLE IS BOUND BY SHARP TRAY EDGE. POSSIBLE SEPARATION/DEVIATIONS
1ERC64AC1XB	2/C w/SHLD	✓	✓	✓	✓	4	3	2 TRAY 11C/OL ON RSC H/R. (13-E-ZCC-009 BAY) SEE NCR. LUC-817
1ERC64AC1XC	2/C w/SHLD			✓	✓			ACCEPTABLE
1ERC64BC1XA	2/C w/SHLD	✓	✓	✓	✓	3	12	10 TRAY PICCOO DAMAGED. SEE NCR-EC-3321
1ERC64BC1XB	2/C w/SHLD	✓	✓	✓	✓		21	TRAY CLAMPS LOOSE ON RISC SUPPORT NCR-E-A-3331

13 8 4 27 TRAY
20 RSC

ITEM DESCRIPTION	I.D. NUMBER	AREA EXAMINED								COMMENTS / FINDINGS
		RECEIPT RECORDS	NAMEPLATE DATA	STORAGE RECORDS	INSTALLATION	INSTALLATION RECORDS	SUPPORT INSTALLATION	SUPPORT INST. RECORDS	COMPLETION RECORDS	
PRESSURE TRANSMITTER	PT-102A	✓	✓	✓	✓	✓	✓	✓	✓	ACCEPTABLE
INSTRUMENT SENSING LINE	FOR PT-102A				✓	✓	✓	✓		ACCEPTABLE
INSTRUMENT RACK	IJSBAA01		✓		✓	✓				ACCEPTABLE
ELECTRICAL PENETRATION	IESAAZ47I	✓		✓	✓	✓				ACCEPTABLE
PRESSURE INDICATOR	PI-102A	✓	✓	✓	✓				✓	ACCEPTABLE
PRESSURE TRANSMITTER	PT-102B	✓	✓	✓	✓	✓	✓	✓	✓	ACCEPTABLE
INSTRUMENT SENSING LINE	FOR PT-102B				✓	✓	✓	✓		ACCEPTABLE
INSTRUMENT RACK	IJSBBA01		✓		✓	✓				ACCEPTABLE
ELECTRICAL PENETRATION	IESFBZ38I	✓		✓	✓	✓				ACCEPTABLE
PRESSURE INDICATOR	PI-102B	✓	✓	✓	✓				✓	ACCEPTABLE
PRESSURE TRANSMITTER	PT-351A	✓	✓	✓	✓	✓	✓	✓	✓	ACCEPTABLE
INSTRUMENT SENSING LINE	FOR PT-351A				✓	✓	✓	✓		CAPPED
PRESSURE INDICATOR	PI-351A	✓	✓	✓	✓				✓	ACCEPTABLE
PRESSURE TRANSMITTER	PT-351B	✓	✓	✓	✓	✓	✓	✓	✓	ACCEPTABLE
INSTRUMENT SENSING LINE	FOR PT-351B				✓	✓	✓	✓		CAPPED + SUPPORT WELD UNDERCUT
PRESSURE INDICATOR	PI-351B	✓	✓	✓	✓				✓	ACCEPTABLE

10-4-83

John,

Here are personnel contacted
at Palo Verde and list of
documents reviewed.

c/o

Neil Lossing

Bechtel

QA Escort

9/8

Mark Alexander

Bechtel

Lead Discipline

Field Engineer - District

de on Jack

Bechtel

Mechanical QC

Dan Workman

CAL-TEC

Test Engineer

Roger Ramon

Bechtel

~~Bechtel~~

Elect Construction -

Field Engineer

Ed Sumida

GE

Field Engineer

John ~~Kadekian~~
Kadekian

Bechtel

Field Engineer

Brad Churchill

Bechtel

QC Engineer

References

1. P&I Diagram Safety Drive Train / shutdown cooling system
Drawing 13-M-SIP-001 Rev. 9
2. Single Line Diagram 4.16 KV Class 1E Power System
Switchgear E-PBA-S03
Drawing 13-E-PBA-001 Rev 5
3. APS Purchase Order 9500088 supply No. 9 Date 6/30/75
HPSI pumps Component Code 31-15-54-4222-0
4. Westinghouse Drawing 8978099, Motor outline
Safeguards pumps
5. Ingersoll-Rand Drawing C-4X11-PCA 86 X2B rev 2
General arrangement
6. Westinghouse # 664486 Drawing V-CE-3151 (6-22-77)
HPSI pump speed vs torque
7. Westinghouse # 664487 Drawing V-CE-3151 (6-22-77)
HPSI Pump Time vs current
8. Project Specification NO. 14273-PE-410 Rev 2, Combustion Engineering
Safeguards Pumps. 10-27-78
Data Sheet NO. 4 rev 2 HPSI Pump.
9. Combustion Engineering Purchase Order document 9500088
dated 6-30-75 P.O. Supplement, V-CE-2513 (2-24-77)
10. Combustion Engineering Purchase Order document 9500088
dated 6-30-75 P.O. Supplement # 6
11. Combustion Engineering Purchase Order document 9500088 Date 6/30/75
V-CE-3056 (6-7-77)

12. Longworth - Rand Order NO. 001-36422/25/28
Instruction Manual for 4X11 CA-8
HPSI Pumps 13-10407-N001-11.05-1-8
Inchless Instructions for Large AC Motors - Life-Line-
D Motors
13. Elementary Diagram 13-E-SIB-001 rev-4
Safety Injection & Shutdown Cooling System
HPSI Pumps M-SJA-P02 & M-SIB-P02
14. Computer program E580 dump CC-1
Cable scheme NO. IESIOIACICA
15. Cable List with VIAS from ESSCO report
dated June 23, 1982
16. Computer Printout Tray with associated recovery
location and notes dated July 28, 1983
Tray fills information
17. Computer Printout of Tray Print ETIEZVIAATDAA
dated September 8, 1983
18. Auxiliary Bldg Conduit & Tray Drawings 13-E-ZAC-003
rev-22. Plan at elev 51'6" level CZACC
19. Auxiliary Bldg Conduit & Tray Drawing 13-E-ZAC-005
rev-18, Plan at elev. 70' level BZABA
20. Auxiliary Bldg Conduit & Tray Drawing 13-E-ZAC-015
rev-19, Plan at elevation 100' level 1ZABA

21. auxiliary Bldg. Conduit & Tray Drawing 13-E-ZAC-018
rev 19, Plan at elev. 100' level 1 Z A10
22. auxiliary Bldg Conduit & Tray Drawing 13-E-ZAC-017
rev 19, Plan at elev. 100' level 1 Z A1C
23. Control Bldg. Conduit & Tray
Drawing 13-E-ZJC-003 rev 12
Plan at elev. 100 ft, level 1A Z J1A
24. Control and Tracking System
Cable & installation card, IESIO/AC1CA
Dated 12-10-79
25. Control and Tracking System
Termination Installation Details
IESIO/AC CA1 and A2
December 3, 1981, November 3, 1981
26. Control and Tracking System
Raceway & installation Cards for
Cable tray points associated with
Cable IESIO-AC-1-CA.
27. Ingersoll-Rand Company, Structural
Integrity & Operability Analysis of HPSI
Pump 4X HCA-8 for Combustion Engineering
Inc. System 80
FAS-TR-7701-ASR Rev 3 Feb 7, 1980
28. HPSI Pump Motor Environmental Qualification
Program NO. 14273-PE-5400 rev 2 5/8/82
Combustion Engineering Inc.

29. Bechtel Material Requisition 13-EM-029 Rev 3
Dated 7-20-78. "5 and 15KV Power Cable
Nuclear Safety Related Priority Class Q.
30. Bechtel Drawing 13-E-ZEB-007 rev-2
Elementary Diagram General Symbol List
31. PVNGS FSAR Ch. 8 sec. 8.3.1.3 "Physical
Identification of Safety-Related Equipment", Page 8.3-80
Cable numbers, colored jacket for cables, Class IE
Cable Tray and raceway separation group designation.
32. Bechtel Drawing 13-E-ZAC-077 rev-2 sheets 1
thru 9, Cable and Raceway Physical Separation Guide
33. Installation Specification for Electrical Cables in Cable Trays, Bechtel
Specification No. 13-EM-330
34. Elementary Diagram 13-E-SIB-040 rev-5, Safety
designation - shutdown cooling systems HPSI pump along
term cooling valves JSIA HV 604 and JSIB-HV-609
35. Single Line Diagram 13-E-PHA-003 rev-9
480V Class IE MCC EPHAM33
36. Computer program ES80 dump CC-1 cable scheme
No. IES140AC1KA and IE SI40AC1RA
37. Control and Tracking System Raceway Installation Cards for
Tray points associated with EC IE SI40AC1KA
38. Control and Tracking System Cable Installation Cards for
Cable EC IE SI40AC1KA

39. Auxiliary Building Condiment and duct drawing 13-E-ZAC-00X
rev 19, Plan elev. 40 level C ZADC.
40. Auxiliary Building Condiment and Tray drawing 13-E-ZAC-003
rev 22, Plan at elev 51'6", level C ZACC.
41. Auxiliary Building Condiment and Tray drawing 13-E-ZAC-020
rev. 10, plan at elev 120', elevs 2 ZADA
42. Auxiliary Building exposed Condiment drawing 13-E-ZAC-070
rev 15, plan elev 120', ZADA
43. Auxiliary Building Condiment and Tray drawing 13-E-ZAC-015
rev 19, Plan at elev. 100' level 1 ZADA
44. Auxiliary Building Condiment and Tray drawing 13-E-ZAC-005
rev 18, plan at elev 120', level B ZABA
45. Control and Tracking system Raceway installation cards
for cable IE SI 40 ACI FA
46. Control and Tracking system Cable installation cards
for cable IE SI 40 ACI RA
47. Elementary Diagram 13-E-SIB-039 rev. 2
Safety Injection - Shutdown Cooling system
HPSI pumps A & B discharge valves SIA HV 698 and
J-SIB-HV-699
48. Single Line Diagram 13-E-PHA-007 rev. 4; 480V
class 1E power system MCC EPHAM37

49. Control and Tracking System Recovery Installation Code for cable IESI 39 AC/KA
50. Control and Tracking System Cable Installation Code for cable IESI 39 AC/KA
51. Computer Program E580 dump CC-1 cable scheme NO. IESI 39 AC/KA and IESI 39 AC/RA
52. Control and Tracking System Recovery Installation Code for cable IESI 39 AC/RA
53. Control and Tracking System Cable Installation Code for cable IESI 39 AC/RA
54. Single Line Diagram 13-E-PBA-001 rev 5
4.16 KV Class IE Power System Switchgear E-PBA-S03
55. Elementary Diagram 13-E-PEB-001 rev 7 sh 1
Standby Generator System, Diesel Generator
E-PEA-G01 4.16 KV Breaker
56. Single Line Diagram 13-E-PEA-001 rev 2
Class IE Standby Generator System, Diesel Generator,
E-PEA-G01 and E-PEB-G02
57. Elementary Diagram 13-E-PEB-002 rev 6 sh 1
Standby Generator System, Diesel Generator E-PEA-G01
Three Line Metering / relaying
58. Computer Program E580 dump CC-1 cable scheme NO. IEPEDACICA, CB and CC.

59. Control and tracking Systems, Racking Installation
Cable for cable scheme IEPE01ACICA, CB and CC
60. Control and Tracking System, Cable Installation Cable
for cable scheme IEPE01ACICA, CB and CC
61. Control Building Conduit arrangement Drawing 13-E-ZJC-037
rev. 14, Plan at elevation 100 ft. Level 1A
62. Control Building Conduit arrangement Drawing 13-E-ZJC-038
rev 14, Plan at elev. 100 ft. Level 1B.
63. Control Building Conduit and Tray Plan at elev. 100 ft
Level 1B ZJIB Drawing 13-E-ZJC-004 rev. 13
64. Diesel Generator Building Conduit and Tray Plan
sh 1 drawing 13-E-ZGC-002 rev. 14
65. Diesel Generator Building Conduit Plan sh 2
Drawing 13-E-ZGC-003 rev. 11.
66. Elementary Diagram 13-E-SIB-021 rev. 5
Safety Injection - Shutdown Cooling system,
Containment Surge Isolation valves
J-SIA-UV-673 and J-SIB-UV-675
67. Single Line Diagram 13-E-PHA-005 rev. 6
480 V Class 1E Power System, MCC E-PHA-M35
68. Computer Program E580 dump CC-1 Cable
scheme IESI21ACIRC and IESI21ACIKA

69. Control and Tracking System, Recovery Installation
Cards for cable scheme IESIZIACIRC and KA

70. Control and Tracking System, Cable Installation Cards
for cable scheme IESIZIACIRC and KA

71. Computer Program E580 dump CC-1 Cable scheme
IESIACIKB and RB

72. Control and Tracking System, Recovery Installation
Cards for cable scheme IESIZIACIRB and KB

73. Control and Tracking System, Cable Installation
Cards for cable scheme IESIZIACIRC and KB

74. Auxiliary Building Electrical Penetration Area N.W.
Drawing 13-E-ZAC-065 rev. 10

75. Containment Building Electrical Penetration
Internal expanded view SW drawing
13-E-ZCC-042 rev. 12

76. Containment Building Conduit and Tray
plans at elev 120 ft level 2 ZC2C
drawing 13-E-ZCC-015 rev. 14

77. Containment Building Conduit and Tray
plan at elev. 100 ft level 1 ZC1C
drawing 13-E-ZCC-011 rev. 18

78. Containment Building Conduit and Tray
Plan at elev. 80 ft level A
ZCAC, ZCAD drawing 13-E-ZCC-008 rev 26

79. Control and Tracking System, Termination
Installation Cards for Cable IESI21AC1KA
at IEPHAM3512 dated 1-19-81.
80. Control and Tracking System, Termination
Installation Card for Cable IESI21AC1RC
at IEPHAM3512 dated 9-22-80 and 6-16-81
81. Control and Tracking System, Termination
Installation Cards for Cable IESI40AC1KA at
IEPHAM3305 dated 11-13-80 and at
ISSIA HV604 dated 10/27/80
82. Control and Tracking System, Termination Installation
Cards for Cable IESI40AC1RA at
IEPHAM3305 dated 6-13-80 and at
ISSIA HV604 dated 10/27/80
83. Control and Tracking System, Termination Installation
Cards for Cable IESI39AC1KA at
IEPHAM3708 dated 7-8-81 and at ISSIA HV698
dated 11-7-80
84. Control and Tracking System, Termination Installation
Cards for Cable IESI39AC1RA at
IEPHAM3708 dated 6-12-80 and at
ISSIA HV698 dated 10-28-80.
85. Control and Tracking System, Termination Installation
Cards for Cable IEP01AC1CA, CB and CC
at IEPBAS03B and IJDGA B03 dated
6-14-82 and 11-2-81

86. Bechtel Cable Specification 13-EM-029, rev. 1,
5 KVA cable.

87. Material Receiving Inspection Report MRR # 30146
Amacorda 3/C 4/O 5KV Cable, vendor number
5-71336-07

FINDING/OBSERVATION

APS ACTION

1. OK HPSI #1 motor IM-SIA-P02 does not have a Tag number on the equipment which identifies equipment and separation group in accord with FSAR sec. 8.3.1.3

APS found metal tag (IM-SIA-P02) wired to a bolt on the HPSI pump near pump/motor coupling. Entire assembly pump/motor is IM-SIA-P02.

2. Cable tray point IEZACCATCBA (shown on drawing 13-E-ZAC-003 rev. 22) located in the HPSI A pump room not marked with red colored separation group dots between points ATCBA at motor and sleeve ARC03 as required by FSAR sec. 8.3.1.3

added color dots on one side of tray 9-13-83. Need to add color dots to both sides of tray. Both sides of tray are marked as of 9-27-83

3. HPSI #1 motor IM-SIA-P02 ground cable was not fastened by its cable clamp (under 5KV termination box). Motor was not grounded at opposite diagonal points or copper ground posts.

Clamped ground cable. Connected ground at opposite diagonal points 9-13-83. DWG

4. Electrical Conduit and Tray drawing 13-E-ZAC-003 rev. 22 did not show tray points ETIEZACCATCAV

13-E-ZVG-007 alt 1 rev 6 note opposite diagonal points not required unless separately called for.

5. Non-safety related conduit IEZADCNRQ506 for thermostat IEQFNT1243C in HPSI A pump room was < 1" physical separation from safety related JB group 1 IEZACCAKKJ03 in violation of separation guide DWG 13-E-ZAC-077

SECTION SHOWN on 13-E-ZAC-003 reference 13-E-ZAC-040 which shows ETIEZACCATCAV

APS had Craftsman move the Conduit on 9/14/83

11

Craftman state that

6. HPSI #1 motor and shield mounted and bolted in accord with vendor instruction manual 13-10407-N001-11.05-1-8 however no record of mounting and torque value of bolting is recorded on 'Special Construction Inspection Planning (CIP) or old alignment data sheet for motor HPSIA P02. Violates WPP/PCZ 151.0 Rev 6 Para. 7.1, ANSI 45.2.8 Para 4.4 and 70 CFR app B sec X on inspection

15-SIA-HV-604 nameplate error at MCC IE-PHA-M3305
Tag reads JSIA UH 604

HPSI A motor heater (M-SIA-P02H)
Nameplate missing at MCC IEPHAM37

9. Conduit not marked on either side of wall between 4160 V #1 SWGR room Control bldg elev-110 and remote shutdown panel #A room for
ER IE Z JIA ARC 16
IDENTIFICATION B C 14
RC 12

10. Conduit sleeves not marked with red letters on white background for Conduit IE Z J I B ARC 15
ARC 14
ARC 13

between Control bldg elev-110' and remote shutdown panel room 3.

IDENT.

APS initiated a Corrective Action report 9-16-83, No. C-83-1380 to provide CIP and installation inspection for HPSI pump including torqueing.

APS initiated a work request #34068 dated 9-16-83

APS initiated a work request #34073 9/16/83

APS verbally contacted Bechtel to accomplish this work of correctly marking the wall on both sides.

APS verbally contacted Bechtel to accomplish this work of correctly marking the wall with conduit sleeve numbers.

9-28-83 5/9

11.

at diesel generator E-PEA-G01 non-safety related flex conduit IEZG1ANRX11 at JB4 touches safety related flex Conduit IEZG1AARR20 at JB6 in violation of separation guide 13-E-ZAC-077 and FSAR Chapter 8

APS initiated a startup field report SFR # 10G172 to correct this deficiency.

12.

at diesel generator E-PEA-G01 noted that vendor non-safety related ALS flex cable at JB14 could potentially move and touch safety related flex Conduit IEZG1AARRX 27 at JB7 resulting in a violation of separation guide 13-E-ZAC-077 and FSAR Ch. 8

APS initiated a startup field report SFR # 10G172 to correct this deficiency.

13.

Material Receiving Report # 42220 15514 HV604 is missing from Book 00161 P.O. 9601231

APS corrected this, made a copy, and filed report.

14.

CE Power System drawing for P.O. 9500088 (Bachtel N001-1.07-B73-1) for HPSI pumps states that

Specification NO. SYS 80-PE-410 rev 3.

applies to this P.O. APS document file does not have SYS 80-PE-410 rev 3. ~~THEY~~ HAVE REV-2

OPEN

15.

Raceway/Installation Guide Conduit IEZG1AARRC06 and IEZG1AARC05 (dated 6/1/82 and 11/2/82 respectively) do not have QC signature.

Procedure Change Notice PCN #76 dated 8-30-83 required QC signature before that, no QC signature required.

16. OK

No maintenance action cards
could be located for 110V's
1JSIA HV604 and 698 in
violation of Maintenance of materials
and equipment Procedure #28 sec 8.10
ALSO STORAGE (HTRS)

APS has
performed PM 405

17.

(Bechtel reel No. 01 5311,
5KV Power cable 4/0 3/C, at Cable
yard) found separation grip (red)
print cracked down to jacket
and manufacturers jacket marking
easily removed by rubbing. Is
cable properly stored to prevent
jacket damage. CABLE JACKET MARKINGS
ILLEGIBLE & NON PERMANENT IN VIOLATION
OF SPEC 13-EM-029 REV 1 SEC. 4.7

APS engineering
investigating cracked
on QA observation
No. C83-80.
Evaluation and
Corrective action
required. APS initiated
CAR #C-83-1402 for the
cable to address loss of
cable jacket markings.

18.

Traceability: between receiving inspection
planning record MRR #36146 for
4/0 3/C 5KV safety related cable
P.O. 10407 spec 13-EM-029 and
Bechtel cable reel number 01
code 5311 can only be determined
by actual cable reel markings.
Control Characteristics data file for Unit 1/2 does
not match BMI for cable reel 71336-07.
BUCK MATERIAL INVENTORY

Bulk Material Inventory
Computer printout show
correlation to order reel.
Control Characteristics
Printout for Unit 1 and 2
in error. APS will
correct files to match
BMI printout.

OK

19.

HPSI #1 with pig tails T1
and T2 stuck. Should they
be separated.

APS engineering
determined that no
requirements exist.

OK

20.

(1JSIA HV698 Cable ESI 39AC1RA)
termination card show TB ** 70 with
RD BK wire but no wire on TB ** 70.
RD BK wire is on TB ** 59 but not on term card.

Covered by SFR #ISI-215,
EES80 Computer program
and work order #
16543,

21. (13SIAHY604 Cable ESI 40 AC RA)
Termination card about TB** 07 with
BL wire but no wire in TB** 07.
A BL wire is on TB** 5 but not in term card.

Covered by SFR# ISI-215,
EES80 Computer program
and work order #
16543

22. Found separation problem inside 4160 V
switchgear cubicle E-PBA-503L.
Non-safety related flex conduit
IEZ JIA NRR52 is < 1" from
safety related wiring in violation of
separation guide 13-E-ZAC-077 and
FSAR Ch. 8. No analysis per IEEE 384(74).

APS will perform
an analysis or
will rework the
wiring. NCR
SE 2916 dated
9/20/83. Wiring will
be reworked.

23. Found separation problem inside 4160 V
switchgear cubicle E-PBA-503K.
Non-safety related flex conduit
IEZ JIA NRR51 is < 1" from
safety related wiring in violation of
separation guide 13-E-ZAC-077 and
FSAR Ch. 8. No analysis per IEEE 384(74).

APS will perform
an analysis or
will rework the
wiring. NCR #
SE 2916 dated
9/20/83. Wiring will
be reworked.

24. Conduit ERIEZCICARK13 inside
Containment (safety related) has an
Anaconda metal hose type NWE
flex which was damaged (extent
unknown) and subsequently taped
over with Scotch 33-Tape. This appears
unsatisfactory. APS has an approved
procedure for repair. Need to evaluate
this carefully (Field Construction; QC
manual vol IV, accessory installation NO. 251.0 rev 1B
Pg 6 of 12 sec 5.10. I requested justification
for this procedure. I feel it is unsatisfactory.

SFR# IRC-171
date 9-22-83
initiated by APS.
Resolution still open.
Material registration
13EH036A rev 13 requires
Suggest application
of raychem heat
shrink sleeve or
replace flex conduit.
Engineering evaluation

recorded
SEPARATION

recorded
SEPARATION

OPEN
ITEM
recorded

9/28/83 8/9

25

OPEN
ITEM

recorded

Vendor reel metal tag for Brand Rep 600V ULTROL 9/C #14 (Cable Code A771 Bechtel reel NO. 0008) is lost (eg not at cable yard). Bulk Material Inventory Computer program correlates Bechtel reel number to Vendor reel number but does not list the MRR Number for the cable reel. Therefore the MRR can not be reviewed to demonstrate traceability because it is not known. Problem can be solved by adding MRR number to Bulk Material Inventory Computer program or filing the cable MRR's by vendor reel number. At present there is a gap in traceability.

APS initiated Construction QA/QC surveillance report # R83-0123 dated September 26, 1983. Bechtel is compiling a cross-reference to facilitate retrievability of documentation.

26

OPEN
ITEM

recorded

Electrical Installation Spec. EM-306 (MC72R) requires spare wires in cables to be coiled and tagged or heat shrink sleeve at end of the wire inside panels. Found green/black tracer spare wire for cable E-SID1-AC1AC at E-PHA-M3512 stripped at end and bare (not tagged or heat shrink sleeve). Noticed that other spare wires at MCC's were tagged in a manner which was inconsistent and most looked like they would fall off. I feel that the procedure should explicitly specify proper and adequate protection for the spare wire ends.

APS had a Craftsman tape the green/black spare. APS initiated QA observation NO. C83-78 which requested establishment of a uniform, permanent method of tagging and requested re-tagging or re-capping of all spare wires.

9/2/83 9/9

OK
X
2 imitogue instruction manual for
safety related motor operated valves
JSIA HV 604 and 698, and
JSIA UV 673 can not be located.

2 imitogue instruction manual
(Nob1-11.04-267-5)
was located in document
center.

APS initiated action
to correct the
drawing.

Single Line Diagram 13-E-PHA-003
rev. 9, 480V MCC EPHAM33
Compartment 05 incorrectly shows HPSI
pump A long term cooling valve
JSIA HV604 as JSIA UV 604.

OK 29
Single Line Diagram 13-E-PHA-005, rev 6,
480V MCC EPHAM35, incorrectly
shows power feed to JSIA-UV-673
from Cubicle M3513A. The
able block diagram on elementary
13-E-SIB-021 rev 5 and the
Termination Card for cable IESIA1AC1KA
show power to JSIA-UV-673 from
Cubicle M3512.

Single line
is correct. M3513A
is a backup
breaker off the
bus which
feeds M3512
Cubicle in
series.

30.
OPEN
ITEM
480 V MCC's. GE DWG 272A560110
at 2 rev. 1 floor frame assembly drawing
does not reflect as built bolting
arrange of installed floor frame.

APS INITIATED
CONSIL QA/QC
SURVEILLANCE RPT
R83-0130 D09/29
A FOLLOW-UP BY
APS

31.
OPEN
ITEM
GE drawings do not give adequate
information on lifting lug bolts. As
a result, some are retained and
some are removed from MCC's. 3/8-inch
structural bolts were missing from the floor frame assembly at some points.
MCC IE-PHA-M35, 3 bolts not
engaged on nut for MCC bolting to floor frame

NON COMPLIANCE

FACTORY QC

C. J. CRANE

9-28-83

117

* APS in-progress drawing document

TASK

Specification (Equipment)
Vendor drawings
Instruction Manual
Purchase Order
seismic analysis
Environmental Qualification
Warehouse maintenance
Construction maintenance
startup maintenance
Cable Specification
Warehouse storage records
Equipment Certification
material Receiving records
Cable 580 Computer Program
Tray loading
single line drawing
elementary drawing
block diagrams
Conduit and Tray drawing
Racing installation Cards
Termination Cards
Cable installation Cards
Electrical Testing records
NCR's
Conduit ; Tray field installation
Physical separation
Terminations at equipment
4160 KV SWGR Termination
Equipment Mounting
Equipment Nameplate
Equipment inspection ground
Cable reel
MCC Terminations

1M-SIA-P02
HPSI
MOTOR
TRAIN A

1JSIAHV604
HPSI
TRAIN A
DISCHARGE
MOV

1JSIAHV698
HPSI
TRAIN A
DISCHARGE
MOV

1JSIAUV673
HPSI A
CONT. SUMP
SUCTION
MOV

1JSIA
UV674
ISO.
VALVE
MOV

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

*

*

*

None

None

None

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

*

*

*

None

None

None

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

9/28/83 2/9

C. T. CRANE

TASK	ITEM	
Inspection	5KV Cable reel 0001	
Termination/separation ^{internal}	4160V E-PBA-S03P	
Termination/separation ^{internal}	4160V E-PBA-S03L	
Termination/separation ^{internal}	4160V E-PBA-S03R	
Termination/separation ^{internal}	4160V E-PBA-S03P	
Termination/separation ^{internal}	4160V E-PBA-S03K	
separation (internal)	4160-480V IE-PGA-L35	
separation (internal)	4160-480V IE-PGA-L33	
Termination/separation ^{internal}	1JDGA B03 dial	
separation (internal)	1MDGA H01 dial	
separation	Circuits in diesel #1 room	
Personnel interview	G	
Traced Circuits from MCC to penetration to valve using freq. probe	ISSIAUV 673	
Physical separation of Cables in Conduit mounting, welding and bolting	all areas	
	IE-PHA-M 33	480V MCC
	IE-PHB-M 35	"
	IE-PHB-M 37	"
	IE-PHB-M 34	"
	IE-PHB-M 36	"
	IE-PHB-M 38	"

10/3/83

1. Electrical Cable Installation

The NRC CAT inspectors selected a sample of installed electrical high and low voltage power, and control cables within the High Pressure Safety Injection system and the Class 1E power system. For each selected cable, the NRC CAT inspectors reviewed associated ~~drawings and documents which define the location, design route, and installation methods for~~ cable installation within tray and conduit.

A ~~physical inspection of the on-site cable~~ installation was performed by inspecting the entire length of cable run between the associated equipment and its respective load center/^{CONTROL CABINET.} the objective of the inspection was to ascertain compliance with design, installation and quality assurance documents. During the course of the inspection the following documents and areas were reviewed: ~~elementary diagrams and cabling block diagrams; cable codes and cable scheme numbers; single line diagrams; cable type and~~ identification, including separation color and cable markers; ESSO Computer program sorts for routing, identification of cables at tray points, actual and allowable tray fill at tray points, and size and type of cable; physical separation criteria, including raceway and tray designations; Conduit and tray arrangement drawings; raceway

installation cards; cable installation cards; and cable installation specifications. The physical inspection of the cable runs included a determination of size, type, routing, protection, separation, identification, loading, cable supports and cable spacing. The actual cable installation and routing was compared to the design as determined from the E580 computer program and the cable installation cards.

The Cables selected for inspection were associated with the following equipment:

Equipment

HPSI pump #A
1MSIA P02

HPSI Pump #A
Long term cooling valve
1SSIA HV604

HPSI Pump #A
Discharge Valve
1SSIA HV698

Diesel Generator
1EPEAG01

Containment Surge
Isolation Valve
1SSIA UV673

Cable(s)

5KV cable from motor to 4.16KV
Class 1E switchgear 1E-PBA-S03
Cubicle E

Power and Control Cables
from motor operator to 480V
Class 1E MCC M33 Cubicle 05

Power and Control cables
from motor operator to 480V
Class 1E MCC M37 Cubicle 08

5KV power cables from diesel
high voltage cabinet 1SDGAB03
to 4.16KV Class 1E switchgear
1E-PBA-S03 Cubicle B

Power and Control Cables
from motor operator to
Containment penetration 1EPHA Z46
to 480V Class 1E MCC M35
Cubicle 12

The following high voltage ^{power} cables, totaling approximately 1274 ft. were inspected:

<u>Cable Scheme No.</u>	<u>Type</u>	<u>From</u>	<u>To</u>
✓ IESIOIACICA	3/c 4/0	IEPBAS03E	MSIAP02
✓ IEPEOIACICA	3-1/c 500KCMIL	IEPBAS03B	IJDGAB03
✓ IEPEOIACICB	3-1/c 500KCMIL	IEPBAS03B	IJDGAB03
✓ IEPEOIACICC	3-1/c 500KCMIL	IEPBAS03B	IJDGAB03

The following low voltage ^{power} cables, totaling approximately 482 ft. were inspected:

<u>Cable Scheme No.</u>	<u>Type</u>	<u>From</u>	<u>To</u>
✓ IESI40ACIKA	3/c #10	IEPHAM3305	IJSIAHV604
✓ IESI39ACIKA	3/c #10	IEPHAM3708	IJSIAHV698

The following control cables, totaling approximately 770 ft. were inspected:

<u>Cable Scheme No.</u>	<u>Type</u>	<u>From</u>	<u>To</u>
✓ IESI40ACIRA	9/c #14	IEPHAM3305	IJSIAHV604
✓ IESI39ACIRA	12/c #14	IEPHAM3708	IJSIAHV698
✓ IESI21ACIRC	9/c #14	IEPHAM3512	IEPHAZ460
✓ IESI21ACIRB	9/c #14	IEPHAZ46I	IJSIAUV673

The following low voltage power cables, totaling approximately 264 ft. were inspected. In addition to the visual inspection, the NRC CAT inspectors connected a high frequency generator to a pair of conductors at the load side of the 480V motor Control Center Cubicle M3512 (the circuit breaker was opened and tagged appropriately by the Ticeran). The NRC CAT inspectors then traced the actual cable along cable trays using a high frequency detector. This method of actual cable tracing was discontinued for cable within rigid steel conduit runs due to shielding and dissipation of the signal; however, for cable in open trays this method proved to be successful.

<u>Cable Scheme No.</u>	<u>Type</u>	<u>From</u>	<u>To</u>
IESI2IAC1KA	3/C #10	IEPHAM3512	IEPHAZ460
IESI2IAC1KB	3/C #10	IEPHAZ461	IJSIAUV673

1274 -
 482 -
 770 -
 264

 2790

Conclusion

NRC CAT

In summary, the inspectors compared the design routing, installation criteria, and quality control requirements, for selected cables, to the as-built installation.

All design documents were in order and in agreement, and the actual field installation was in complete agreement with the design. The NRC CAT inspectors found several deficiencies, which are described below, but in general the area was found to be in good order.

(a) Identification

The PVNGS FSAR, Section 8.3.1.3, states in part, "Each circuit and raceway is given a unique alphanumeric identification. This identification provides a means of distinguishing a circuit or raceway associated with a particular voltage or function as well as with a particular channel or load group. Class IE raceways are identified at the ends with colored nameplate stickers and along their lengths by colored diamonds or dots of separation group designation at intervals not exceeding 15 feet."

← Insert CTC-1

¶ During the inspection of raceway systems, the NRC CAT inspectors identified the following deficiencies with respect to physical identification of safety-related components:

- (1) Separation Group 1 Cable tray located in the HPSI pump room NO.1 auxiliary building level C (Conduit and Tray drawing 13-E-ZAC-003 rev. 22) was not marked with red colored separation group dots between tray joints IEZACCATCBA at the HPSI motor and ball sleeve IEZACCARCO3 as required by the FSAR section 8.3.1.3. (When appraised of this deficiency, APS initiated action which resulted in the installation

CJC-1

¶ Bechtel Cable and Raceway Physical Separation Guide drawing 13-E-ZAC-077 rev 2, section 1 states that the PVNGS separation criteria complies with the requirements of IEEE Standard 384-1977. IEEE Standard 384-1977, section 5.1.2 states in part, "exposed class 1E raceways shall be marked in a distinct permanent manner at intervals not to exceed 15 ft. and at points of entry to and exit from enclosed areas".

of the required raceway separation group designation date on September 13, 1983).

- (2) Separation Group 1 Conduits were not identified by alphanumeric marker at either side of wall between group 1 4.16 KV switchgear area and Channel A remote shutdown panel area at Control building elevation 100 ft level 1A for the following Conduits as required by IEEE 384-1977

1E Z J 1 A A R C 16

1E Z J 1 A A R C 14

1E Z J 1 A A R C 12

- (3) Separation Group 1 Conduit sleeves were not identified by alphanumeric marker (red lettering on white background) on Control building wall in Channel B remote shutdown area at elevation 100 ft, level 1B for the following Conduits as required by IEEE 384-1977 :

1E Z J 1 B A R C 15

1E Z J 1 B A R C 14

1E Z J 1 B A R C 13

In general, other than the deficiencies stated above, identification of Class IE and ~~non~~ - Class IE cable and raceway installations ~~was~~ excellent. Raceways were clearly and distinctly marked and highly visible. In addition, all Class IE cable had colored cable jackets (red, green, yellow, or blue) which clearly designated the respective separation group.

(b.) Electrical Separation

Bechtel Cable and Raceway Physical Separation Guide drawing 13-E-ZAC-077^{RAW2}; sections 3c, 3d, and 3e state in part "The minimum horizontal, vertical, or diagonal separation between conduits of different separation groups shall be 1 inch. The minimum horizontal or vertical separation between enclosed raceway (rigid steel conduit, ALS, CS, metal wireway, flexible metal conduit) of non-Class IE separation group N, and open ventilated cable trays or conduit of any class IE separation group is 1 inch."

Insert CTC-2

¶ During the inspection of raceway systems, the NRC CAT inspectors identified the following deficiencies with respect to physical separation:

- (1) Non-Class IE separation group N Conduit IEZADCNRQ506 for room thermostat IEQFNT1243C was physically routed in close proximity (less than 1 inch) to Class IE separation group I junction box IEZACCAKKJ03 located in HPSI room #1 auxiliary building level C in violation of Bechtel Separation Guide 13-E-ZAC-077. (When apprised of this deficiency, APS initiated action which resulted in the reconfiguration of the subject conduit to obtain acceptable separation on September 14, 1983).

CJC-2

Flex Conduit shall not be used as a substitute for rigid steel Conduit to meet separation requirements."

(2) Non-Class IE separation group N flexible conduit IEZGIANRX11 at JB4 within diesel generator room "A" (diesel IE-PEA-G01) was in physical contact with Class IE separation group 1 flexible conduit IEZGIAARR20 at JB6 in violation of Bechtel Separation Guide 13-E-ZAC-077 and IEEE 384-1977. ↑

(3) At diesel generator IE-PEA-G01, a vendor supplied non-Class IE ALS flexible conduit at JB14 was routed such that it could potentially move and physically touch Class IE separation group 1 flexible conduit IEZGIAARX27 at JB7 resulting in a violation of Bechtel Separation Guide 13-E-ZAC-077 and IEEE 384-1977. ↑

(When appraised of this deficiency, APS initiated a startup field report #10G172 to correct this deficiency and obtain the required electrical separation).

In general, other than the deficiencies stated above, physical separation and independence of class 1E electrical cables and raceways was in accordance with criteria specified in - Bechtel Separation Guide 13-E-ZAC-077, the PVNGS FSAR, and IEEE Standard 384-1977. The NRC CAT inspectors found the design and cable installation criteria regarding separation to be clear and precise, and the raceway layout and routing appeared to be well planned thereby minimizing the amount of separation group interfaces.

15

(C.) Design Documentation

During the inspection, the following discrepancies were observed:

- (1) Single Line Diagram 13-E-PHA-003 rev. 9, 480V Class 1E Motor Control Center 1E-PHA-M33, Compartment 05, incorrectly designates the load (HPSI pump A long term cooling valve JSIAHV604) as JSIAUV 604. (When apprised of this discrepancy, APS initiated action to correct the drawing).

- delete (2) Single Line Diagram 13-E-PHA-005 rev. 6, Class 1E 480V Motor Control Center 1E-PHA-M35, incorrectly shows power feed to Containment sump valve JSIAUV603 from Compartment 13A. The cable block diagram on elementary 13-E-SIB-021 rev 5 and the termination installation card for Cable 1ESI21AC1KA show power feed from Compartment 12.

Other than the minor deficiencies stated above, the NRC CAT inspectors found the design documents to be in good order.

d. Cable Traceability

The NRC CAT inspectors selected various installed Class 1E cables to determine the degree of traceability of the cable to the vendor cable reel and the cable material receiving and inspection records. The objective was to establish full identification of the installed cable by examination of vendor reel data and receiving records and to compare the installed cable with the design requirements. Traceability was conducted on the following cables:

<u>Cable</u>	<u>Description</u>
IESI01ACICA	5KVA, 3/C, 4/0, red jacket, Amaraconda
IESI40ACIRA	600V, 9/C, #14, red jacket, Brand Rex
IESI40ACIKA	600V, 3/C, #10, red jacket, Rockbestos

The NRC CAT inspectors inspected the cable jacket of the installed cables for identification. The Brand Rex and Rockbestos cable jackets were clearly marked, as required, with size, type, and manufacturer designation. The cable jacket identification marking for the Amaraconda cable was extremely difficult to find. When the Amaraconda cable identification marking was finally located, it was barely discernable. As a check, the inspectors inspected another 5KVA Type A cable (Containment spray pump B,

green jacket) and could not locate cable identification markings. The cable installation card and the ESPO Computer program designated reel 0001 as the Bechtel assigned reel number for the subject Anaconda cable (IESIO/ACICA); the NRC CAT inspectors inspected Bechtel reel 01. This reel was located at the cable yard, and had remaining 5 KVA cable. The inspectors found cable jacket identification markings on this cable, however it was noted that the lettering size was small (approximately $\frac{1}{8}$ inch white characters). The inspectors also observed that the lettering could easily be rubbed off, and it appeared that the cable jacket identification markings were applied over a lubricant base and therefore the lettering could be easily removed. The inspectors found the identical problem with the jacket identification markings on Anaconda 5 KVA cable on reel 03. It became obvious that the cable jacket identification markings for ^{the installed} 5 KVA Anaconda cable were non-permanent and became illegible due to cable installation (cable handling and cable pulling).

Bechtel Cable Specification 13-EM-029 rev 1, section 4.7, 5KVA Cable, states in part, "Cables shall have a permanent identification such as a distinctive color code, pigmented compounds, or a printed legend on the jacket. The identification shall be durable enough to remain legible for the life of the plant. Each cable shall be clearly marked on the outer jacket at a maximum of 3-foot intervals with the manufacturer's name, year date, voltage class, and the number and size of conductors. In addition, each cable shall be provided with a style V marker tape under the shield tapes. Consecutive serial numbers printed on the tape, and the sequential footage markings on the cable outer jacket shall indicate production run for traceability purposes. The marker tape numbers and sequential footage numbers shall be cross-referenced and records kept by supplier. Each cable shall also be clearly marked at a maximum of 5-foot intervals with sequential footage markings."

and therefore not in accordance with the requirements of specification 13-EM-029 rev 1, section 4.7.

The NRC CAT inspector concluded that the cable jacket identifiers (manufacturer's name, year date, cable type, etc) are non-permanent and illegible for the installed 5KVA Anaconda cables,

As a further aspect to traceability, the NRC CAT inspectors observed that the subject Amacinda 5KVA Cable reel was marked by Bechtel to indicate the appropriate Bechtel cable identifiers (Cable Code 5311, Bechtel reel 01, Material Receiving Report # 30146). The Cable reel identifiers placed on the reel by Bechtel were consistent with the ESBO computer program and Cable installation Card. In addition, the Cable reel carried the vendor's metal tag which indicated the specification, vendor ^{reel} number, Bechtel Cable Code, and Cable size and type. The inspectors reviewed the Material Receiving and Inspection Report (MRR # 30146) and found the as-shipped Cable to be consistent with design requirements. Traceability was therefore established.

With respect to the Rockbestos and Brand Rex Cable reels, both reels were "dead" (all Cable used). Bechtel Craftsman at the Cable yard informally detach and file all vendor metal Cable reel tags, marking the Bechtel Cable reel number and Cable Code on the tag before filing. The NRC CAT inspectors observed that the Rockbestos Cable reel tag (Cable Code 8391, Bechtel reel 02) was located in the file, but Brand Rex Cable reel tag (Cable Code A771, Bechtel reel 08) could not be found. It was noted that the material

(MRR)

receiving report numbers for the cable reels were not recorded at the cable yard. Therefore traceability to the receiving documents and vendor data provided later. Cable shipment was impeded for the Rockhewer and Brand Rex Cable due to the lack of an MRR number. It should be noted that for the 5 KVA Amacorda reel, the MRR number was retained because the number was painted on the reel and the reel was stored at the yard. However, for the subject "dead" reels, the MRR number was not retained.

The NRC CAT inspectors reviewed the Bechtel Computer sorts for cable data to determine whether information existed in the data base to correlate the Bechtel reel number with the vendor reel identifier and the appropriate MRR number. This information listing would provide a readily retrievable mechanism to establish traceability between the installed cable (cable installation card identifies Bechtel reel number) and the material receiving report records on (vendor cable description at shipment). The inspectors found that the Bechtel Computer program designated as "Bulk Material Inventory" (BMI) listed the Bechtel Cable Code, the Bechtel reel number, the Bechtel Specification number, and the vendor reel identification number. However, the material

without a time consuming and laborious search through the MRR files.

22

receiving report (MRR) number was not listed. Traceability from the Bechtel reel number to the vendor reel number was established, however the MRR number was not identified. Therefore, the material receiving and inspection records, quality verification documentation and vendor cable description could not be reviewed. It was noted that this problem could be easily solved by adding the MRR number to the BMI program or by actually filing the MRR and inspection records by vendor reel number.

During the course of this evaluation of cable traceability, the NRC CAT inspectors observed that the Bechtel computer program for cable data sorts designated "Control Characteristics" was in error. The Control Characteristics sort, ^{by unit} for cable code 53I1 Bechtel reel 0001 indicated the following:

Unit	Cable Code	reel	Spec.	vendor reel	date
1	53I1	001	13EM029	336-0	8-26-83
2	53I1	0001	13EM029	336-0	6/23/83
3	53I1	0001	13EM029	71336-07	8/14/83

The correct vendor reel number is 71336-07 as determined by the material receiving report (MRR # 30146) and therefore Unit 1 and Unit 2 Control Characteristic data are in error. ~~(In apparent of this deficiency, MRS stated that Bechtel will correct the Control~~

characteristics, data file to match the Bulk material.
Inventory data file for correct vendor reel
numbers).

During the course of this evaluation, the NRC CAT
inspectors inspected the Anaconda 5KV power cable
(Cable code 5311, 3/C 4/0) ^{which remained} on Bechtel reel NO. 01
located at the cable reel storage yard. The inspectors
observed that the colored, ^{pigmented portion of the} jacket (separation group 1 -
red) was faded and cracked ^{in numerous locations}, such that the
actual cable jacket ^(black) could be seen at several
colored pigment crack points. Observation of
several cracks under magnification appeared to show
that the only the colored pigment ^{was} cracked and
actual jacket remained intact. The inspectors
noted that cable ends were sealed as required and
a plastic sheet covered the cable reel.

In summary, the NRC CAT inspectors selected power and control cable and evaluated the degree of traceability of the installed cable to the material receiving records, and vendor cable description and reel number. This information was then compared to the design requirements for the selected cable. The inspectors determined that full traceability existed for the selected cables, however, the following deficiencies were observed:

- (1.) Anaconda 5KVA, 3/C, 4/0 cable procured under Bechtel Specification 13-EM-029 has cable jacket identifiers (manufacturer's name, year date, cable type, sequential postage markers, and production run data) which are non-permanent and illegible on the installed cable. This condition is not in accordance with Bechtel Specification 13-EM-029 rev 1. section 4.7. In addition, actual independent verification of traceability of the installed cable is difficult at present and may be more difficult in the future. (When apprised of this deficiency, APS initiated CORRECTIVE ACTION 83-140D BN 9/10/83 a Non-Conformance report (NO.) for the subject cable).
- (2.) The material receiving record number (MRR) is not listed in the Bechtel Computer program for cabling designated as "Bulk Material Inventory" (BMI). The installed cables can be traced to

the Bechtel reel number, which in turn can be correlated to the vendor reel number; however, the material receiving and inspection records, quality verification documents and vendor cable description, as shipped, can not be reviewed without a laborious search through all the MRR files. Addition of the MRR number to the BME or filing of the MRR by vendor reel number will solve this situation.

(3) The Control Characteristics sent by unit for Cable Code 53I1 Bechtel reel 0001, Unit 1 and Unit 2 incorrectly listed the vendor reel number as 336-0 instead of 71336-07. (When appraised of this deficiency, APS stated that Bechtel will correct the Control Characteristics data file to match the Bulk Material Inventory data file for correct vendor reel number.)

(When appraised of this situation, APS initiated Construction QA/QC surveillance report NO. R83-0123 dated September 26, 1983. Bechtel is compiling a cross-reference to facilitate retrievability of documentation in response to this QA/QC surveillance report.)

- (4) The Anaconda 5KV power cable which remained on Bachtel reel no. 01 (Cable code 53II, 3/C, 4/0) located at the cable reel storage yard was observed to have cracks through the colored pigment portion of the cable jacket. The colored pigment was also faded. (When appraised of this situation APS initiated Quality Assurance Observation No. C83-80 which stated that the cable appears to have deteriorated due to outside storage and requested engineering evaluation of the cable and requisite corrective action).

2. Electrical Cable Termination

The NRC CAT inspectors performed an inspection on a sample of electrical cable end terminations to determine compliance with design requirements shown on the Termination Installation Cards and installation requirements specified in Bechtel Specification 13-EM-306. These terminations were inspected against applicable requirements for the following:

- Cable end marker for cable identification
- size and quantity of conductors
- Cable type
- grounding of cable shield
- Type of terminal lug
- mounting hardware
- identification of terminal blocks and joints
- Conductors terminated as shown on Termination Installation Card
- Terminal lug exhibits evidence of proper crimp tool usage
- Spare wires coiled and insulated
- Heat shrink tape
- wiring supports
- Conductors free from damage to insulation
- Cables tied, supported and separated
- verification of tool use and calibration of tools
- General neatness and workmanship inside enclosure

- Torquing of bus bolts
- Physical separation or barriers for redundant Class 1E and non-Class 1E wiring

Cable end terminations were inspected on the following cables:

<u>Cable Scheme No.</u>	<u>Type</u>	<u>Cable end</u>	<u>Cable end</u>
IESI01ACICA ✓	3/C	IEPBAS03E	IMSIA P02
IESI21ACIKA ✓	3/C	IEPHAM3512	—
IESI21ACIRC ✓	9/C	IEPHAM3512	—
IESI40ACIKA ✓	3/C	IEPHAM3305	IMSIA HV604
IESI40ACIRA ✓	9/C	IEPHAM3305	IMSIA HV604
IESI39ACIKA ✓	3/C	IEPHAM3708	IMSIA HV698
IESI39ACIRA ✓	12/C	IEPHAM3708	IMSIA HV698
IEPE01ACICA ✓	3-1/C	IEPBAS03B	JDGAB03
IEPE01ACICB ✓	3-1/C	IEPBAS03B	JDGAB03
IEPE01ACICC ✓	3-1/C	IEPBAS03B	JDGAB03
IESI01ACIRH	2/C	—	IMSIA P02H

The following additional panels were inspected to determine the degree of physical separation maintained between redundant class IE or class IE and non-class IE wiring:

Panel

IE-PBA-S03	4.16 KV	Switchgear	Cubicle	L
IE-PBA-S03	4.16 KV	Switchgear	Cubicle	R
IE-PBA-S03	4.16 KV	Switchgear	Cubicle	P
IE-PBA-S03	4.16 KV	Switchgear	Cubicle	K
IE-PGA-L35	480 V	Switchgear		
IE-PGA-L33	480 V	Switchgear		
1J-DGA-B03	4.16 KV	Diesel Generator	IE-PEA-G01	
		High voltage	Cubicle	
1MDGAH01		Diesel Generator	IE-PEA-G01	

The following deficiencies were identified during the inspection of cable terminations and panel internal wiring:

(a.) Electrical Separation (Panel Internal Wiring)

The PVNGS FSAR, section 8.3.1.4.1.2, subsection states in part "When non-Class 1E cables enter an enclosure containing class 1E wiring, a 6-inch minimum physical separation is maintained between the non-class 1E cables and any class 1E wiring. When a 6-inch separation cannot be maintained, the non-class 1E cables are installed in enclosed raceways and a minimum of one-inch separation is maintained between the non-class 1E enclosed raceway and the class 1E cables." Bechtel Specification 13-EM-306, Installation Specification for Cable Splicing, Termination, and Supports, section 11.3, specifies the same requirements as stated above. In addition, IEEE 384-1977 section 5.6.5 requires, ^{either} 6-inch physical separation between non-class 1E wiring and class 1E wiring within control switchboards or a barrier to be installed. Section 4.6.1 subsection (3) of IEEE 384-1977 allows analysis to demonstrate that Class 1E circuits are not degraded below acceptable levels when the required 6-inch separation distance can not be maintained.

During the inspection of cable terminations, the NRC CAT inspectors identified the following deficiencies with respect to physical separation criteria for non-class 1E and class 1E cabling and wiring within panels.

- (1) Non-class 1E separation group N flexible conduit IEZJIANRR52 located within 4.16 KV switchgear 1E-PBA-S03 Cubicle L, ESF service transformer 1E-NBN-X03 switchgear, was in close proximity (less than 1-inch) to Class 1E separation group I cubicle wiring in violation of PVNGS FSAR, IEEE 384-1977, and Separation Guide 13-E-ZAC-077 Criteria.
- (2) Non-class 1E separation group N flexible conduit IEZJIANRR51 located within 4.16 KV switchgear 1E-PBA-S03 Cubicle K, ESF service transformer 1E-NBN-X04 switchgear, was in close proximity (less than 1-inch) to Class 1E separation group I cubicle wiring in violation of PVNGS FSAR, IEEE 384-1977, and Separation Guide 13-E-ZAC-077 Criteria.

(When apprised of this deficiency, APS initiated non Conformance report NCR/NO. SE 2916 dated September 20, 1983. The panel wiring will be rerouted to obtain the required physical separation distance).

In general, other than the deficiencies stated above, physical separation conflicts between redundant Class 1E wiring, or Class 1E and non-Class 1E wiring, within panels were found to be few in number. The NRC CAT inspectors found the separation criteria provided to the electrical contractor in Bechtel Specification 13-EM-306 to be detailed, clear, and precise. It was obvious that electrical separation had been taken into account in the design, installation, and routing of cables and wiring within panels.

(b.) Termination of Spare Wires

Bechtel Installation Specification 13-EM-306 rev-7, Cable Splicing, Termination and Supports, section 7.2 (r) states "Field is not required to terminate spare wires even if shown on EE580 termination cards. Unterminated spare wires shall be insulated by tape or heat shrinkable end cap."

During the inspection of cable terminations, the NRC CAT inspectors identified the following deficiencies:

- (1). Cable 1ESI21ACIRC at 480V motor control center 1E-PHA-M35 compartment 12 had spare conductor green/black coiled, tied off, and the end stripped of insulation, however the conductor end was bare (not insulated) in deviation with requirements of specification 13-EM-306 section 7.2 (r). (When apprised of this deficiency, APS initiated action which resulted in the installation of tape for the conductor end.)

(2) In several instances the NRC CAT inspectors observed that unterminated spare conductors were insulated with tape at the conductor end, however the tape configuration varied. For a number of these spare conductors, the insulation tape appeared to be loose (for example about to fall off); for other spare conductors, the insulation tape was open at the end. It appears that lack of an explicit method for installing tape on spare conductor ends has created a situation where a number of spare conductor ends are not suitably insulated. In the NRC CAT inspector's opinion, heat shrinkable end caps would have easily alleviated this situation. (When apprised of this observation, APS initiated a Quality assurance observation NO. C83-78 which stated that the taping of spare conductor ends is questionable and requested the establishment of a uniform, permanent method of taping spare wires. Retaping of spare wire was also requested as required).

It is suggested that APS initiate a program to inspect spare conductors at termination locations and retape all unterminated spare conductor ends (or add heat shrinkable end caps) where necessary.

(a.) Identification

The PVNGS FSAR section 8.3.1.3, Physical Identification of Safety-Related Equipment, states in part, "All equipment is provided with a tag number which includes the applicable separation group identification. Nameplates of color background are provided for all Class 1E Cabinets."

During the inspection of equipment, the NRC CAT inspectors identified the following deficiencies with respect to physical identification of safety-related equipment:

- (1) ~~HPSI pump motor IM-SIA-P2 did not have a tag number on the motor which uniquely identified the equipment and the separation group in accordance with FSAR section 8.3.1.3 requirements. (When appraised of the deficiency, APS found the appropriate tag attached to a flange nut on the pump. APS committed to relocating the tag to a prominent location on the motor).~~
- (1) Nameplate of color background at 480V MCC IE-PHA-M33 Cubicle 05 for motor operated valve JSIAHV604 is incorrectly engraved JSIAUH604 (When appraised of this deficiency, APS initiated work request NO. 34068 to correct this deficiency).

- (3) HPSI pump NO.1 motor heater IM-SIA-P02H has no nameplate of colored background at 480 V MCC 1E-PHA-M37 Cubicle 09A. (When appraised of this deficiency, APS initiated work request NO. 34073 on September 16, 1983 to correct this deficiency).

In general, other than the deficiencies stated above, equipment identification was accurate, visible, and in accordance with requirements.

3. Electrical Equipment Installation

The NRC CAT inspectors selected a sample of installed electrical equipment within the High Pressure Safety Injection system and the Class 1E Power system. For ~~each~~ ^{THE} ^{WORKS} equipment item the inspectors reviewed associated vendor drawings and documents, and plant maintenance, test, and installation records which define the design and installation methods for the equipment. A physical inspection of the installed equipment was performed to determine compliance to design requirements and vendor installation criteria. The following documents and areas were reviewed: equipment specifications; purchase order documentation; vendor drawings and instruction manuals, including maintenance and installation requirements; seismic analysis or test and equipment qualification documentation, including ^{special} mounting and maintenance requirements; equipment maintenance records for warehouse, construction, and startup phases; warehouse records including receipt, storage, and release documentation; material receiving reports, including equipment certifications from vendors; electrical testing records for pre-operational phase; and associated quality control and installation records. The physical inspection of the equipment included a determination of

mounting, bolting, identification, & nomenclature data, location, grounding, and protection. Components selected included the following:

a. Motors

The installation and associated hardware and documents for the following motors were inspected:

Motor Identification

High Pressure Safety Injection Pump Motor No. 1
IM-SIA-P02

During the inspection of the motor installation and documentation, the NRC CAT inspectors identified the following deficiencies:

delete

(1) The HPSI pump NO.1 motor has four vendor supplied Copper ground pads, one at each corner of the lower motor housing, for customer connection of grounding cable for personnel and motor protection. The motor grounding was installed such that connection was made to two ground pads located at the back end of the motor rather than at opposite diagonal locations as required by the electrical installation drawings. (The APS QC inspector initiated action which resulted in the ^{re-routing} correction of plant grounding cable to opposite diagonal points on September 13, 1983).

(1.) a portion of the grounding cable, located below the termination box on HPSI pump NO.1 motor ^{1MSIAP02}, was not fastened to its installed cable clamp. (When apprised of this deficiency, APS initiated action which resulted in clamping of the subject cable on September 13, 1983).

(2) Combustion Engineering drawing for Purchase Order NO. 9500088 supplement 9 dated December 18, 1978 (vendor print file NO. N001-1.07-873-1) states that the following specifications apply to the HPSI pump purchase order : Specification for Standard Plant for Safeguards Pumps, Specification Number SYS 80-PE-410, Rev. 03 ; and Project Specification for Safeguards Pumps Specification No. 14273-PE-410, Rev-02. The APS site document system and Bechtel home office document system contained revision 02 of both specifications, rev. 03 of SYS 80-PE-410 could not be located.

(4) The instruction manual for the HPSI pump and motor (vendor log NO. 13-10407-NOO-11.05-1-8) specifies, ^{mounting methods could} torque values for pump and motor feet bolting to the ^{HPSI} skid. The instruction manual ^{also specifies that} pins should be inserted through base of motor into the foundation, to maintain accurate positioning of the motor, at opposite diagonal locations. After review of ^{material receiving report} MRR # 10457, Book 1 of 2, for the HPSI pump, ^{and motor assembly} no record of the ^{installation} ^{IMSIAP02} mounting, and, ^{bolting} torque values for motor, ~~bolting~~ was documented on the Special Construction Inspection Planning (CIP) report for NSSS equipment, or the CIP Cold Alignment Data Sheet. (When

appraised of this deficiency, APC initiated a Corrective Action Report, on September 16, 1983, NO. C-83-138DD

to investigate if a generic condition exists for pump installations, and to provide CIP and ^{and documentation} installation inspection ^{for HPSI pump, including} ^{motor/MSIAP02} Torquing).

In addition, dowel pins were not installed although the motor feet to the skid as required.

This deficiency is in violation of Work Plan Procedure WPP/QCI 151.0 Rev-6 Paragraph 7.1 Concerning CIP for mechanical equipment installation; ANSI 45.2.8 Paragraph 4.4 Concerning inspection of mechanical items; and 10 CFR 50 Appendix B Section X Concerning inspection.

(b) Emergency Diesel Generator

The electrical aspects of the emergency diesel generator NO.1, IEPEAG01, including control cabinet wiring, were inspected for location, mounting, separation, protection, and identification.

These reviewed aspects indicated work was performed in accordance with installation requirements. No deficiencies were identified.

C. Motor Operated Valves

The installation and the associated documentation for the following motor operated valves (MOV) were inspected:

MOV Identification

IJSIA HV698 HPSI pump NO.1 discharge valve

IJSIA HV604 HPSI pump NO.1 long term cooling valve

IJSIA UV673 Containment sump isolation valve

During the inspection of MOV installation and documentation, the NRC CAT inspectors identified the following deficiencies:

(1) Material Receiving Report #42220 for MOV IJSIA HV604 was missing from documentation files Book OC161, purchase order 9601231. (When apprised of this deficiency, APS obtained a copy of MRR #42220 and filed the report in book OC161).

(2) Maintenance Action Cards could not be found for MOV IJSIA HV604 and IJSIA HV698. Upon further investigation the NRC CAT inspectors determined that the APS position is that MOV's do not require maintenance. This position is in conflict with Maintenance of Materials and Equipment Procedure No. 28 section 8.10.1 which states that motor operated and control valves shall be maintained as specified by Manufacturer's instructions. Section 8.10.2 additionally states in part "on motor operated valves verify that heaters, if provided, are energized".

d. Switchgear

The following 4.16 kV switchgear were inspected and compared to installation drawings relative to Configuration, location, mounting, identification, and protection.

Switchgear Identification

1E-PBA-503	4.16 kV switchgear, separation group 1
1E-PGA-L35	480 V switchgear, separation group 1
1E-PGA-L33	480 V switchgear, separation group 1

These reviewed aspects indicated work was performed in accordance with installation and design requirements. No deficiencies were identified.

Motor Control Centers

The following 480V motor control centers (MCC) were inspected and compared to installation drawings relative to configuration, location, mounting, identification, installation card documentation, and protection.

MCC Identification

1E-PHA-M33	480 V MCC, separation group 1
1E-PHA-M35	480 V MCC, separation group 1
1E-PHA-M37	480 V MCC, separation group 1
1E-PHB-M34	480 V MCC, separation group 2
1E-PHB-M36	480 V MCC, separation group 2
1E-PHB-M38	480 V MCC, separation group 2

These reviewed aspects indicated work was performed in accordance with installation and design requirements. No deficiencies were identified.

During the inspection of motor control centers, the NRC CAT inspectors identified the following deficiencies with respect to bolting and vendor drawings:

The NRC CAT inspectors observed during the inspection that Design Charge Package DCP NO. ISE-PH-035 was in progress for modifications to the tie down methods for the 480V motor control centers. These changes were required to comply with seismic analysis requirements. The specific modifications included installation of anchor brackets and hold down bolts for securing the MCC to the NEMA ^{enclosure} floor frame assembly, and addition of more weld joints between the floor frame ^{assembly} and the embedment plates. The inspectors observed that these changes were completed MCC's IE-PHB-M34, -M36 and -M38; however, modification work to MCC's IE-PHA-M33, -M35, and -M37 had not begun. During the inspection, the NRC CAT inspectors identified the following deficiencies with respect to bolting and vendor drawings:

- (1.) General Electric drawing 272 A5601LD sk2 rev.1 shows the bolting locations for mounting of the MCC cubicles to the NEMA enclosure floor frame assembly. The NRC CAT inspectors found that the front right bolt for mounting the MCC to the floor frame 8-inch cubicle midchannel only partially engaged the tie down nut. On MCC IE-PHA-M35 Cubicles 1, 2, and 3 (viewed from the MCC front, right to left). The NRC inspectors concluded that this was a quality control error at the vendor manufacturing facility (General Electric) due to the fact that the MCC's were mounted on the floor frame prior to shipment to the site. In addition, DCP NO. 1SE-PH-035 requires modification work to be completed on the MCC which will correct this deficiency.

(2) The Bechtel Specification for procurement of the 480V MCC's, 13-EM-018 rev 4, requires as built outline dimensioned drawings for foundation and mounting details. The NRC CAT inspectors reviewed the General Electric drawing package for MCC's and found that drawing 272A5601LD sh 2 rev 1, NEMA floor frame assembly, was in error and did not represent the as-built bolting configuration. The drawing indicated a four bolt arrangement below the 8-inch cubicle midchannel support (viewed from the front of the floor frame), however the actual floor frame at the MCC (for example IE-PHB-M34) had an 8 bolt arrangement. The NRC CAT inspectors concluded that as-built drawings were not provided by the manufacturer for the NEMA floor frame assembly in accordance with Bechtel specification 13-EM-018 rev 4.

- (3) The NRC CAT inspectors determined that the General Electric drawing package for the Class 1E 480V motor control centers does not show the exact point of attachment for addition of lifting lugs to the floor frame assembly during the initial installation. For example, GE drawing 212B 8570 sh. 39, 1E-PHA-M35, does not provide information as to the point of attachment for the lifting lug and bolts. In addition, no information is provided as to whether the lifting lug bolts should be retained or removed from the floor frame assembly after installation. As mentioned above, an "as-built" drawing of the floor frame assembly has not been included in the drawing package. As a result of this lack of information, the NRC CAT inspectors observed that some of the ^{3/4-inch} lifting lug bolts and some of the floor ^{frame} assembly ^{assembly} 3/8-inch structural bolts were removed at the lifting lug point for MCC's 1E-PHA-M33, M35, and M37 and 1E-PHB-M34, M36, and M38. The number of missing bolts varied from point to point. In addition, one 3/4-inch lifting lug bolt at 1E-PHA-M35 was only half screwed in.

while others were retained at these points

The NRC CAT inspectors found that the $\frac{3}{8}$ -inch bolts at their lifting point locations provide structural support to internal ^{support} members of the floor frame assembly. Therefore the missing $\frac{3}{8}$ -inch bolts at the lifting key points appear to violate the structural integrity of the MCC mounting. Although there are no construction drawing, as-built, with which to assess proper bolting configuration of the floor frame assembly, the NRC CAT inspectors believe that the missing $\frac{3}{8}$ -inch bolts should have been found by the APS quality control check when the MCC units were installed and the control and tracking system installation card was signed off. The inspectors questioned whether the $\frac{3}{4}$ -inch lifting key bolts should be retained or removed after MCC installation in order to comply with seismic analysis requirements.

In summary, the NRC CAT inspectors found:
 the G-E drawing package does not provide as-built drawing of the floor frame assembly; the lifting key points on the floor frame assembly are not specifically pointed out; no information is provided with respect to retention or deletion of the $\frac{3}{4}$ -inch lifting key bolts after MCC installation; and some $\frac{3}{8}$ -inch bolts required for floor frame assembly structural support were found to be missing. The missing $\frac{3}{8}$ -inch

butte represent a violation of 10 CFR 50 appendix
B section X for 'inspection of safety related
components. (WHEN APPRAISED OF THESE FIND'GS. APS INITIATED
CONSTR. QA/QC SURVEILLANCE RPT. R83-0130 DTD.
9/29/83. FOR EXAMINATION & CORRECT'N. OF IDENTIFIED
DEFICIENCIES).

4. Electrical Raceways

a. Conduit

The NRC CAT inspectors observed 4 Conduit runs and associated fittings totaling 1164 feet in length. The runs were inspected for conformance to installation and routing requirements, separation, size, identification and, spacing and attachments. These Conduit runs were inspected coincident with the electrical cable installation inspection.

During the course of the Conduit inspection, the following deficiency was identified by the NRC CAT inspectors:

- (1) Field Construction and Quality Control Manual
VOL. II, Raceway Installation, NO. 251.0 rev. 18,
section 5.10 states in part "a repair tag
may be used to document damaged covering
on flexible conduit and will be repaired as
follows - cut out damaged section of jacket
on the flex and install 2 half-lapped layers
of Scotch 33+ all weather tape extending
approximately one inch beyond existing jacket".

During the course of the inspection of ^{Class 1E} conduit
 run WEECICARK13 located inside containment
 at elevation 120 ft, the NRC CAT inspector
 found an Anaconda flexible metal hose
 type NWC which was damaged (extent
 of damage unknown) and subsequently repaired
 in accordance with the above procedure by
 taping over with Scotch 33 tape. The NRC
 CAT inspector questioned the validity
 of this procedure with respect to maintaining
 integrity of the conduit under LOCA/MSLB
 Conditions. It was pointed out that Material
 Requirement 13-EM-036A rev 13, Class 1E Conduit
 and Fitting, requires certified test reports and
 data to demonstrate suitability of flexible
 liquid-tight conduits to withstand accident
 environments. It is the NRC CAT inspector

opinion that the tapping of the flexible conduit is unsatisfactory with respect to maintaining ^{integrity and} qualification of the conduit. (When apprised of this observation, APS initiated startup field report SFR NO. IRC-171 dated September 22, 1983 to request engineering to provide justification for the present repair procedure or initiate an alternate repair procedure to ensure integrity and qualification of the flexible conduit).

A suitable heat shrink repair kit or replacement of the flexible conduit is advised.

9/29/83

C J Crane

53

HangerTray DWGrev.Hanger detailDWG. / REV.

1E2ABAH25

H26

H27

H28

13E2AC005

18

3-3

13E2AC045/10

1E2A1AH20

H19

H77

H76

13E2AC032

5

13A-3

13E2AC047/9

13A-3

1A-48

1A-48

1. found spring nut cocked so grooves did not
 catch at tray clamp at H25. Craftman
 repaired on the spot and torqued.

5B01

CABLE INSPECTION RECORD

NO.	VERIFICATION DESCRIPTION	RFE	DATE	QCE	DATE	TYPE
1	CABLE ROUTED PER FACEWAYS PRINTED ON FACE OF CARD			139	6/24/81	
2	CABLE CODE - INSTALLED TYPE CABLE AS ON CARD			139	6/24/81	
3	SEPARATION - CABLE COLOR CODE AS ON CARD			139	6/24/81	
4	CABLE PULL SET UP			139	6/24/81	
5	HOLD POINT			139	6/24/81	
6	CABLE PULL CALCULATION NUMBER			N/A	JUN 24 '81	
7	MAXIMUM ALLOWABLE PULLING TENSION			N/A	JUN 24 '81	
8	DYNAMOMETER OR TENSIONOMETER FEADING			N/A	JUN 24 '81	
9	ACTUAL PULLING TENSION			N/A	JUN 24 '81	
10	DYNAMOMETER OR TENSIONOMETER S/N-			N/A	JUN 24 '81	
	CAL. DATE-			N/A	JUN 24 '81	
11	CABLE ENDS SEALED - AS REQUIRED			139	JUN 24 '81	
12	CABLE ID STUBS FROM CABLE CARD AT EACH END OF CABLE			139	JUN 24 '81	
13	CABLE SUPPORTED AND SPACED			139	JUN 24 '81	
14	CABLE LAID IN TRAY BY HAND			139	JUN 24 '81	
15	CABLE PULLED BY HAND			139	JUN 24 '81	
*** REMARKS *** PRE-cut				139	6/24/81	

REMARKS P01411

SIGNATURES		RFE/DATE	Michael B. Goldberg 7/6/81
		QCE/DATE	7-14-81

TERMINATION INSPECTION RECORD

NO.	VERIFICATION DESCRIPTION	RFE	DATE	QCE	DATE	TYPE
1.0	FLEX CONDUITS INSTALLED, IF REQUIRED.				JUL 14 '81	
2.0	TERMINATION PER -CONTROL AND TRACKING SYSTEM TERMINATION INSTALLATION CARD-			97	JUL 14 '81	
3.0	TERMINATION PER SPEC 13-EM-306, REV 4 EXCLUDE TESTING			97	JUL 14 '81	
4.0	TORQUE WRENCH S/N N/A CALIBRATION DUE N/A			N/A	JUL 14 '81	
5.0	CRIMPING TOOL S080715 CALIBRATION DUE 9/81			N/A	JUL 14 '81	
6.0	TERMINATIONS IDENTIFIED PER SPEC 13-EM-303, REV. 47			N/A	JUL 14 '81	
7.0	CABLE TIED, SUPPORTED, AND SEPARATED - IF REQUIRED - (N/A)			N/A	JUL 14 '81	
8.0	GROUNDING IS INSTALLED AS REQUIRED.			N/A	JUL 14 '81	

REMARKS:

SIGNATURES	SUPERINTENDENT/DATE	RFE/DATE	9/16/81
		QCE/DATE	9-22-81

COM. TERMINATION NUMBER **1ERC65CC1XA** **9/13** TERMINATION CODE **PT-102C** PARATION GROUP NO. OF CABLES NO. OF CONNECTIONS DATE ISSUED **85.23** ICD ISSUE NO.

EC **1ERC65CC1XA** **CT63** CABLE NUMBER CABLE CODE

TERMINATION DESCRIPTION

ACCOUNT CODE

TERMINATION DESIGN DETAILS

TERMINATIONS.

LOCATION OF TERMINATION

F **1FSAC22H1** LOCATION NUMBER

PN **PENETRATION** LOCATION DESCRIPTION

LOCATION DESIGN DETAILS

PENETRATION 22H1

ET **1E2C1CCT1YAA** LAYOUT DRAWING

13E7CC11 REV. **02**

CONNECT DRAWING

REV.

VE **035080** VENDOR DRAWING

REV.

THE CONDUCTORS MUST BE CONNECTED TO THE FOLLOWING POINTS:

BLOCK	POINT	S	COLOR	WIRE NO.	BLOCK	POINT	S	COLOR	WIRE NO.	BLOCK	POINT	S	COLOR	WIRE NO.
T12A	04		EX	P										
T12A	05		SH	N										
T12A	06		SHLD	*SHLD										

RETENTION TIME LT
 NOV 30 1981
 COMPUTER

RECEIVED
 NOV 28 1981
 QC-DCC

INSTALLER MUST COMPLETE SPACES 48 THRU 53 SIGN AND DATE

GEWKDC **1ERC65CC1XA2** **01** **CC** NO. OF CONNECTIONS

CRIMP TOOL **130454**

INSTALLED BY Scott Goodman EI 2244 SIGNATURE

DATE INSTALLED **11/16/91**

CONTROL AND TRACKING SYSTEM
 TERMINATION INSTALLATION CARD



5801

TERMINATION INSPECTION RECORD

[illegible]

F*	1ESACZ280	177AC15	00	PENETRATION 2280
COM.	TO LOCATION	DRAWING	REV.	DESCRIPTION

DESIGN DETAILS

PO 310

PT-102C

RETENTION TIME 47 YRS.

THIS CABLE MUST BE PULLED THROUGH THE FOLLOWING RACEWAYS:

FK	1FZJ4ACKXAB	EN	1FZJ4ACKXVB	ET	1FZJ4BCTXVB	ET	1FZJ4BCTXCD
ET	1FZJ4ACTXCE	ET	1FZJ4ACTXAA	ET	1FZJ4ACTXVN	ET	1FZJ1ACTYAD
ET	1FZJ1ACTYAC	ET	1FZJ1ACTYAA	ET	1FZA1DCTXBL	ET	1FZA1DCTXFK
ET	1FZA1DCTXIJ	ET	1FZA1DCTXBN	ET	1FZA1DCTXFG	ET	1FZA1DCTXBF
ET	1FZA1DCTXFF	ET	1FZA1DCTXBD	ET	1FZA1DCTXBC	ET	1FZA1DCTXBD
ET	1FZA1DCTXLA	ET	1FZA1ACTXBA	ET	1FZA1ACTXBB	ET	1FZA1ACTXBC

INSTALLER MUST COMPLETE SPACES 54 THRU 79 SIGN AND DATE

[illegible]

CONTROL AND TRACKING SYSTEM CABLE INSTALLATION CARD



CABLE INSPECTION RECORD

NO.	VERIFICATION DESCRIPTION	RFE	DATE	QCE	DATE	TYPE
1	CABLE ROUTED PER RACEWAYS PRINTED ON FACE OF CARD			3/1	20 MAY '80	
2	CABLE CODE - INSTALLED TYPE CABLE AS ON CARD			3/1	20 MAY '80	
3	SEPARATION - CABLE COLOR CODE AS ON CARD			3/1	20 MAY '80	
4	CABLE PULL SET UP			3/1	20 MAY '80	
5	HOLD POINT			3/1	20 MAY '80	
6	CABLE PULL CALCULATION NUMBER			N/A	20 MAY '80	
7	MAXIMUM ALLOWABLE PULLING TENSION			N/A	20 MAY '80	
8	DYNAMOMETER OR TENSIONOMETER READING			N/A	20 MAY '80	
9	ACTUAL PULLING TENSION			N/A	20 MAY '80	
10	DYNAMOMETER OR TENSIONOMETER S/N-			N/A	20 MAY '80	
	CAL. DATE-			N/A	20 MAY '80	
11	CABLE ENDS SEALED - AS REQUIRED			3/1	20 MAY '80	
12	CABLE ID STUBS FROM CABLE CARD AT EACH END OF CABLE			3/1	20 MAY '80	
13	CABLE SUPPORTED AND SPACED			3/1	20 MAY '80	
14	CABLE LAID IN TRAY BY HAND			3/1	20 MAY '80	
15	CABLE PULLED BY HAND			3/1	20 MAY '80	
*** REMARKS ***						
COILED AT 1E2A1A CT x BC (3/1) 20 MAY '80 full complete (3/1) 3/20/80						

PERMANENT: P0310

SIGNATURES	*****	JUN 11 1980	RFE/DATE	Mohammed Amin 5/1/80
			QCE/DATE	N. Alchong 6-10-80

QC-DCC

COM. 0160 TERMINATION NUMBER 1270000 REV. 1 TERMINATION CODE CC SEPARATION GROUP AND COLOR CC NO. OF CABLES 1 NO. OF CONNECTIONS 1 DATE ISSUED 85.23 ICD ISSUE NO. 1000
 CABLE NUMBER 1270000 CABLE CODE 1 TERMINATION DESCRIPTION TERMINATION ACCOUNT CODE 85.23

TERMINATION DESIGN DETAILS TERMINATION RETENTION TIME LT YRS.

LOCATION OF TERMINATION

COM. 1 LOCATION NUMBER 1270000 LOCATION CODE 1 LOCATION DESCRIPTION CONTROL BLDG UNIT 1, 2A EL 14

LOCATION DESIGN DETAILS WESS CHAN C ANALOG INS CABINET

LAST RACEWAY 1270000 LAYOUT DRAWING 1 REV. 1 CONNECT DRAWING 1 REV. 1 VENDOR DRAWING 1200125 REV. 1

THE CONDUCTORS MUST BE CONNECTED TO THE FOLLOWING POINTS:

BLOCK	POINT	COLOR	WIRE NO.	BLOCK	POINT	COLOR	WIRE NO.	BLOCK	POINT	COLOR	WIRE NO.

INSTALLER MUST COMPLETE SPACES 48 THRU 53 SIGN AND DATE

NO. OF CONNECTIONS 1 CRIMP TOOL 130474
 INSTALLED BY Steven Moody E.T. 1713 DATE INSTALLED 6/17/80 JUL 1 1980

COM. 1 TERMINATION NUMBER 1270000 REV. 1 TERMINATION CODE CC SEPARATION GROUP AND COLOR YL-YELLO NO. OF CABLES 1 NO. OF CONNECTIONS 0003 DATE ISSUED 06JAF1 ICD ISSUE NO. 2151

CABLE NUMBER 1270000 CABLE CODE 1 TERMINATION DESCRIPTION TERMINATION ACCOUNT CODE 85.23

TERMINATION DESIGN DETAILS TERMINATION RETENTION TIME LT YRS.

LOCATION OF TERMINATION

COM. 1 LOCATION NUMBER 1270000 LOCATION CODE 1 LOCATION DESCRIPTION AUX. BLDG. ELECT. PENET. AREA. N.W.

LOCATION DESIGN DETAILS PENETRATION 2240

LAST RACEWAY 1270000 LAYOUT DRAWING 1 REV. 1 CONNECT DRAWING 1 REV. 1 VENDOR DRAWING 1203400 REV. 1

THE CONDUCTORS MUST BE CONNECTED TO THE FOLLOWING POINTS:

BLOCK	POINT	COLOR	WIRE NO.	BLOCK	POINT	COLOR	WIRE NO.	BLOCK	POINT	COLOR	WIRE NO.
T124	0	BL	1								
T124	0	BL	2								
T124	0	BL	3								

INSTALLER MUST COMPLETE SPACES 48 THRU 53 SIGN AND DATE

NO. OF CONNECTIONS 1 CRIMP TOOL 1305718
 INSTALLED BY B. Curran E.T. 1707 DATE INSTALLED 12/08/11

CONTROL AND TRACKING SYSTEM
TERMINATION INSTALLATION CARD



CONTROL AND TRACKING SYSTEM
TERMINATION INSTALLATION CARD



TERMINATION INSPECTION RECORD

NO.	VERIFICATION DESCRIPTION	RFE	DATE	QCE	DATE	TYPE
1.0	FLEX CONDUITS AND GROUNDING INSTALLED			(3)	6-17-80	
2.0	TERMINATION PER-CONTROL AND TRACKING SYSTEM TERM INSTALLATION CARD- AND SPEC NO 13-EM-306, REV-3			(3)	6-17-80	
3.0	TORQUE WRENCH S/N <i>N/A</i> CAL DUE DATE <i>N/A</i>			(3)	6-17-80	
4.0	TERMINATIONS IDENTIFIED			(3)	6-17-80	
5.0	CABLE TIED, SUPPORTED, AND SEPARATED - IF REQ			(3)	6-17-80	

RECEIVED

JUN 27 1980

QC - DCC

REMARKS: * CRIMP TOOL JEB0474; 8-80 (3) 6-17-80

SIGNATURES	SUPERINTENDENT/DATE	RFE/DATE <i>Louisa S. Cook 23 JUN 80</i> QCE/DATE <i>M. Schuyler 6-26-80</i>
------------	---------------------	---------------------------------------------------------------------------------

TERMINATION INSPECTION RECORD

NO.	VERIFICATION DESCRIPTION	RFE	DATE	QCE	DATE	TYPE
1.0	FLEX CONDUITS INSTALLED, IF REQUIRED.			N/A	1-23-81	
2.0	TERMINATION PER -CONTROL AND TRACKING SYSTEM TERMINATION INSTALLATION CARD-			(3)	1-23-81	
3.0	TERMINATION PER SPEC 13-EM-306, REV 4 EXCLUDE TESTING			(3)	1-23-81	
4.0	TORQUE WRENCH S/N <i>N/A</i> CALIBRATION DUE <i>N/A</i>			N/A	1-23-81	
5.0	CRIMPING TOOL S/N <i>JEB0578</i> CALIBRATION DUE <i>3-81</i>			(3)	1-23-81	
6.0	TERMINATIONS IDENTIFIED PER SPEC 13-EM-303, REV. 6			(3)	1-23-81	
7.0	CABLE TIED, SUPPORTED, AND SEPARATED - IF REQUIRED-			(3)	1-23-81	
8.0	GROUNDING IS INSTALLED AS REQUIRED.			N/A	1-23-81	

RECEIVED

JAN 26 1981

QC -

REMARKS:

SIGNATURES	SUPERINTENDENT/DATE	RFE/DATE <i>Louisa S. Cook 1-28-81</i> QCE/DATE <i>M. Schuyler 1-29-81</i>
------------	---------------------	-------------------------------------------------------------------------------

COM.	FROM LOCATION	DRAWING	REV.	DESCRIPTION
1	15306.1	15306.1	05	DRACK

COM.	1-78-06771	1-78-06771-05	INSIDE CONTAINMENT PENETRATION
		DRAWING	DESCRIPTION
		REV.	

DT-102D

THIN CABLE MUST BE PULLED THROUGH THE FOLLOWING RACEWAYS:

[illegible]

RECEIVED

RETENTION TIME IT

JUL 22 1981

COMPUTER Q-C-DCC

INSTALLER MUST COMPLETE SPACES 11 THRU 79 SIGN A

[illegible]

INSTALLED BY Chenault F-1526 DATE INSTALLED 06/24/82 10624 PM 2

1. The first part of the document is a title page. It contains the title of the document, the author's name, and the date of the document. The title is "The History of the United States of America". The author is "John Adams". The date is "1776".

1970-1971

100

1

1947

100

100

CABLE INSPECTION RECORD

INC.	VERIFICATION DESCRIPTION	RFE	DATE	QCE	DATE	TYPE
1	CABLE ROUTED PER RACEWAYS PRINTED ON FACE OF CARD			139 QCE	6/22/81	
2	CABLE CODE - INSTALLED TYPE CABLE AS ON CARD			139 QCE	6/22/81	
3	SEPARATION - CABLE COLOR CODE AS ON CARD			139 QCE	6/22/81	
4	CABLE PULL SET UP			139 QCE	6/22/81	
5	HOLD POINT			139 QCE	6/22/81	
6	CABLE PULL CALCULATION NUMBER			N/A	6/22/81	
7	MAXIMUM ALLOWABLE PULLING TENSION			N/A	6/22/81	
8	DYNAMOMETER OR TENSIONOMETER READING			N/A	6/22/81	
9	ACTUAL PULLING TENSION			N/A	6/22/81	
10	DYNAMOMETER OR TENSIONOMETER S/N- CAL. DATE-			N/A	6/22/81	
11	CABLE ENDS SEALED - AS REQUIRED			139 QCE	6/22/81	
12	CABLE ID STUBS FROM CABLE CARD AT EACH END OF CABLE			139 QCE	6/22/81	
13	CABLE SUPPORTED AND SPACED			139 QCE	6/22/81	
14	CABLE LAID IN TRAY BY HAND			139 QCE	6/22/81	
15	CABLE PULLED BY HAND			139 QCE	6/22/81	
**** REMARKS **** PRE-CUT					6/16/81	
<div> <div>南音南音南音S</div> <div>PO1294</div> </div>						
SIGNATURES		<div> <div>Michael B. Goldberg 7/18/81</div> <div>Y. A. Schaefer 7-20-81</div> </div>				

EW 1ERC65DC1XA1 *9/13* D BL-BLUE 01 0003 01JL81 2991

EC 1ERC65DC1XA CE64 85.23

PT-1020

LOCATION OF TERMINATION

E* 1JSBDA01 JR INSTRUMENT RACK

LOCATION DESIGN DETAILS JRACK

ER 1EZC2ADRX01 13EZCC13 03

THE CONDUCTORS MUST BE CONNECTED TO THE FOLLOWING POINTS:

BLOCK	POINT	COLOR	WIRE NO.	BLOCK	POINT	COLOR	WIRE NO.	BLOCK	POINT	COLOR	WIRE NO.
T***	13	BK	P								
T***	14	WH	N								
		SHLD	SHLD								

RETENTION TIME LT
SEP 25 1981
COMPUTER

RECEIVED
SEP 23 1981
QC-DCC

GEWKDC 1ERC65DC1XA1 04 CC

INSTALLED BY *John Mayera* EI-2959

DATE INSTALLED 7/13/81

CONTROL AND TRACKING SYSTEM
TERMINATION INSTALLATION CARD



10

[illegible]

EW 1ERC65DC1X42	01	01	BL-BLUE	01	0005	010281	2991
COM. TERMINATION NUMBER	REV.	TERMINATION CODE	SEPARATION GROUP AND COLOR	NO. OF CABLES	NO. OF CONNECTIONS	DATE ISSUED	ICD ISSUE NO.
EC 1ERC65DC1X4	CE64					85.23	
COM. CABLE NUMBER	CABLE CODE	TERMINATION DESCRIPTION				ACCOUNT CODE	

TERMINATION
OF SIGN
DETAILS

9/13 **PT-102D**

LOCATION OF TERMINATION

E*	1ESFDZ771	P*	PENETRATION
COM.	LOCATION NUMBER	LOCATION CODE	LOCATION DESCRIPTION
TERMIN.			

LOCATION
OF SIGN
DETAILS

INSIDE CONTAINMENT PENETRATION

ET 1E2C2DDTYAC	13E2CC16	05			VE035250	00
LAST RACEWAY	LAYOUT DRAWING	REV.	CONNECT DRAWING	REV.	VENDOR DRAWING	REV.

THE CONDUCTORS MUST BE CONNECTED TO THE FOLLOWING POINTS:

BLOCK	POINT	COLOR	WIRE NO.	BLOCK	POINT	COLOR	WIRE NO.	BLOCK	POINT	COLOR	WIRE NO.
T12A	04	BK	P	RETENTION TIME LT DEC 16 1981 COMPUTER							
T12A	05	WH	1								
T12A	06	SHLD	SHLD								
OK 9/13				DEC 15 1981 QC-DCC							

INSTALLER MUST COMPLETE SPACES 48 THRU 53 SIGN AND DATE

GEWKDC	1ERC65DC1X42	01	CC
18	20-21	22-23	

NO. OF CONNECTIONS									
CRIMP TOOL	13	04	15	14					
48									

INSTALLED BY

Scott Goodman EI2244

SIGNATURE

DATE INSTALLED 12/10/81

CONTROL AND TRACKING SYSTEM
TERMINATION INSTALLATION CARD



SB01

TERMINATION INSPECTION RECORD

[illegible]



CABLE INSPECTION RECORD

NO.	VERIFICATION DESCRIPTION	RFE	DATE	USE	DATE	TYPE
1	CABLE ROUTED PER RACEMAYS PRINTED ON FACE OF CARD			131	10-14-81	
2	CABLE CODE - INSTALLED TYPE CABLE AS ON CARD			131	10-14-81	
3	SEPARATION - CABLE COLOR CODE AS ON CARD			131	10-14-81	
4	CABLE PULL SET UP			131	10-14-81	
5	HOLD POINT			131	10-14-81	
6	CABLE PULL CALCULATION NUMBER			NA	10-14-81	
7	MAXIMUM ALLOWABLE PULLING TENSION			NA	10-14-81	
8	DYNAMOMETER OR TENSIONMETER READING			NA	10-14-81	
9	ACTUAL PULLING TENSION			NA	10-14-81	
10	DYNAMOMETER OR TENSIONMETER S/N			NA	10-14-81	
	CAL. DATE-			NA	10-14-81	
11	CABLE ENDS SEALED - AS REQUIRED			131	10-14-81	
12	CABLE ID STUBS FROM CABLE CARD AT EACH END OF CABLE			131	10-14-81	
13	CABLE SUPPORTED AND SPACED			131	10-14-81	
14	CABLE LAID IN TRAY BY HAND			131	10-14-81	
15	CABLE PULLED BY HAND			131	10-14-81	
**** REMARKS ****						
16	PREV					

***** PO 1999

SIGNATURES	<div style="text-align: center;">*****</div> <div style="text-align: right;"> RFE/DATE: <i>Michael B. Opberg</i> 10/21/81 DATE: <i>Joe L. Crawford</i> 11-5-81 </div>
------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

EC 1ERC65DC1X1E 01 0 PL-BLUE 0003 23591 3398
COM. CABLE NUMBER CABLE CODE TERMINATION DESCRIPTION ACCOUNT CODE

TERMINATION DESIGN DETAILS PT-102D

LOCATION OF TERMINATION
E* 1JSBDC024 JC INSTRUMENTATION CABINET
COM. LOCATION NUMBER LOCATION CODE LOCATION DESCRIPTION

TERMIN.

LOCATION DESIGN DETAILS NSSS CHAN D ANALOG INS CABINET

EK 1EZJ23DKYAKS 13EZJ009 01
LAST RACEWAY LAYOUT DRAWING REV. CONNECT DRAWING REV. VENDOR DRAWING REV.

THE CONDUCTORS MUST BE CONNECTED TO THE FOLLOWING POINTS:

BLOCK	POINT	COLOR	WIRE NO.	BLOCK	POINT	COLOR	WIRE NO.	BLOCK	POINT	COLOR	WIRE NO.
TB2*	49	EK	3								
TB2*	50	W4	V								
TB2*	51	SHLD	SHLD								

RETENTION TIME LT
NOV 4 1981
COMPUTER

RECEIVED
NOV 4 1981
QC-DCC

INSTALLER MUST COMPLETE SPACES 48 THRU 53 SIGN AND DATE
NO. OF CONNECTIONS CRIMP TOOL

INSTALLED BY George Kennard EI-507 DATE INSTALLED 10/19/81

CONTROL AND TRACKING SYSTEM
TERMINATION INSTALLATION CARD



EW 1ERC65DC1X1E 01 0 PL-BLUE 0003 23591 3398
COM. TERMINATION NUMBER REV. TERMINATION CODE SEPARATION GROUP AND COLOR NO. OF CABLES NO. OF CONNECTIONS DATE ISSUED ICD ISSUE NO.

EC 1ERC65DC1X1E 01 0 PL-BLUE 0003 23591 3398
COM. CABLE NUMBER CABLE CODE TERMINATION DESCRIPTION ACCOUNT CODE

TERMINATION DESIGN DETAILS

LOCATION OF TERMINATION
E* 1FSFD2770 PV PENETRATION
COM. LOCATION NUMBER LOCATION CODE LOCATION DESCRIPTION

LOCATION DESIGN DETAILS OUTSIDE CONTAINMENT PENETRATION

ET 1EZA23DTXAA 13EZAC66 06
LAST RACEWAY LAYOUT DRAWING REV. CONNECT DRAWING REV. VENDOR DRAWING REV.

THE CONDUCTORS MUST BE CONNECTED TO THE FOLLOWING POINTS:

BLOCK	POINT	COLOR	WIRE NO.	BLOCK	POINT	COLOR	WIRE NO.	BLOCK	POINT	COLOR	WIRE NO.
T12A	04	EK	3								
T12A	05	W4	V								
T12A	06	SHLD	SHLD								

RETENTION TIME LT
FEB 4 1982
COMPUTER

RECEIVED
FEB 4 1982
QC-DCC

INSTALLER MUST COMPLETE SPACES 48 THRU 53 SIGN AND DATE
NO. OF CONNECTIONS CRIMP TOOL

INSTALLED BY J. L. ... DATE INSTALLED 12/10/81

CONTROL AND TRACKING SYSTEM
TERMINATION INSTALLATION CARD



TERMINATION INSPECTION RECORD

NO.	VERIFICATION DESCRIPTION	RFE	DATE	OCE	DATE	TIME
1.0	FLEX CONDUITS INSTALLED, IF REQUIRED.			NA	OCT 30 '81	
2.0	TERMINATION PER -CONTROL AND TRACKING SYSTEM TERMINATION INSTALLATION CARD-.			131	OCT 30 '81	
3.0	TERMINATION PER SPEC 13-EM-306, REV 4 EXCLUDE TESTING			131	OCT 30 '81	
4.0	TORQUE WRENCH S/N N/A CALIBRATION DUE N/A			131	OCT 30 '81	
5.0	CRIMPING TOOL S/N JEB 885 CALIBRATION DUE 1-82			131	OCT 30 '81	
6.0	TERMINATIONS IDENTIFIED PER SPEC 13-EM-303, REV. 7			131	OCT 30 '81	
7.0	CABLE TIED, SUPPORTED, AND SEPARATED -IF REQUIRED-.			131	OCT 30 '81	
8.0	GROUNDING IS INSTALLED AS REQUIRED.			N/A	OCT 30 '81	

REMARKS:

SIGNATURES

SUPERINTENDENT/DATE

RFE/DATE

OCE/DATE

HB 10/27/81
J. Crawford 11-381

TERMINATION INSPECTION RECORD

NO.	VERIFICATION DESCRIPTION	RFE	DATE	OCE	DATE	TIME
1.0	FLEX CONDUITS INSTALLED, IF REQUIRED.			N/A	OCT 17 '81	
2.0	TERMINATION PER -CONTROL AND TRACKING SYSTEM TERMINATION INSTALLATION CARD-.			131	OCT 17 '81	
3.0	TERMINATION PER SPEC 13-EM-306, REV 5 EXCLUDE TESTING			131	OCT 17 '81	
4.0	TORQUE WRENCH S/N N/A CALIBRATION DUE N/A			131	OCT 17 '81	
5.0	CRIMPING TOOL S/N JEB 885 CALIBRATION DUE 1-82			131	OCT 17 '81	
6.0	TERMINATIONS IDENTIFIED PER SPEC 13-EM-303, REV. 7			131	OCT 17 '81	
7.0	CABLE TIED, SUPPORTED, AND SEPARATED -IF REQUIRED-.			131	OCT 17 '81	
8.0	GROUNDING IS INSTALLED AS REQUIRED.			N/A	OCT 17 '81	

REMARKS:

Wires bent more than 30" change wires to inner black from top of 12-17-81 (OK 1-25-82)
D. G. Schuster 11-382

SIGNATURES

SUPERINTENDENT/DATE

RFE/DATE

OCE/DATE

D. G. Schuster 11/15/81
J. Crawford 11-382

PT
351D
CALIBRATION
1/23/82

EC	1EHC62DC1XA	09	CE64	D	BL-BLUE	01	0314	26SE81	3419
COM.	CABLE NUMBER	REV.	CABLE CODE	SEPARATION GROUP AND COLOR		NO. OF CABLES	COMPUTED LENGTH	DATE ISSUED	ICD ISSUE NO.

F*	10HCDPT351D	13EZAC16	03	PRESSURE TRANSMITTER		1084.3
COM.	FROM LOCATION	DRAWING	REV.	DESCRIPTION		ACCOUNT CODE

F*	1JSBDC02A	13EZJC09	01	SSSS CHAN D ANALOG INS CABINET	
COM.	TO LOCATION	DRAWING	REV.	DESCRIPTION	

DESIGN DETAILS

THIS CABLE MUST BE PULLED THROUGH THE FOLLOWING RACEWAYS:

ER	1EZA1BDRX02	EK	1EZA1BDKXJ01	ER	1EZA1BDRX01	ER	1EZA2BDRX07
ER	1EZA2BDRX16	EK	1EZA2BDKXJ01	ER	1EZA2BDRX02	ER	1EZA2BDRX23
ER	1EZA2BDRX06	EK	1EZJ2BDKXJ01	ER	1EZJ2BDRX06	EK	1EZJ2BDKXJ02
ER	1EZJ2BDRX01	ER	1EZJ2BDRX14	ET	1EZJ2BDTYA4	ET	1EZJ2BDTYAF
ET	1EZJ2BDTYAG	ET	1EZJ2BDTYAH	ET	1EZJ2BDTYAJ	ET	1EZJ2BDTYAK
EK	1EZJ2BDKYAKS						

RETENTION TIME LT
JAN 12 1982
COMPUTER

RECEIVED
JAN 12 1982

INSTALLER MUST COMPLETE SPACES 34 THRU 79 SIGN AND DATE

GECKDC	1EHC62DC1XA	09	CC	CE64	REEL NUMBER	0005
1	6	7	18	20-21	22-21	38

SERIAL NUMBER

START FOOTAGE

END ACTUAL FT.

INSTALLED BY Mike Don Carlos FI 3244 DATE INSTALLED 1-04-82

SIGNATURE

CONTROL AND TRACKING SYSTEM
CABLE INSTALLATION CARD
BECHTEL

CABLE INSPECTION RECORD

Q.	VERIFICATION DESCRIPTION	RFE	DATE	QCE	DATE	TYPE
1	CABLE ROUTED PER RACEWAYS PRINTED ON FACE OF CARD			131	10-4-81	
2	CABLE CODE - INSTALLED TYPE CABLE AS ON CARD			131	10-14-81	
3	SEPARATION - CABLE COLOR CODE AS ON CARD			131	10-14-81	
4	CABLE PULL SET UP			131	10-14-81	
5	HOLD POINT			131	10-14-81	
6	CABLE PULL CALCULATION NUMBER			131	10-14-81	
7	MAXIMUM ALLOWABLE PULLING TENSION			131	10-14-81	
8	DYNAMOMETER OR TENSIONOMETER READING			131	10-14-81	
9	ACTUAL PULLING TENSION			131	10-14-81	
10	DYNAMOMETER OR TENSIONOMETER S/N-			131	10-14-81	
	CAL. DATE-			131	10-14-81	
1	CABLE ENDS SEALED - AS REQUIRED			131	10-14-81	
2	CABLE ID STUBS FROM CABLE CARD AT EACH END OF CABLE			131	10-14-81	
3	CABLE SUPPORTED AND SPACED			131	10-14-81	
4	CABLE LAID IN TRAY BY HAND			131	10-14-81	
5	CABLE PULLED BY HAND			131	10-14-81	
*** REMARKS ***						
6	PRE CUT			131	10-14-81	
7	COILED @ IEZAI DDKX501			131	10-14-81	
	UNCOIL + PULL THRU PER CARD. MBG. 12/31/81			131	10-14-81	
	Items 6 through 15 - 1-4-82			131	10-14-81	

REMARKS: PO 1999, UNCOIL #1330

GNATURES	SUPERVISOR SIGNATURE	RFE/DATE	QCE/DATE
		Michael B. Goldberg 1/4/82	1-4-82
		1-12-82	

COM. TERMINATION NUMBER	REV.	TERMINATION CODE	SEPARATION GROUP AND COLOR	NO. OF CABLES	NO. OF CONNECTIONS	DATE ISSUED	ICD ISSUE NO.
1FHG620C1XA	CE64					04JAE2	3827
TERMINATION DESCRIPTION						ACCOUNT CODE	
						85.23	

TERMINATION DESIGN DETAILS

9/13

LOCATION OF TERMINATION

COM.	LOCATION NUMBER	LOCATION CODE	LOCATION DESCRIPTION
1	1	1	INSTRUMENT SW. PRESS. LEVEL ETC.

LOCATION DESIGN DETAILS

PRESSURE TRANSMITTER

LAST RACED	LAYOUT DRAWING	REV.	CONNECT DRAWING	REV.	VENDOR DRAWING	REV.
1-28-1000X10	1-28-1000X10	07				

THE CONDUCTORS MUST BE CONNECTED TO THE FOLLOWING POINTS:

BLOCK	POINT	COLOR	WIRE NO.	BLOCK	POINT	COLOR	WIRE NO.	BLOCK	POINT	COLOR	WIRE NO.
PT35	1N	WH	1								
PT35	1P	SK	2								
		SHLD	5HLD								
				RETENTION TIME LT							
				JAN 21 1982							
				COMPUTER							

RECEIVED

JAN 20 1982

QC-DCC

INSTALLER MUST COMPLETE SPACES 48 THRU 53 SIGN AND DATE

STAKCO	1FHG620C1XA	13	00	NO. OF CONNECTIONS	CRIMP TOOL
					10170121

INSTALLED BY *Robert Engels FI 5246*

DATE INSTALLED 1/11/82

CONTROL AND TRACKING SYSTEM
TERMINATION INSTALLATION CARD



SB01

7-

26 1962	UN 19
26 1962	UN 19 '62
26 1962	UN 19
26 1962	UN 19
26 1962	UN 19 '62
26 1962	UN 19
26 1962	UN 19 '62
26 1962	UN 19
26 1962	UN 19 '62

SUPERINTENDENT/DATE

RFE/DATE

LOGISTICS

RFE/DATE
4. B.L. Schaefer 1/16/82

DATE Jan 20 1982

FW 1FHC62DC1XA2 03 COM. TERMINATION NUMBER 227. TERMINATION CODE 0001-BLUE SEPARATION GROUP AND COLOR 01 NO. OF CABLES 0003 NO. OF CONNECTIONS 0005 DATE ISSUED 13729 ICD ISSUE NO. 85.23 ACCOUNT CODE

TERMINATION
DESIGN
DETAILS

LOCATION OF TERMINATION

FC 1JSBDC02A COM. LOCATION NUMBER JC INSTRUMENTATION CABINET LOCATION CODE

LOCATION
DESIGN
DETAILS

NSSS CHAN D ANALOG INS CABINET

FK 1F2J2BDKYAK00 LAST RACEWAY 1F2J2C00 LAYOUT DRAWING 01 REV. 01 CONNECT DRAWING REV. N1200125 VENDOR DRAWING 4 REV.

THE CONDUCTORS MUST BE CONNECTED TO THE FOLLOWING POINTS:

BLOCK	POINT	S	COLOR	WIRE NO.	BLOCK	POINT	S	COLOR	WIRE NO.	BLOCK	POINT	S	COLOR	WIRE NO.
T82*	67		BK	P										
T82*	68		WH	N										
T82*	69		SHLD	*SHLD										

RETENTION TIME

DEC 21 1981

COMPUTER

INSTALLER MUST COMPLETE SPACES 48 THRU 53 SIGN AND DATE

GEWKDC 1FHC62DC1XA2 03 CC 18 20-21 22-23

NO. OF
CONNECTIONS

CRIMP
TOOL

INSTALLED BY

George Kennard E1-507

DATE
INSTALLED

12/14/81

CONTROL AND TRACKING SYSTEM
TERMINATION INSTALLATION CARD



TERMINATION INSPECTION RECORD

[illegible]

REMARKS:

SIGNATURES

SUPERINTENDENT/DATE

RFE/DATE

QCN/DATE

12/17/81

22-19-81

CABLE INSPECTION RECORD

NO.	VERIFICATION DESCRIPTION	RFE	DATE	GCE	DATE	TYP
1	CABLE ROUTED PER RACEWAYS PRINTED ON FACE OF CARD			(131) GCE	WH 15 01	
2	CABLE CODE - INSTALLED TYPE CABLE AS ON CARD			(131) GCE	WH 15 81	
3	SEPARATION - CABLE COLOR CODE AS ON CARD			(131) GCE	WH 15 81	
4	CABLE PULL SET UP			(131) GCE	WH 15 01	
5	HOLD POINT			(131) GCE	WH 15 01	
6	CABLE PULL CALCULATION NUMBER			NA	8-8-81	
7	MAXIMUM ALLOWABLE PULLING TENSION			NA	8-8-81	
8	DYNAMOMETER OR TENSIONMETER FEADING			NA	8-8-81	
9	ACTUAL PULLING TENSION			NA	8-8-81	
10	DYNAMOMETER OR TENSIONMETER S/N-			NA	8-8-81	
	CAL. DATE-			NA	8-8-81	
11	CABLE ENDS SEALED - AS REQUIRED			(167) GCE	8-8-81	
12	CABLE ID STUBS FROM CABLE CARD AT EACH END OF CABLE			(167) GCE	8-8-81	
13	CABLE SUPPORTED AND SPACED			(167) GCE	8-8-81	
14	CABLE LAID IN TPAY BY HAND			(167) GCE	8-8-81	
15	CABLE PULLED BY HAND			(167) GCE	8-8-81	
*** REMARKS ***						
16	Coiled @ TXAB			(131) GCE	WH 15 81	
17	UNCOIL + HAND-PULL AS PER CARD. REG. 8/3/81			(167) GCE	8-8-81	
CABLE UN COILED PULLED PER CARD (167) GCE 8-8-81						
PO 1154, UNCOIL #709						
SIGNATURES		RFE/DATE		Michael B. Opdenberg 8/10/81		
		GCE/DATE		Nash 8-13-81		

TERMINATION NUMBER REV. 12805
DATE ISSUED 128MYR1
NO. OF CONNECTIONS 10003

TERMINATION CODE
CABLE NUMBER
CABLES

TERMINATION CODE
CABLE NUMBER
CABLES

TERMINATION CODE
CABLE NUMBER
CABLES

TERMINATION CODE
CABLE NUMBER
CABLES

CONTROL AND TRACKING SYSTEM
TERMINATION INSTALLATION CARD

TERMINATION
DESIGN
DETAILS

LOCATION OF TERMINATION

LOCATION OF TERMINATION
LOCATION NUMBER
LOCATION CODE
LOCATION DESCRIPTION

LOCATION
DESIGN
DETAILS

LOCATION
DESIGN
DETAILS

LOCATION
DESIGN
DETAILS

LOCATION
DESIGN
DETAILS

LOCATION
DESIGN
DETAILS

LOCATION
DESIGN
DETAILS

THE CONDUCTORS MUST BE CONNECTED TO THE FOLLOWING POINTS:

POINT	WIRE NO.	COLOR	WIRE NO.	COLOR	WIRE NO.	COLOR	WIRE NO.	COLOR	WIRE NO.	COLOR
PT35	1	RED	2	RED	3	RED	4	RED	5	RED
PT35	1	RED	2	RED	3	RED	4	RED	5	RED
PT35	1	RED	2	RED	3	RED	4	RED	5	RED
PT35	1	RED	2	RED	3	RED	4	RED	5	RED
PT35	1	RED	2	RED	3	RED	4	RED	5	RED
PT35	1	RED	2	RED	3	RED	4	RED	5	RED
PT35	1	RED	2	RED	3	RED	4	RED	5	RED
PT35	1	RED	2	RED	3	RED	4	RED	5	RED
PT35	1	RED	2	RED	3	RED	4	RED	5	RED
PT35	1	RED	2	RED	3	RED	4	RED	5	RED

INSTALLER MUST COMPLETE SPACES 48 THRU 53 SIGN AND DATE

INSTALLER MUST COMPLETE SPACES 48 THRU 53 SIGN AND DATE

DATE
INSTALLED

DATE
INSTALLED

INSTALLER MUST COMPLETE SPACES 48 THRU 53 SIGN AND DATE

DATE
INSTALLED

DATE
INSTALLED

7 --

[illegible]

COM.	TERMINATION NUMBER	REV.	TERMINATION CODE	SEPARATION GROUP AND COLOR	NO. OF CABLES	NO. OF CONNECTIONS	DATE ISSUED	ICD ISSUE NO.
EC	1AHCEPCC1XA	043					85.23	
COM.	CABLE NUMBER	CABLE CODE	TERMINATION DESCRIPTION				ACCOUNT CODE	

TERMINATION
DESIGN
DETAILS

LOCATION OF TERMINATION

COM.	LOCATION NUMBER	LOCATION CODE	LOCATION DESCRIPTION
F*	1JSHCC	JC	INSTRUMENTATION CABINET

LOCATION
DESIGN
DETAILS

NGOS CHAN C ANALOG INS CABINET			
COM.	LAST RACEWAY	LAYOUT DRAWING	REV.
EC	172JACKXAU	172JCC9	01
CONNECT DRAWING		REV.	VENDOR DRAWING
			N1200125

THE CONDUCTORS MUST BE CONNECTED TO THE FOLLOWING POINTS:

BLOCK	POINT	COLOR	WIRE NO.	BLOCK	POINT	COLOR	WIRE NO.	BLOCK	POINT	COLOR	WIRE NO.
1	67	EX	P	2	68	WH	P	3	69	SHLD	SHLD
1	68			2	69			3			
1	69			2				3			

RETENTION TIME LT

SEP 14 1981

COMPUTER

SEP 14 1981

QC-DCC

INSTALLER MUST COMPLETE SPACES 48 THRU 53 SIGN AND DATE

COM.	TERMINATION NUMBER	REV.	TERMINATION CODE
GEKDC	1AHCEPCC1XA	03	00

NO. OF CONNECTIONS

CRIMP TOOL	30636
------------	-------

INSTALLED BY Chaga Wankhorn EZ 2877

SIGNATURE

DATE INSTALLED 8/22/81

CONTROL AND TRACKING SYSTEM
TERMINATION INSTALLATION CARD



HCO

QTY	DESCRIPTION	RFE	DATE	QCE	DATE	W72
0	FLEX CONDUITS INSTALLED, IF REQUIRED.			N/A	SEP 10 '81	
0	TERMINATION PER -CONTROL AND TRACKING SYSTEM			140 QCE	SEP 10 '81	
0	TERMINATION INSTALLATION CARD-			140 QCE	SEP 10 '81	
0	TERMINATION PER SPEC 13-EM-306, REV 4 EXCLUDE TESTING			140 QCE	SEP 10 '81	
0	TORQUE WRENCH S/N <u>JE80636</u> N/A CALIBRATION DUE N/A			140 QCE	SEP 10 '81	
0	CRIMPING TOOL S/N <u>JE80636</u> CALIBRATION DUE 11-81			140 QCE	SEP 10 '81	
0	TERMINATIONS IDENTIFIED PER SPEC 13-EM-303, REV. 7			140 QCE	SEP 10 '81	
0	CABLE TIED, SUPPORTED, AND SEPARATED - IF REQUIRED-			140 QCE	SEP 10 '81	
0	GROUNDING IS INSTALLED AS REQUIRED.			N/A	SEP 10 '81	

SUPERINTENDENT/DATE

REF/DATE	M. Test 8-28-81
QUR/DATE	J. V. S. 9-11-81

1081017 1081017 1081017 1081017 1081017 1081017 1081017

FROM LOCATION DRAWING REV. DESCRIPTION ACCOUNT CODE

TO LOCATION DRAWING REV. DESCRIPTION

DESIGN DETAILS 659 RETENTION TIME 10 YRS.

THIS CABLE MUST BE PULLED THROUGH THE FOLLOWING RACEWAYS:

1081017					
---------	--	--	--	--	--

COMP FEB 13 1981

INSTALLER MUST COMPLETE SPACES 54 THRU 79 SIGN AND DATE

SERIAL NUMBER 00010003 START FOOTAGE 002856 END ACTUAL 002834 21

INSTALLED BY R. Ramsey E1-2561 DATE INSTALLED 01/17/81

CONTROL AND TRACKING SYSTEM
CABLE INSTALLATION CARD
BECHTEL

EQ 1ES1185C1PA 7 4772 1 1F-GREEN 01 0197 06JN81 2852
 CDM. CABLE NUMBER REV. CABLE CODE SEPARATION GROUP AND COLOR NO. OF CABLES COMPUTED LENGTH DATE ISSUED ICD ISSUE NO.

1EPH-K3476 1424016 108 COMPT DB 480V CLASS 1E PWR SYS 1084.3
 CDM. FROM LOCATION DRAWING REV. DESCRIPTION ACCOUNT CODE

10STEUV667 1424016 4 FPS1 PUMPS TO R&T ISO VALVE
 CDM. TO LOCATION DRAWING REV. DESCRIPTION

DESIGN
DETAILS

667
FULL FACTORY LPP

THIS CABLE MUST BE PULLED THROUGH THE FOLLOWING RACEWAYS:

LF	1LZ4107-K44	T	1LZ4107-K44	1	1LZ4107-K44	LT	1LZ4107-K44
FT	1LZ4107-K44	T	1LZ4107-K44	T	1LZ4107-K44	FT	1LZ4107-K44
ET	1LZ4107-K44	ET	1LZ4107-K44	ET	1LZ4107-K44	ET	1LZ4107-K44
ET	1LZ4107-K44	ET	1LZ4107-K44	ET	1LZ4107-K44	ET	1LZ4107-K44
ER	1LZ4107-K44	ER	1LZ4107-K44	ER	1LZ4107-K44	ER	1LZ4107-K44

RETENTION TIME LT

NOV 4 1981

COMPUTER

RECEIVED
OCT 29 1981
QC-DCC

INSTALLER MUST COMPLETE SPACES 54 THRU 78 SIGN AND DATE

5ECKDC 1FS11PFC1PA 7 CC 4772
 1 4 7 10 20-21 22-23 24 40

SERIAL NUMBER 60 67 START FOOTAGE 68 69 END ACTUAL FT. 70 71 72 73 74 75 76 77 78

INSTALLED BY J. D. Standen E1361
 SIGNATURE

DATE INSTALLED 6/26/81

CONTROL AND TRACKING SYSTEM
CABLE INSTALLATION CARD



COM. ☐ CABLE NUMBER ☐ REV. ☐ CABLE CODE ☐ SEPARATION GROUP AND COLOR ☐ NO. OF CABLES ☐ COMPUTED LENGTH ☐ DATE ISSUED ☐ ICS ISSUE NO. ☐

RETENTION TIME 27 YRS. 1094.3

COM. ☐ DRAWING ☐ REV. ☐ 10 DESCRIPTION 023269(1) ACCOUNT CODE ☐

COM. ☐ DRAWING ☐ REV. ☐ U-609

DESIGN DETAILS BM3410 HV609 202 03 AD

THIS CABLE MUST BE FILLED THROUGH THE FOLLOWING BACKWAYS:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	-----

RECEIVED
 FEB 11 1980
 CC - DDC

SERIAL NUMBER ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ 11 ☐ 12 ☐ 13 ☐ 14 ☐ 15 ☐ 16 ☐ 17 ☐ 18 ☐ 19 ☐ 20 ☐ 21 ☐ 22 ☐ 23 ☐ 24 ☐ 25 ☐ 26 ☐ 27 ☐ 28 ☐ 29 ☐ 30 ☐ 31 ☐ 32 ☐ 33 ☐ 34 ☐ 35 ☐ 36 ☐ 37 ☐ 38 ☐ 39 ☐ 40 ☐ 41 ☐ 42 ☐ 43 ☐ 44 ☐ 45 ☐ 46 ☐ 47 ☐ 48 ☐ 49 ☐ 50 ☐ 51 ☐ 52 ☐ 53 ☐ 54 ☐ 55 ☐ 56 ☐ 57 ☐ 58 ☐ 59 ☐ 60 ☐ 61 ☐ 62 ☐ 63 ☐ 64 ☐ 65 ☐ 66 ☐ 67 ☐ 68 ☐ 69 ☐ 70 ☐ 71 ☐ 72 ☐ 73 ☐ 74 ☐ 75 ☐ 76 ☐ 77 ☐ 78 ☐ 79 ☐ 80 ☐ 81 ☐ 82 ☐ 83 ☐ 84 ☐ 85 ☐ 86 ☐ 87 ☐ 88 ☐ 89 ☐ 90 ☐ 91 ☐ 92 ☐ 93 ☐ 94 ☐ 95 ☐ 96 ☐ 97 ☐ 98 ☐ 99 ☐ 100

REEL NUMBER ☐ 03 COMP

START FOOTAGE ☐ 51 ☐ 56 ☐ 57 ☐ 58 ☐ 59 ☐ 60 ☐ 61 ☐ 62 ☐ 63 ☐ 64 ☐ 65 ☐ 66 ☐ 67 ☐ 68 ☐ 69 ☐ 70 ☐ 71 ☐ 72 ☐ 73 ☐ 74 ☐ 75 ☐ 76 ☐ 77 ☐ 78 ☐ 79 ☐ 80 ☐ 81 ☐ 82 ☐ 83 ☐ 84 ☐ 85 ☐ 86 ☐ 87 ☐ 88 ☐ 89 ☐ 90 ☐ 91 ☐ 92 ☐ 93 ☐ 94 ☐ 95 ☐ 96 ☐ 97 ☐ 98 ☐ 99 ☐ 100

DATE INSTALLED 11/29/80 JUL 11 1980

INSTALLED BY Santa Cruz C EJ-77

CONTROL AND TRACKING SYSTEM
 CABLE INSTALLATION CARD
 0340
 0438

BECHTEL

100 1154000000 14 0572 100 0572 00 0572 0572 0572 0572
 COM. CABLE NUMBER REV. CABLE CODE SEPARATION GROUP NO. OF CABLES COMPUTED LENGTH DATE ISSUED ICD ISSUE NO.

F* 1154000000 1154000000 04 HDST PUMP LOW TERM CLG VALVE 1004.3
 COM. FROM LOCATION DRAWING REV. DESCRIPTION ACCOUNT CODE

F* 1154000000 1154000000 00 AUX RELAY CAB CLASS 1E
 COM. TO LOCATION DRAWING REV. DESCRIPTION

DESIGN DETAILS RETENTION TIME _____ YRS.
 PULL PACKAGE 115

THIS CABLE MUST BE PULLED THROUGH THE FOLLOWING RACEWAYS:

EP	1E2ACDBRK21	ET	1E2ACDBRKJ01	EP	1E2ACDBRK11	EP	1E2ACDBRK06
EP	1E2ACDBRK33	ET	1E2ACDBRTLAC	ET	1E2ACDBRTLAC	ET	1E2ACDBRTLAA
ET	1E2ACDBRTLAV	ET	1E2APBRTLAC	ET	1E2APBRTLAA	ET	1E2APBRTLAV
ET	1E2A1PRTLAA	ET	1E2A1PRTLAA	ET	1E2A1PRTLAC	ET	1E2A1PRTLAA
ET	1E2A1PRTKAS	EP	1E2A1PRTK72				

INSTALLER MUST COMPLETE SPACES 34 THRU 75 SIGN AND DATE

600000 1551400000 14 00 1370
 SERIAL NUMBER START FOOTAGE END ACTUAL FT.
 INSTALLED BY *J. The J. Smith* DATE 9/1/88 COMP
 Rework #95

CONTROL AND TRACKING SYSTEM
 CABLE INSTALLATION CARD


EC YESI40RC1RG 04 C462 B GR-GRFN 01 0607 13JL82 9452
COM. CABLE NUMBER REV. CABLE CODE SEPARATION GROUP AND COLOR NO. OF CABLES COMPUTED LENGTH DATE ISSUED ICD ISSUE NO.

E* 1JSI8HV609 13EZAC04 04 HPSI PUMP LONG TERM CLG VALVE 1084.3
COM. FROM LOCATION DRAWING REV. DESCRIPTION ACCOUNT CODE

E* 1JSD8C09 13EZJC06
COM. TO LOCATION DRAWING REV.
RETENTION TIME LT RECEIVED
APR 6 1983 APR 6 1983

DESIGN
DETAILS

COMPUTER

QC-DCC

System

THIS CABLE MUST BE FILLED THROUGH THE FOLLOWING RACEWAYS:

ER 1EZACDBRK21	EK 1EZACDBRKJ01	ER 1EZACDBRK10	ER 1EZACDBRK07
ER 1EZACDBRK32	ET 1EZACDBTLAC	ET 1EZACDBTLAB	ET 1EZACDBTLAA
ET 1EZACDBTLAV	ET 1EZABRTLAJ	ET 1EZABRTLAA	ET 1EZABRTLAV
ET 1EZA1BRTLVA	ET 1EZA1BRTKAL	ET 1EZA1BRTKAJ	ET 1EZA1BRTKAM
ET 1EZA1BRTKAQ	ET 1EZA1BRTKAS	ET 1EZA1BRTKCJ	ET 1EZA1BRTKCH
ET 1EZA1BRTKCG	ET 1EZA1BRTKCF	ET 1EZA1BRTKCE	ET 1EZA1BRTKCD
ET 1EZA1BRTKCC	ET 1EZA1BRTKCR	ET 1EZA1BRTKCA	ET 1EZJRBRTSCA
ET 1EZJRBRTSVC	ET 1EZJRBRTSAB	ET 1EZJRBRTSVB	ET 1EZJRBRTSCB
ET 1EZJ2BRTSCA	ET 1EZJ2BRTSAB	ET 1EZJ2BRTSAC	ET 1EZJ2BRTSAD
ET 1EZJ2BRTSAE	ET 1EZJ2BRTSAF	ET 1EZJ2BRTSAG	ET 1EZJ2BRTSAH
ET 1EZJ2BRTSAJ	ET 1EZJ2BRTSAK	ET 1EZJ2BRTSAL	ET 1EZJ2BRTSAM
ET 1EZJ2BRTSAV	ET 1EZJ2BRTSAP	ET 1EZJ2BRTSAQ	ET 1EZJ2BRTSCL
ET 1EZJ2BRTSCK	ET 1EZJ2BRTSCJ	ET 1EZJ2BRTSCH	ET 1EZJ2BRTSDG

CONTINUED ON NEXT CARD

INSTALLER MUST COMPLETE SPACES 54 THRU 79 SIGN AND DATE

REEL NUMBER 005
SERIAL NUMBER 1141
START FOOTAGE 680
END ACTUAL FT. 680
DATE INSTALLED 1/21/1982

INSTALLED BY *Bob Schmitt* EI-30
SIGNATURE

CONTROL AND TRACKING SYSTEM
CABLE INSTALLATION CARD



EC 1ESI188C1KA 8392 01 GR-GREEN 0197 29SE81 3426
COM. CABLE NUMBER RELV. CABLE CODE SEPARATION GROUP AND COLOR NO. OF CABLES COMPUTED LENGTH DATE ISSUED ICD ISSUE NO.

E* 1EPHBM3608 13EZAC16 001 COMPT 08 480V CLASS 1C PWR SYS 1084.3
COM. FROM LOCATION DRAWING RELV. DESCRIPTION ACCOUNT CODE

E* 1JST9UV667 13EZAC04 04 HPST PUMPS TO RWT ISO VALVE
COM. FROM LOCATION DRAWING RELV. DESCRIPTION

DESIGN
DETAILS

PULL PACKAGE 380

THIS CABLE MUST BE PULLED THROUGH THE FOLLOWING RACEWAYS:

ER 1EZA18BRK44	ET 1EZA18PTKCK	ET 1EZA18BTIKAK	ET 1EZA18BTLAF
ET 1EZA18BTLAC	ET 1EZA18BTLAB	ET 1EZA18BTLAA	ET 1EZA88BTLAV
ET 1EZA88BTLAA	ET 1EZA88PTLAA	ET 1EZAC8BTLAV	ET 1EZAC8BTLAA
ET 1EZAC8BTLAP	ET 1EZAC8BTLAC	ER 1EZAC8BRK34	ER 1EZAC8BRK09
ER 1EZAC8BRK12	ER 1EZAC8BRK01	ER 1EZAC8BRK14	

19

Completed
9/14/83

RETENTION TIME LT

NOV 4 1981

COMPUTER

OCT 09 1981

OC-DOC

GECKDC 1ESI18FC1KA 05 CC 8392

INSTALLER MUST COMPLETE SPACES 54 THRU 79 SIGN AND DATE

WHEEL
NUMBER

SERIAL
NUMBER

START
DATE

END
DATE

INSTALLED BY

L.D. Stender

E1136

DATE
INSTALLED

6/26/81

CONTROL AND TRACKING SYSTEM
CABLE INSTALLATION CARD



EC 1ESI18BC1RE 18 A272 B GR-GREEN 01 0486 25MR82 4152
COM. CABLE NUMBER REV. CABLE CODE SEPARATION GROUP AND COLOR NO. OF CABLES COMPUTED LENGTH DATE ISSUED ICD ISSUE NO.

E 1JS16UV667 13EZAC04 04 HPSI PUMPS TO RWY ISO VALVE 1084.3
CON. FROM LOCATION DRAWING REV. DESCRIPTION ACCOUNT CODE

E 1JESECO1 13EZJC09 01 SAFETY EQUIP STATUS SYSTEM CAB
CON. TO LOCATION DRAWING REV. DESCRIPTION

DESIGN
DETAILS

PULL PACKAGE 080

SI09

THIS CABLE MUST BE PULLED THROUGH THE FOLLOWING RAILWAYS:

ER	1EZACDBRK14	EK	1EZACDBKKJ01	ER	1EZACDBRK11	ER	1EZACDBRK06
ER	1EZACDBRK33	ET	1EZACDBTLAC	ET	1EZACDBTLAB	ET	1EZACDBTLAA
ET	1EZACDBTLAV	ET	1EZABBBTLAJ	ET	1EZABBBTLAA	ET	1EZABBBTLAV
ET	1EZA1BBTLVA	ET	1EZA1BBTKAL	ET	1EZA1BBTRAK	ET	1EZA1DBTRAJ
ET	1EZA1DBTRAH	ET	1EZA1DBTRAG	ET	1EZA1DBTFAF	ET	1EZA1DBTRAE
ET	1EZA1DBTRAD	ET	1EZA1DBTRAC	ET	1EZA1DBTRAB	ET	1EZA1DBTRAA
ET	1EZJRBBTRBB	ET	1EZJRBBTRBC	ET	1EZJRBBTRBF	ET	1EZJRBBTRVC
ET	1EZJRBBTRVB	ET	1EZJRBBTRCB	ET	1EZJ2BBTRCA	ET	1EZJ2BBTRDA
ET	1EZJ2ABTRDB	ET	1EZJ2ABTSFW	ET	1EZJ2ABTSFS	ET	1EZJ2ABTRGA
ET	1EZJ2ABTRGB	ET	1EZJ2ABTRGC	ET	1EZJ2ABTRGD	ET	1EZJ2ABTRGE
ET	1EZJ2ABTSVA	EK	1EZJ2ABKSVAS				

RETENTION TIME-LT

INSTALLER MUST COMPLETE SPACES 34 THRU 39 SIGN AND DATE

GECKDC 1ESI18BC1RE 18 CC A272 APR 10 1982

SERIAL
NUMBER

START
FOOTAGE

COMPUTER

DATE
INSTALLED

R 12 1982
CC-DCC

CONTROL AND TRACKING SYSTEM
CABLE INSTALLATION CARD

EC 1FS139BC1KA 27 8342 GR-GREEN 01 0190 09JN:81 2860
COM. CABLE NUMBER CABLE CODE SEPARATION GROUP AND COLOR NO. OF CABLES COMPUTED LENGTH DATE ISSUED ICD ISSUE NO.

1EPHEM3807 1EZAC14 00 COMPT 07 4P TV CLASS 17 PWR SYS 1084.3
COM. FROM LOCATION DRAWING REV. DESCRIPTION ACCOUNT CODE

1JSIBHV699 13FZAC04 04 WEST PUMP AREA DISCHARGE VALVE
COM. TO LOCATION DRAWING REV.

DESIGN
DETAILS

PULL PACKAGE 080

V-699

THIS CABLE MUST BE PULLED THROUGH THE FOLLOWING RACEWAYS:

ER	1EZA1EBRK49	ET	1EZA1EBTKK	ET	1EZA1EBTKAS	ET	1EZA1EBTLAF
ET	1EZA1EBTLAC	ET	1EZA1EBTLAE	ET	1EZA1EBTLAA	ET	1EZA1EBTLAV
ET	1EZA1EBTLAA	ET	1EZA1EBTLAJ	ET	1EZA1EBTLAV	ET	1EZA1EBTLAA
ET	1EZA1EBTLAV	ET	1EZA1EBTLAC	ET	1EZA1EBTKAS	ET	1EZA1EBTKAA
ER	1EZA1EBRK11	ET	1EZA1EBRKJ1	ET	1EZA1EBRKJ1	ET	1EZA1EBRKJ1

RETENTION TIME LT
JUL 20 1981
COMPUTER

19 RECEIVED
JUL 20 1981
QC-DCC

9/14/83

GECKDC 1E139BC1KA 07 CC 8342 REEL NUMBER 54 55 56 57 58 59
INSTALLER MUST COMPLETE SPACES 54 THRU 59 SIGN AND DATE

SERIAL NUMBER 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79
START FOOTAGE 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99
INSTALLED BY L.D. Stanley E11361 DATE INSTALLED 7/02/81

Rework #559

CONTROL AND TRACKING SYSTEM
CABLE INSTALLATION CARD



E* 1EPHEM307 13EZAC15 00 COMPT 07 480V CLASS 15 PWR SYS 1084.4
 CON. FROM LOCATION DRAWING REV. DESCRIPTION ACCOUNT CODE

E* 1USIBHV09 13EZAC04 04 HPSI PUMP AND DISCHARGE VALVE
 CON. TO LOCATION DRAWING REV. DESCRIPTION

DESIGN
DETAILS

PULL PACKAGE 080

THIS CABLE MUST BE PULLED THROUGH THE FOLLOWING RACEWAYS:

ER 1EZA10BRK46	ET 1EZA10BTCK	ET 1EZA10PIKAS	ET 1EZA10BTLAF
ET 1EZA10BTLAC	ET 1EZA10BTLAB	ET 1EZA10BTLAA	ET 1EZA10BTLAV
ET 1EZA10DBTLAA	ET 1EZA10BTLAJ	ET 1EZA10DBTLAV	ET 1EZA10DBTLAA
ET 1EZA10DBTLA9	ET 1EZA10DBTLAC	ET 1EZA10DBPK03	ET 1EZA10DBRK06
ER 1EZA10DBRK11	ET 1EZA10DBKKJ01	ET 1EZA10DBRK20	

RETENTION TIME LT
 JUL 20 1981
 COMPUTER

RECEIVED

JUL 20 1981

QC-DCC

INSTALLER MUST COMPLETE SPACES 34 THRU 39 SIGN AND DATE

GECKDC 1ESI39BC1FA 00 00 A872

REEL NUMBER 34 35 36 37 38 39

Rework #559

SERIAL NUMBER 40 41 42 43 44 45 46 47 48 49

START FOOTAGE 50 51 52 53 54 55 56 57 58 59

END ACTUAL FT. 60 61 62 63 64 65 66 67 68 69

INSTALLED BY

[Signature] 2/1361

DATE INSTALLED

7/2/81



CONTROL AND TRACKING SYSTEM
 CABLE INSTALLATION CARD

EC 1ES179C1RE 05 CLE2 E GR-GREEN 01 0545 09AU82 4515
COM. CABLE NUMBER REV. CABLE CODE SEPARATION CODE NO. OF COMPUTED DATE ICD ISSUE NO.
CABLES LENGTH ISSUED

F* 1JS1HIV499 13EZAC04 04 FPS1 PUMP AIR DISCHARGE VALVE 1084.3
COM. FROM LOCATION DRAWING REV. DESCRIPTION ACCOUNT CODE

F* 1JS1HIV499 13EZJC04 RECEIVED RETENTION TIME LT
COM. TO LOCATION DRAWING REV. DESCRIPTION

MAR 14 1983 MAR 15 1983

DESIGN
DETAILS

QC-DCC

COMPUTER

THIS CABLE MUST BE PULLED THROUGH THE FOLLOWING KNOTWAYS:

ER	1EZACDBRK20	ER	1EZACDBRKJ01	ER	1EZACDBRK10	FR	1EZACDBRK07
ER	1EZACDBRK32	ET	1EZACDBTLAC	ET	1EZACDBTLAF	ET	1EZACDBTLAA
ET	1EZACDBTLAV	ET	1EZABBTTLAJ	ET	1EZABBTTLAA	ET	1EZABBTTLAV
ET	1EZA1FBTTLVA	ET	1EZA1FBTKAL	ET	1EZA1FBTKAJ	ET	1EZA1FBTKAM
ET	1EZA1DBTKA0	ET	1EZA1DBTKAS	ET	1EZA1DBTKCJ	ET	1EZA1DBTKCH
ET	1EZA1DBTKCG	ET	1EZA1DBTKCF	ET	1EZA1DBTKCF	ET	1EZA1DBTKCD
ET	1EZA1DBTKCC	ET	1EZA1DBTKCB	ET	1EZA1DBTKCA	ET	1EZJREBTSCA
ET	1EZJREBT SVC	ET	1EZJREBTSAH	ET	1EZJREBT SVI	ET	1EZJREBTSCB
ET	1EZJREBT RVE	ET	1EZJREBT RCB	ET	1EZJ2HTKCA	ET	1EZJ2B8TRDA
ET	1EZJ2ABTRDB	ET	1EZJ2ABTSF	ET	1EZJ2ABTSFT	ET	1EZJ2ABTS GG
ET	1EZJ2ABTS GA	ET	1EZJ2ABTS GF	ET	1EZJ2ABTS GC	ET	1EZJ2ABTS GD
ET	1EZJ2ABTS GE	ET	1EZJ2ABTS VH	ET	1EZJ2ABTRLE	FR	1EZJ2ABRR13

INSTALLER MUST COMPLETE SPACES 34 THRU 39 SIGN AND DATE

GECKDC 1ES139C1RE 05 CC CLE2 REEL NUMBER 0065

SERIAL
NUMBER

WA

START
FOOTAGE

88774

88190

INSTALLED BY

Carl Schmitz E1-30

DATE

INSTALLED

03-03-83
1-21-83
3-12-83

CONTROL AND TRACKING SYSTEM
CABLE INSTALLATION CARD



CONTROL AND TRACKING SYSTEM CABLE INSTALLATION CARD



CONTROL AND TRACKING SYSTEM CABLE INSTALLATION CARD



INSTALLER MUST COMPLETE SPACES 54 THRU 78 SIGN AND DATE

CKDC 1ESIO1BC1CA 07 CC 5312 REEL NUMBER 54 55 56 57 58 59 Rework #

SERIAL NUMBER 60 61 62 63 64 65 66 67 START FOOTAGE 68 69 70 71 72 73 74 75 76 77 78 END ACTUAL F.T. 79 80

APPROVED BY Mfr. Loughi E1-105 DATE INSTALLED 03/05/81 COMP

CABLE INSPECTION RECORD

NO.	VERIFICATION DESCRIPTION	RFE	DATE	QCE	DATE	TYPE
1	CABLE ROUTED PER RACEWAYS PRINTED ON FACE OF CARD	ma	11/24/79		11/28/79	
2	CABLE CODE - INSTALLED TYPE CABLE AS ON CARD	ma	11/24/79		11/28/79	
3	SEPARATION - CABLE COLOR CODE AS ON CARD	ma	11/24/79		11/28/79	
4	CABLE PULL SET UP	ma	11/24/79		11/28/79	
5	HOLD POINT	N/A			11/28/79	
6	CABLE PULL CALCULATION NUMBER	ma	11/24/79		N/A	
7	MAXIMUM ALLOWABLE PULLING TENSION 1000	ma	11/24/79		N/A	
8	DYNAMOMETER OR TENSIONOMETER READING 600	ma	11/28/79		11/28/79	
9	ACTUAL PULLING TENSION 600	ma	11/28/79		11/28/79	
10	DYNAMOMETER OR TENSIONOMETER S/N- JJA0076	ma	11/28/79		11/28/79	
	CAL. DATE- Due 5-2-80	ma	11/28/79		11/28/79	
11	CABLE ENDS SEALED - AS REQUIRED	ma	11/28/79		11/28/79	
12	CABLE ID STUBS FROM CABLE CARD AT EACH END OF CABLE	ma	11/28/79		11/28/79	
13	CABLE SUPPORTED AND SPACED	ma	12/31/79		11/28/79	
14	CABLE LAID IN TRAY BY HAND	ma	12/31/79		11/28/79	
15	CABLE PULLED BY HAND *	ma	11/28/79		11/28/79	
**** REMARKS ****						
* 100 ft. (part of each end) pulled by hand 11/28/79						

REMARKS:

P031

SIGNATURES *****	RFE/DATE: Muhammad a. arain 12/3/79 QCE/DATE: N. Sely 12-4-79
---------------------	------------------------------------------------------------------

CABLE INSPECTION RECORD

NO.	VERIFICATION DESCRIPTION	RFE	DATE	QCE	DATE
1	CABLE ROUTED PER RACEWAYS PRINTED ON FACE OF CARD				
2	CABLE CODE - INSTALLED TYPE CABLE AS ON CARD				
3	SEPARATION - CABLE COLOR CODE AS ON CARD				
4	CABLE PULL SET UP				
5	HOLD POINT				
6	CABLE PULL CALCULATION NUMBER				
7	MAXIMUM ALLOWABLE PULLING TENSION				
8	DYNAMOMETER OR TENSIONOMETER READING				
9	ACTUAL PULLING TENSION				
10	DYNAMOMETER OR TENSIONOMETER S/N-				
	CAL. DATE-				
11	CABLE ENDS SEALED - AS REQUIRED				
12	CABLE ID STUBS FROM CABLE CARD AT EACH END OF CABLE				
13	CABLE SUPPORTED AND SPACED				
14	CABLE LAID IN TRAY BY HAND				
15	CABLE PULLED BY HAND				
**** REMARKS ****					
16	TERMINATION REQUIRES AN ADDITIONAL 2' AT 1EPEBS04E; HAND-PULL SLACK UNTIL FOOTAGE REQUIRED IS OBTAINED.	MB	2/26/81		3/5/81

REMARKS: Rework #221

SIGNATURES *****	RFE/DATE: Michael B. Adders 3/1/81 QCE/DATE: N. Sely 3-10-81
---------------------	-----------------------------------------------------------------

EW 1ESI01BC1CA2 J5 GR-GREEN 01 0003 10MRA2 4098
COM. TERMINATION NUMBER REV. TERMINATION CODE SEPARATION GROUP AND COLOR NO. OF CABLES NO. OF CONNECTIONS DATE ISSUED ICD ISSUE NO.

EC 1ESI01BC1CA 5312 85.3
COM. CABLE NUMBER CABLE CODE TERMINATION DESCRIPTION ACCOUNT CODE

TERMINATION
DESIGN
DETAILS

LOCATION OF TERMINATION

E 1MSIBP02 PU PUMP
COM. LOCATION NUMBER LOCATION CODE LOCATION DESCRIPTION

LOCATION
DESIGN
DETAILS

HP SAFETY INJECTION PUMP

ET 1EZACDBTCBA 13EZACU2
LAST RACEWAY LAYOUT REV. CONNECT REV. VENDOR REV.
DRAWING DRAWING DRAWING

THE CONDUCTORS MUST BE CONNECTED TO THE FOLLOWING POINTS:

BLOCK	POINT	COLOR	WIRE NO.	BLOCK	POINT	COLOR	WIRE NO.	BLOCK	POINT	COLOR	WIRE NO.
M ***	0A	BK	A	RETENTION TIME LT MAR 17 1982 COMPUTER							
M ***	0B	WH	B								
M ***	0C	RD	C								

GEWKDC 1ESI01BC1CA2 05 CC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
NO. OF CONNECTIONS CRIMP TOOL 48 53

INSTALLED BY _____ DATE INSTALLED _____
SIGNATURE

EW 1ESI01BC1CA2 J5 GR-GREEN 01 0003 16 Feb 82
COM. TERMINATION NUMBER REV. TERMINATION CODE SEPARATION GROUP AND COLOR NO. OF CABLES NO. OF CONNECTIONS DATE ISSUED ICD ISSUE NO.

EC 1ESI01BC1CA 5312 85.22
COM. CABLE NUMBER CABLE CODE TERMINATION DESCRIPTION ACCOUNT CODE

TERMINATION
DESIGN
DETAILS

LOCATION OF TERMINATION

E 1MSIBP02
COM. LOCATION NUMBER LOCATION CODE LOCATION DESCRIPTION

LOCATION
DESIGN
DETAILS

1EZACDBTCBA 13EZACU2
LAST RACEWAY LAYOUT REV. CONNECT REV. VENDOR REV.
DRAWING DRAWING DRAWING

THE CONDUCTORS MUST BE CONNECTED TO THE FOLLOWING POINTS:

BLOCK	POINT	COLOR	WIRE NO.	BLOCK	POINT	COLOR	WIRE NO.	BLOCK	POINT	COLOR	WIRE NO.
M ***	0A	BK	A	RETENTION TIME LT MAR 17 1982 COMPUTER							
M ***	0B	WH	B								
M ***	0C	RD	C								

GEWKDC 1ESI01BC1CA2 05 CC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
NO. OF CONNECTIONS CRIMP TOOL 48 53

INSTALLED BY _____ DATE INSTALLED _____
SIGNATURE

CONTROL AND TRACKING SYSTEM
TERMINATION INSTALLATION CARD



CONTROL AND TRACKING SYSTEM
TERMINATION INSTALLATION CARD



TERMINATION INSPECTION RECORD

NO.	VERIFICATION DESCRIPTION	RFE	DATE	QCE	DATE	TYPE
1.0	FLEX CONDUITS INSTALLED, IF REQUIRED.					
2.0	TERMINATION PER -CONTROL AND TRACKING SYSTEM TERMINATION INSTALLATION CARD-.					
3.0	TERMINATION PER SPEC 13-EM-306, REV 5 EXCLUDE TESTING					
4.0	TORQUE WRENCH S/N CALIBRATION DUE					
5.0	CRIMPING TOOL S/N CALIBRATION DUE					
6.0	TERMINATIONS IDENTIFIED PER SPEC 13-EM-303, REV. 7					
7.0	CABLE TIED, SUPPORTED, AND SEPARATED -IF REQUIRED-.					
8.0	GROUNDING IS INSTALLED AS REQUIRED.					
REMARKS <i>To Verify EESB Information QAS 3/12/82</i>						
SIGNATURES		SUPERINTENDENT/DATE RFE/DATE <i>S. C. Selig 3-12-82</i> QCE/DATE <i>Joe L. Crawford 3-16-82</i>				

TERMINATION INSPECTION RECORD

NO.	VERIFICATION DESCRIPTION	RFE	DATE	QCE	DATE	TYPE
1.0	FLEX CONDUITS INSTALLED, IF REQUIRED.			N/A	2-18-82	
2.0	TERMINATION PER -CONTROL AND TRACKING SYSTEM TERMINATION INSTALLATION CARD-.				2-18-82	
3.0	TERMINATION PER SPEC 13-EM-306, REV 5 EXCLUDE TESTING				2-18-82	
4.0	TORQUE WRENCH S/N <i>57A 596</i> CALIBRATION DUE <i>4/82</i>				2-18-82	
5.0	CRIMPING TOOL S/N <i>T20 0172</i> CALIBRATION DUE <i>2/82</i>				2-18-82	
6.0	TERMINATIONS IDENTIFIED PER SPEC 13-EM-303, REV. 7				2-18-82	
7.0	CABLE TIED, SUPPORTED, AND SEPARATED -IF REQUIRED-.				2-18-82	
8.0	GROUNDING IS INSTALLED AS REQUIRED.			N/A	2-18-82	
REMARKS <i>Use Termination Kit HVMC-5-15/20-00 QAS 2/16/82 LOT # Torqued to 42 ft/lb. 2-18-82</i> <i>Power per NCR SE 296 A0450 only. S.W.P. 1456 2-18-82 (186) 2-18-82</i> <i>LOT# 152678</i>						
SIGNATURES		SUPERINTENDENT/DATE RFE/DATE <i>S. C. Selig 3/16/82</i> QCE/DATE <i>Joe L. Crawford 3-16-82</i>				

EW 1FS101PC1CA1 05 01 0003 23AUG 1687
 COM. TERMINATION NUMBER REV. TERMINATION CODE SEPARATION GROUP AND COLOR NO. OF CABLES NO. OF CONNECTIONS DATE ISSUED ICD ISSUE NO.

EC 1FS101PC1CA 5712 85.3
 COM. CABLE NUMBER CABLE CODE TERMINATION DESCRIPTION ACCOUNT CODE

TERMINATION
 DESIGN
 DETAILS

LOCATION OF TERMINATION

E 1E1P104 51 CONTROL FLAG UNIT 1, 283 1P FL10
 CDR. LOCATION NUMBER LOCATION CODE LOCATION DESCRIPTION

LOCATION
 DESIGN
 DETAILS

4160V NORMAL SUPPLY BREAKER

ET 1E2J1P104C 1E2JCC4 CC VEG09187 00
 LAST RACEWAY LAYOUT DRAWING REV. CONNECT BRADING REV. VERSION DRAWING REV.

THE CONDUCTORS MUST BE CONNECTED TO THE FOLLOWING POINTS:

BLOCK	POINT	COLOR	WIRE NO.	BLOCK	POINT	COLOR	WIRE NO.	BLOCK	POINT	COLOR	WIRE NO.
S041	1A	1P	1								
S041	1B	1H	2								
S041	1C	1D	3								

RETENTION TIME LT
 NOV 4 1981
 COMPUTER

RECEIVED
 NOV 3 1981
 CC-DCC

INSTALLER MUST COMPLETE 4000S 48 THRU 53 SIGN AND DATE

GEWHDC 1FS101PC1CA1 05 CC
 1 2 3 12 20-21 22-23

NO. OF CONNECTIONS

CRIMP TOOL 180512

INSTALLED BY Sweet E1 470

DATE INSTALLED 3/10/81

CONTROL AND TRACKING SYSTEM
 TERMINATION INSTALLATION CARD



TERMINATION INSPECTION RECORD

NO.	VERIFICATION DESCRIPTION	RFE	DATE	QCE	DATE	TYPE
1.0	FLEX CONDUITS AND GROUNDING INSTALLED.			N/A	5-6-81	
2.0	TERMINATION PER -CONTROL AND TRACKING SYSTEM			128	5-6-81	
	TERMINATION INSTALLATION CARD-.			128	5-6-81	
3.0	TERMINATION PER SPEC 13-EM 376, REV 4 EXCLUDE TESTING			128	5-6-81	
4.0	TORQUE WRENCH S/N 3MA0578 CAL DUE DATE 4-9-82			128	5-6-81	
5.0	CRIMPING TOOL S/N 30512 CAL DUE DATE 3-31-81			128	5-6-81	
6.0	TERMINATIONS IDENTIFIED PER SPEC 13-EM-373, REV 4			128	5-6-81	
7.0	CABLE TIED, SUPPORTED AND SEPARATED IF REQUIRED			128	5-6-81	
REMARKS: NO HT POT AS YET. KWS 5/6/81. NO BUSS BAR HV ROOTS INSTALLED. KWS 5/6/81.						
** NO TORQUE OF BUSS BOLT NUTS AS YET. KWS 5/6/81. (HT POT TO BE INSTALLED 10/23/81. NUTS E12610)						
SIGNATURES		SUPERINTENDENT/DATE		RFE/DATE		
				QCE/DATE		

FW830502A

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
WASHINGTON, D. C. 20555

April 25, 1983

IE INFORMATION NOTICE NO. 83-23: INOPERABLE CONTAINMENT ATMOSPHERE
SENSING SYSTEMS

Addressees:

All nuclear power reactor facilities holding an operating license (OL) or construction permit (CP).

Purpose:

This information notice is being issued to remind all licensees of the importance of assuring that procedures are both properly developed and carefully followed. The instances cited relate to the containment system, an important element in the "defence-in-depth" approach to nuclear safety and are of particular concern because some had apparently existed for several months without detection.

Description of Circumstances:

Seven instances have been compiled since April 1981 that indicate insufficient licensee management attention is being given to maintaining containment integrity, and to the operability of equipment related to the containment function.

At LaCrosse Nuclear Generating Station on two separate occasions in April 1981, a containment high-pressure sensing switch was temporarily isolated while the plant was at power, thus defeating automatic emergency core cooling system actuation. A proposed design change was being implemented without proper review and authorization. Subsequently, it was determined that under 10 CFR 50.59, the change should not have been made without concurrence by the Nuclear Regulatory Commission.

At Oconee Nuclear Station, in March 1982, an NRC inspector found that a pipe cap had not been reinstalled on a test connection to a containment pressure sensing line, as required by the relevant test/calibration procedure last performed in July 1981. As a result, containment integrity had been violated for that interval, and the sensing system (although operable) was degraded. Containment pressure as sensed by the system could be significantly lower than actual containment pressure.

At Dresden Unit 2, there is a local sight (gage) glass on the side of the suppression pool to show the level of the water in the pool. In October 1982, the

8303040025

licensee reported finding the upper isolation valve and the vent valve open. This violated containment integrity, and allowed free communication between the inerted atmosphere of the suppression pool and the outside atmosphere. In fact, both the upper and lower isolation valves should be closed, except when calibrating other level-sensing devices, while shut down.

At Kewaunee Nuclear Station, the licensee reported in October 1982 that all containment pressure-sensing lines were found to have pipe caps installed, thereby defeating the entire containment pressure-sensing systems, including alarm and emergency core cooling functions. The licensee believes the caps were improperly left in place after required testing and calibration about five months earlier.

At Arkansas Nuclear One on December 16, 1982, during performance of routine refueling surveillance of the reactor building pressure transmitters, the licensee discovered that the inlet ports on two transmitters were blocked with brass pipe plugs. One of the two inoperable transmitters provide an input to a recorder; however, the other instrument provides a signal to one of three engineered safeguards actuation system (ESFAS) safety channels. With this transmitter input plugged, the ESFAS logic for reactor building high pressure was reduced from a 2 out of 3 to a 2 out of 2 trip logic required for the initiation of engineered safeguards. It was determined that the plugs were installed on February 20, 1981, as a prerequisite for a containment integrated leak rate test and remained installed until their discovery on December 16, 1982 during the next refueling outage. The licensee attributed the specific cause to use of an inadequate temporary test procedure change which allowed plugs to be installed in the pressure transmitters but did not contain a step specifically requiring their removal.

At Calvert Cliffs Nuclear Power Plant on June 18, 1982, an NRC inspector and licensee representative were examining containment system boundaries of Unit 1 in preparation for a containment integrated leak rate test. They discovered two of the four safety-related containment pressure sensing lines were isolated with pipe caps inside containment, thus deactivating containment pressure monitoring instruments which provide protection signals to the safety systems. A review of records and logs from the previous operating cycle revealed that this inoperable condition did not exist prior to the last refueling outage. The licensee reviewed records and conducted an investigation but was unable to determine who installed the pipe caps; when they were installed; or with what authorization. It was however assumed that they were installed by mistake during the prior outage.

In each of the above instances, in normal operation there is little difference between containment pressure and ambient atmospheric pressure. For pressure differences of the magnitude expected in normal containment system operations, verification techniques such as trend plotting of averaged output values may be beneficial to supplement visual verification of individual component status.

At Salem Nuclear Station, on October 17-18, 1982, the licensee found during containment purge operations that radiation monitor sensing lines, which provided high radiation level automatic containment isolation signals, had been temporarily capped while making a design change, and the caps had not subsequently been

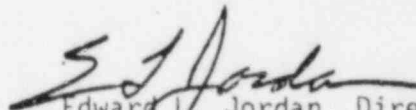
removed as required. The work had been performed during a refueling outage which terminated on April 11, 1982.

Systems for sensing airborne radioactivity typically include a blower or air pump to extract a sample of the air being monitored and direct it through or past sensors. For the very low levels of activity normally expected, some technique is required for integrating total activity over a known time interval. To achieve acceptable accuracy of calibration, the actual flow (quantity of air in the total sample) must be known. Periodic observation of the flow measuring device provides a simple means of verifying this aspect of system operability, and would have detected the capped lines at Salem.

Although all the examples cited above involve sensing of containment atmosphere conditions, (pressure and radioactivity) and the licensee event reports do not in each case identify why the anomalous condition existed undetected for so long a time, the NRC staff is of the opinion that inadequate surveillance procedures, or inadequate implementation of the procedures, or both, were the underlying cause(s) of the situations. Further, a variety of other instances have appeared in licensee reports indicating that surveillance of operability of other safety-related systems could be improved.

No specific actions are required of any licensee by this Information Notice.

If you have any questions regarding this matter, please contact the Regional Administrator of the appropriate NRC Regional Office or this office.



Edward L. Jordan, Director
Division of Emergency Preparedness
and Engineering Response
Office of Inspection and Enforcement

Attachment:

List of Recently Issued IE Information Notices

Technical Contact: J. B. Henderson
(301) 492-9654

LIST OF RECENTLY ISSUED
IE INFORMATION NOTICES

Information Notice No.	Subject	Date of Issue	Issued to
83-01 Supp. 1	Ray Miller, Inc.	4/15/83	OL, CP, Nuc. Fuel Cycle Lic., Cat. B, Pri. 1 Mat. Lic.
83-22	Boiling Water Reactor Safety/Relief Valve Failures	4/22/83	All power reactor facilities holding an OL or CP.
83-21	Defective Emergency - Use Respirator	4/15/83	All power reactor facilities holding an OL or CP, research & test reactors, fuel cycle licensees, & Priority I material licensees.
83-20	ITT Grinnell Figure 306/307 Mechanical Snubber Attach- ment Interference	04/13/83	All power reactor facilities holding an OL or CP
83-19	General Electric Type HFA Relay Contact Gap and Wipe Setting Adjustments	04/05/83	All power reactor facilities holding an OL or CP
83-18	Failures of the undervoltage HFA trip function of Reactor Trip System Breakers	04/01/83	All power reactor facilities holding an OL or CP
83-17	Electrical Control Logic Problem Resulting in Inoper- able Auto-Start of Emergency Diesel Generator Units	03/31/83	All power reactor facilities holding an OL or CP
83-16	Contamination of the Auburn Steel Property with Cobalt-60	03/30/83	All Material licensees
83-15	Falsified Pre-Employment Screening Records	03/25/83	All power reactor facilities holding an OL or CP
83-14	Dewatered Spent Ion Exchange Resin Susceptibility to Exothermal Chemical Reaction	03/21/83	All power reactor facilities holding an OL or CP

OL = Operating License
CP = Construction Permit

1234567890	IEN	IEN 83-22	BWR SAFETY/RELIEF VALVE FAILURES	ISEG GARRETT	05/09/83 05/09/83
NRC	2				06/30/83 06/06/83
		EQ ID		ORIGINATOR ISEG CLYDE	
				STATUS ACT COMMENTS	
				EQ DESC	
STEP	01		REVIEW FOR APPLICABILITY TO PVNGS	ISEG GARRETT	06/06/83 06/06/83
					06/06/83 06/06/83
				STATUS COM COMMENTS	
1234567890	IEN	IEN 83-23	INOPERABLE CONTAINMENT ATMOSPHERE SENSING SYSTEMS	ISEG FERRARI	06/01/83 06/08/83
NRC	2				11/01/83
		EQ ID		ORIGINATOR ISEG SPINNATO	
				STATUS ACT COMMENTS	
				EQ DESC	
STEP	1		DISTRIBUTED TO OPS TO VERIFY THEIR AWARENESS OF PROBLEM.	OPS YOUNGER	06/08/83 06/08/83
					11/01/83
				STATUS ACT COMMENTS	
STEP	2		REQUESTED REVIEW OF SURVEILLANCE PROCEDURES BE MADE TO ENSURE ADEQUACY OF PROCEDURE.	ENGR ROMAN	06/14/83 06/14/83
					07/15/83 07/11/83
				STATUS COM COMMENTS	
1234567890	IEN	IEN 83-24	LOOSE PARTS IN THE SECONDARY SIDE OF STEAM GENERATORS AT PRESSURIZED WATER REACTORS	ISEG GONSOWSKI	06/01/83 06/24/83
NRC	2				09/30/83
		EQ ID		ORIGINATOR ISEG SPINNATO	
				STATUS ACT COMMENTS	07/15/83.
				EQ DESC	
STEP	1		REVIEW INPO RECOMMENDATIONS OF SOER 82-12 AND RENEW THESE COMMITMENTS. THIS IEN WILL ADDRESS SOER 82-12 ACTION ITEMS.	ISEG GONSOWSKI	06/24/83 06/24/83
					09/30/83
				STATUS ACT COMMENTS	07/08/83.
1234567890	IEN	IEN 83-25	STANDBY GAS TREATMENT SYSTEM HEATER HIGH TEMPERATURE TRIP SETPOINT ADJUSTMENT	ISEG FERRARI*	06/01/83 06/15/83
NRC	2				07/15/83 06/15/83
		EQ ID		ORIGINATOR ISEG SPINNATO	
				STATUS COM COMMENTS	
				EQ DESC	
STEP	1		DETERMINED NOT APPLICABLE BECAUSE PVNGS DOES NOT HAVE SYSTEM. DISTRIBUTED FOR INFO TO MNTC DUE TO SIMILAR HVAC SYSTEMS	ISEG GROSS	06/15/83 06/15/83
					06/18/83 06/15/83
				STATUS COM COMMENTS	