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BLIND, A.A. Indiana Michigan Power Co. (formerly Indiana & Michigan Ele
RECIP. NAME RECIPIENT AFFILIATION
DAVIS, A.B. Region 3 (Post 820201)

SUBJECT: Informs of preliminary assessment of 900713 electrical contact accident at facility.

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Indiana Michigan
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Cook Nuclear Plant
One Cook Place
Bridgman, MI 49106
616 465 5901

DCD

August 27, 1990



United States Nuclear Regulatory Commission
Region III
799 Roosevelt Road
Glen Ellyn, IL 60137

ATTN: Mr. A. Bert Davis, Regional Administrator

Dear Mr. Davis:

The purpose of this letter is to inform you of our preliminary assessment of the electrical contact accident that occurred at the Donald C. Cook Nuclear Plant on July 13, 1990.

At approximately 1 p.m., a contractor electrician working on our site contacted an energized 4KV electrical feed cable in breaker cubicle T21C1. The ensuing electrical flash resulted in one fatality and three seriously injured personnel. We have conducted an investigation and have provided the preliminary report and additional information, as requested, to our resident inspectors and members of an investigative team from the NRC Office for Analysis and Evaluation of Operational Data (AEOD). In addition, the Michigan Occupational Safety and Health Administration (MIOSHA) has completed their investigation and determined that no safety rules were violated. This letter also provides the results of the assessment of our work control process and the action we are taking to prevent a similar occurrence.

Immediately after the accident, an accident investigation team was formed that consisted of three personnel from other locations within the Indiana Michigan Power Company (I&M), including the I&M Safety Director and two Plant personnel. Additionally, an electrical engineer from the plant and an electrical engineer and a fire protection engineer from American Electric Power Service Corporation provided technical support to the investigation team. Also working with the accident investigation team for several days was the Safety Manager for Nuclear Support Services, Inc. (the employer for the contract employees involved in the accident).

The team visited the accident site, reviewed documentation associated with the activity that was to be conducted, and interviewed a large number of personnel to develop the attached preliminary investigation report that describes the accident. This preliminary report is essentially the same as the one that was provided to the resident inspectors and the

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AEOD team.

Because the investigation team has been unable to directly interview the three survivors of the accident, we are keeping the investigation open until we are able to complete the interview process. Information from the contract electrician (now in Nebraska) obtained by his employer and information from a 20-minute telephone conversation from the I&M Maintenance Mechanic A (electrician) has been considered in developing the preliminary accident report. The I&M Instrumentation and Control (I&C) technician's critical condition still precludes a direct interview. While the investigation remains open and the report is not finalized, we have obtained enough information to begin corrective action to prevent a similar occurrence.

The accident investigation team was not able to positively determine why the deceased contract electrician approached close enough to the energized conductors to initiate a fault. It appears that none of the individuals at the job site knew the exact physical location of the current transformers that they were looking for. Nevertheless, it is an I&M safety policy that potentially energized equipment should be considered energized until positively proven or shown that the equipment is de-energized. This policy is communicated to all personnel as part of the Nuclear General Employee Training received prior to obtaining unescorted access. From our interviews it is also our understanding that experienced electricians do know that they should verify that high-voltage equipment is properly cleared/isolated and grounded where appropriate. Records on site indicate that the men involved in the accident, particularly the electricians, were experienced individuals.

In addition to the requirement to check that equipment is de-energized before starting work on it, we have in place at the Cook Nuclear Plant several processes that should have prevented this accident. We have reviewed the Design Change packages and the job order packages associated with the accident. The packages did not contain information on the location of the current transformers. We did find that there are drawings on site that, while not showing a great amount of detail, did show generally where the current transformers are located. Additionally, it was determined that the on-site design change engineer and the Request For Change lead engineer in AEPSC did know the physical location of the current transformers. They had not received any request from the work group to help them locate the current transformers.

We also reviewed the clearance request associated with this event. In this particular event the clearance request was prepared by the I&C technician involved in the accident. But

as noted in the attached report, the clearance request was deficient. The clearance was hung as requested. We also determined that the control room personnel who hung the clearance did not have drawings that show the physical location of the current transformers available to them in the control room. They were of the understanding, based on the request, that the clearance that they had approved and had hung was adequate for the work the I&C technician would be doing.

We do require that the supervisor responsible for an activity ensure that an appropriate job briefing is conducted. In this event the instrument maintenance supervisor that was responsible for installing the design change did conduct a job briefing with the Maintenance Mechanic A and the two contract electricians. His direct report, the I&C technician, had already been working on the activity. During the job briefing the supervisor did state that he was unsure of the current transformer location. We also have indication that the maintenance mechanic A stated during the briefing, in response to a statement by the supervisor that he always checked for voltage.

We have reviewed our work control and training processes that were used and have found nothing inherently wrong in the processes nor any violations that significantly contributed to the event other than a failure to check that the equipment was de-energized. We are, however, investigating to see if there are changes we can make to strengthen the work control processes to preclude similar events. Although the individuals involved in the event appeared qualified to work in and around high-voltage equipment, we are reviewing our training program to see if we should emphasize more strongly our Company's fundamentals of safety. That is, we are reviewing to see if we should emphasize more strongly that all electrical equipment should be considered energized unless appropriately verified that it is deenergized. It is also possible that the team from AEOD may find something that we have missed. We know that the team is taking a very close look at our clearance permit process and our job planning process. Any recommendations from the AEOD will be evaluated and incorporated into our processes as appropriate.

As stated, we have investigated the accident and are looking at changes in our training and work processes that will help preclude any similar events. We will keep our NRC Resident Inspectors advised if any significant new information becomes available.


Also, the Michigan Occupational Safety and Health Administration (MIOSHA) conducted an investigation. Their representative met with us on August 20, 1990. The verbal de-

Mr. Bert Davis
August 27, 1990
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scription of their investigation of the accident appears to agree with our findings. MIOSHA will not be issuing any violations or citations.

If you should require any additional information, please do not hesitate to let me know.

Yours truly,



A. A. Blind

/fc

Attachments

c: Brent Clayton
Timothy Colburn
NRC Resident Inspector
M. P. Alexich
S. J. Brewer
J. E Rutkowski
R. E. Walker

DESCRIPTION OF ACCIDENT - July 13, 1990

On July 13, 1990 at approximately 1300, a contract electrician contacted energized feed cables in the back of an ITE metal clad breaker cabinet. The resulting flash resulted in one fatality and three injured personnel. The following is a description of what happened.

A request for change package (RFC) DC-12-3008 was prepared to revise electrical protective equipment to improve overall circuit coordination. The specific portion of the RFC being worked at the time of the accident was subtask 6. In part, this subtask involved installing an additional G.E. I.A.C. relay and current transformer (C.T.) on the bus - side of breaker T21C1. This 1200 amp breaker is part of an ITE 5HK250, 5KV Metal-Clad breaker cabinet located in Unit-2 4KV Breaker Room. A typical drawing of this cabinet and the actual electrical one line is attached (see attachments 1 and 2 respectively). A plant job order, B43965, was written and issued to the Maintenance Department on July 4, 1990. After review by the Instrument Maintenance Supervisor, the job was assigned to the I&C Technician. The I&C Technician began working on the job several days before the accident. He submitted a clearance permit request on July 11, 1990. Equipment requested to be cleared was the 4KV T21C bus. Specific tagout requirements requested were breakers T21C1, T21C2, T21C3 and grounding the bus. The new G.E. I.A.C. relay was installed and the control wiring nearly completed for breaker T21C1.

On the morning of the accident, the I&C Technician worked on the T21C1 relay control wiring. The I&M Maintenance Mechanic "A" (MMA) worked on an unrelated job in the plant. Two Nuclear Support Services (NSS) contract electricians (NSS-1; NSS-2) were working with another I&M Maintenance Mechanic "A" on an unrelated job in an adjoining room. Later in the morning, the Electrical Maintenance Supervisor assigned the I&M MMA, NSS-1, and NSS-2 the job of assisting the I&C Technician with the installation of the CT. Since the Electrical Maintenance Supervisor did not have any detail of the job, he did not conduct a job briefing.

Shortly after lunch, at approximately 12:45 p.m., the MMA, NSS-1, and NSS-2 went to the Instrument Maintenance Supervisor's office for a job briefing. During the discussion,

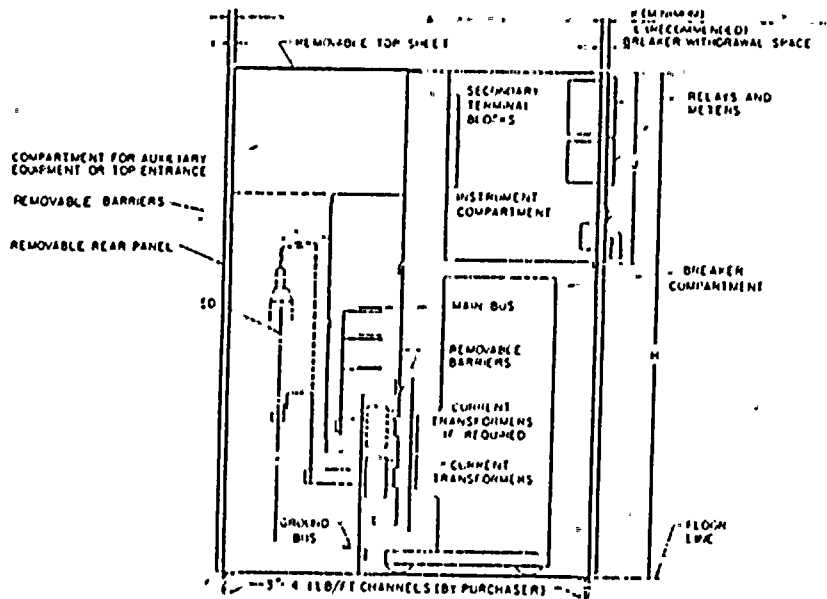
the Instrument Maintenance Supervisor stated his belief that the CTs could be reached from the front of the breaker cabinet. There was no drawing with the job package showing the CT location. The Instrument Maintenance Supervisor then took the men to the I&C shop to meet the I&C Technician. The I&C Technician and the NSS-2 proceeded to the Unit-2 4KV Breaker Room. The MMA told the NSS-1 to get the high voltage tester and insulating gloves and meet him in the 4KV Breaker Room. The MMA's intention was to check things out and then get the needed tools. The MMA then went to the Shift Supervisor's office to sign on the clearance permit #2900759. This clearance included, in part, breakers T21C1, T21C2, T21C3, 21C1, bus T21C, and transformer TR21C. A ground had been placed on the 4KV side of transformer TR21C. The 4KV breaker room door entry record showed that the I&C Technician and NSS-2 entered at 12:57 p.m. and the NSS-1 entered at 12:58 p.m. The record also shows that the Electrical Maintenance Supervisor entered at 12:58 p.m. and the MMA entered at 13:00 p.m. The Electrical Maintenance Supervisor was on his way to check a job in an adjoining room and, when he saw the men, stopped at the front of T21C cabinet to briefly discuss the job. The Electrical Maintenance Supervisor did not remember who was present. During the discussion, he cautioned them of possible backfeed from potential transformers in the cabinet. He walked around to the back of breaker T21C1 and commented that the CTs may be behind the bus bars. He said that the back cabinet door was open. He then left through the north fire door to the adjoining room. The MMA said that he arrived at the job site as the Electrical Maintenance Supervisor and the NSS-1 were talking behind the breaker cabinet. Due to the noise, the MMA could not hear their conversation. He said the NSS-2 and the I&C Technician were standing behind the NSS-1. He also said that he thought it was strange that the men were behind the breaker cabinet because he was not sure everything had been checked out. The MMA said that he looked around and did not see a high voltage tester or insulating gloves. The MMA said that he told the NSS-1 to leave the cabinet alone. The MMA added that he would go to get the high voltage tester and insulating gloves. He turned to leave and within seconds, he heard an explosion. The Electrical Maintenance Supervisor who was in an adjoining room, grabbed a fire

extinguisher and reentered the breaker room. NSS-1 was on the floor behind the T21C1 cabinet. The Electrical Maintenance Supervisor extinguished the fire on the NSS-1 and then moved to the main entrance where he extinguished at least one other man. Door entry records show that the MMA exited at 13:01 p.m. The Electrical Maintenance Supervisor exited at 13:02 p.m. EMT and fire brigade personnel began arriving in response to alarms and started treating the victims.

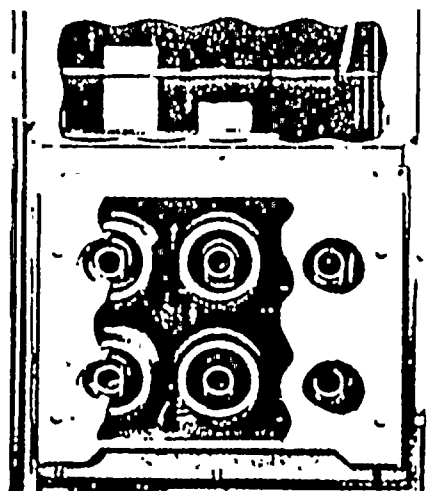
From the physical evidence, it appears that NSS-1 contacted the energized 4KV feed cables with his upper inside left arm and right chest. The resultant three phase fault was calculated at between 38,000 to 48,000 amps. The fault was cleared by overcurrent relays for breaker 2C6 in approximately 40 to 70 cycles. Analysis of bubbled and charred paint on walls indicate approximately 85% of the heat went left or north of the cabinet. The attached accident scene reconstruction drawing (see attachment 3) shows probable temperature profiles and probable individual's positions. The actual location of the CTs were on the stationary breaker stabs accessed from the front of the cabinet. The MMA, I&C Technician, and NSS-2 were wearing hard hats. NSS-1's hard hat was found near another breaker cabinet and showed no signs of heat damage. There was no high voltage personal protective equipment or high voltage test equipment found at the job site.

Typical Drawing of ITE 5HK 250 4KV Metal-Clad Switchgear

5 HK INDOOR SWITCHGEAR

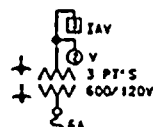
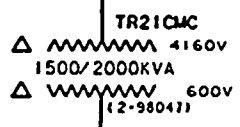
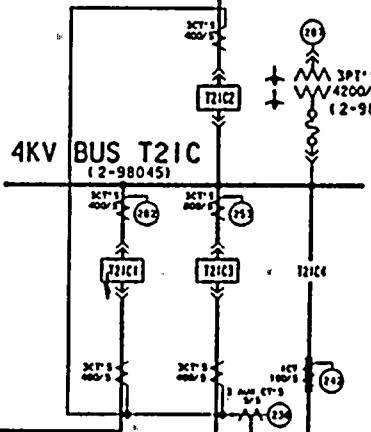
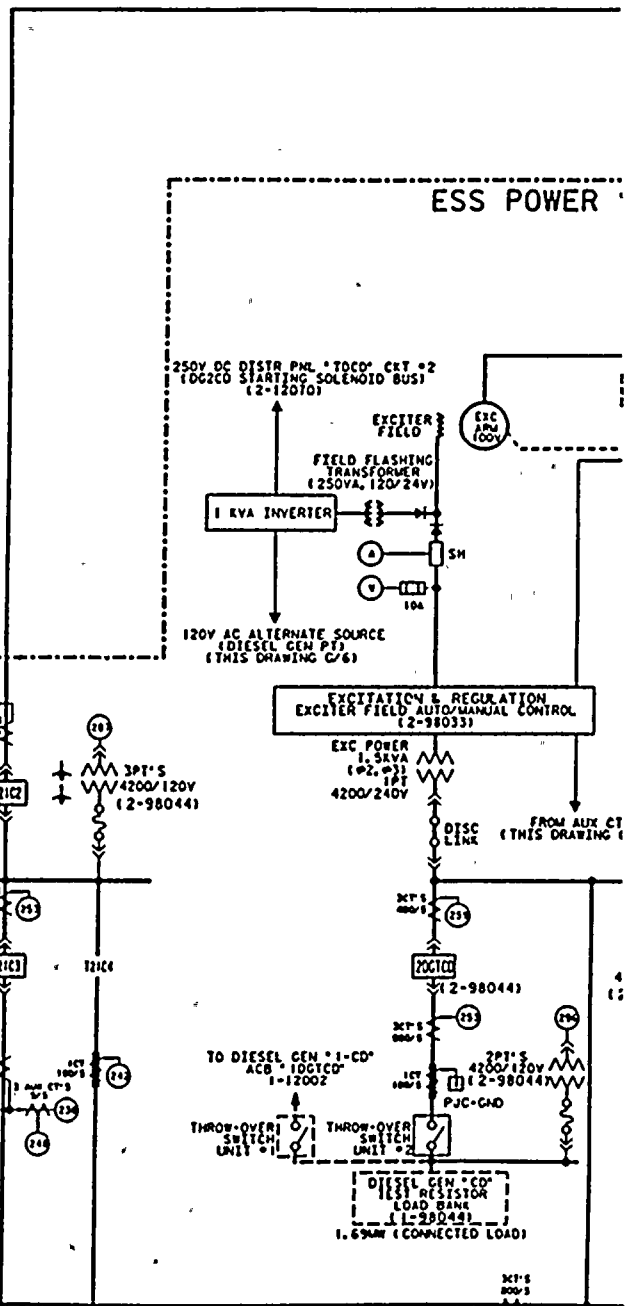
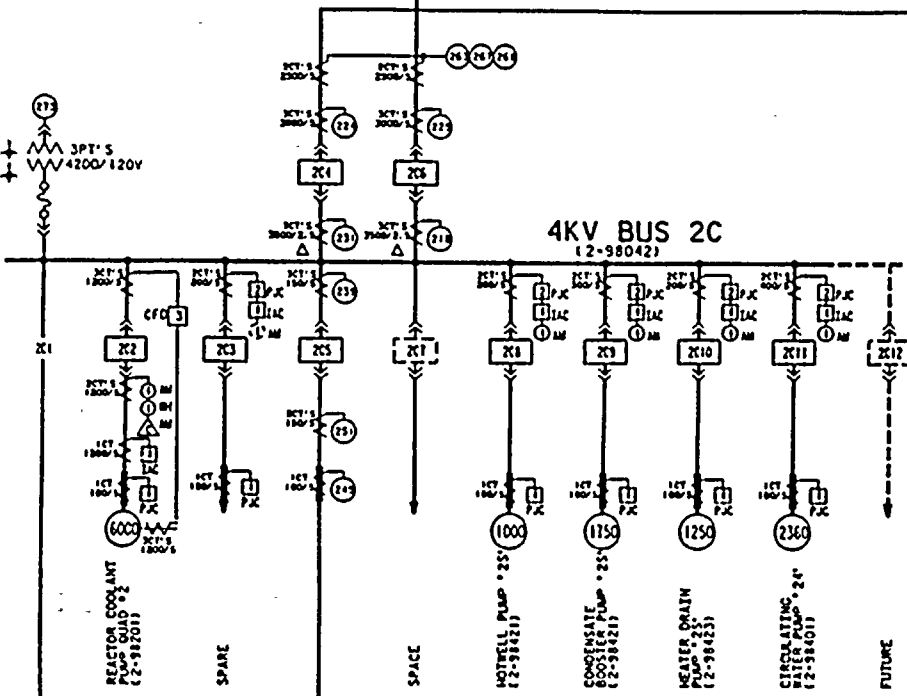
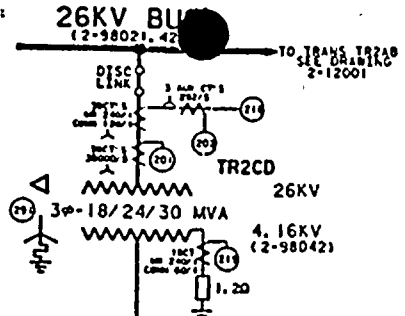


View Showing Feed Cable and CT Location



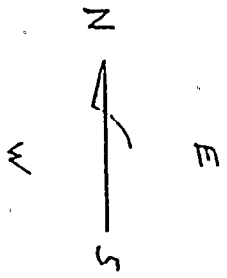
5 HK Shutter and Current Transformers

View Showing Closeup of CTs



600V BUS 21CMC

600V BUS 21C



SUSPECTED MEANS OF ENTRY

..... ITC TECH (A)

----- NSS-2 (H)

----- M/M A (F)

XXXX NSS-1 (B)

ADDITIONAL PARAMETERS

Source: 4650F

Q₁ - greater than 2000°F

Q₂ - greater than 850°F

Q₃ - greater than 850°F

Q₄ - greater than 850°F

Q₅ - greater than 300°F

