UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	Docket Nos. STN 50-454 OL
	)	STN 50-455 OL
COMMONWEALTH EDISON COMPANY	)	
	)	
(Bryon Nuclear Power Station, Units 1 and 2)	)	

SUMMARY OF TESTIMONY OF BOBBY G. TREECE ON ISSUES 5 AND 6 (CABLE OVERTENSIONING) AS LIMITED BY THE LICENSING BOARD'S ORDER OF JUNE 8, 1984

I. Bobby G. Treece of Sargent & Lundy is the Senior Electrical Project Engineer for Byron Station.

II. All of the safety-related cables which were installed in conduit prior to the December, 1982, implementation of the electrical contractor's revised cable installation procedure will perform their intended functions.

A. This conclusion is borne out by the analysis performed by Sargent & Lundy.

B. This analysis comprised the following steps:

1. Available cable pull reports for cables pulled in conduit before December, 1982, were reviewed. Many of the cables covered by these reports were found to be acceptable.

2. For those cable pull reports in which the allowable pulling tensions had been exceeded,

based upon the general pull criteria, the details of the cable pulls were forwarded to the cable manufacturers for the performance of a specific analysis to determine the acceptability of the cable pulls.

3. All of these cable pulls were found to be acceptable, based upon the manufacturers' specific analysis.

4. Sargent & Lundy then analyzed approximately 2600 conduits, which included all safety related cables pulled in conduit prior to December, 1982.

5. The safety-related cables in all but three of the approximately 2600 conduits analyzed were found to be acceptable.

6. The details of these three conduits were forwarded to the cable manufacturer for the performance of a specific analysis. Based upon the cable manufacturer's analysis, these cables were found to be acceptable.

C. The NRC accepted this analysis and concluded that there was a reasonable assurance that the safety-related cables installed in conduit prior to December, 1982, would perform their intended functions.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	Docket Nos. STN 50-454 OL
	)	STN 50-455 OL
COMMONWEALTH EDISON COMPANY	)	
	)	
(Bryon Nuclear Power Station, Units 1 and 2)	)	

DIRECT TESTIMONY OF
BOBBY G. TREECE
ON ISSUES 5 AND 6
(CABLE OVERTENSIONING),
AS LIMITED BY THE LICENSING BOARD'S
ORDER OF JUNE 8, 1984

Q-1. Please state your name.

A-1. Bobby G. Treece.

Q-2. What is your residence address?

A-2. My residence address is 807 South We-Go Trail, Mt. Prospect, Illinois 60056.

Q-3. By whom are you employed and in what capacity?

A-3. I am employed by Sargent & Lundy. My position is Associate and Senior Electrical Project Engineer for Byron and Braidwood Stations.

Q-4. Please describe your educational background.

A-4. I received a Bachelor of Science degree in electrical engineering from the University of Arkansas in 1948.

I am licensed as a professional engineer in the states of Arkansas, Florida and Illinois.

Q-5. Please describe your employment experience.

A-5. I went to work for Ebasco Services in 1948 as a cadet engineer. In 1951, I joined Sargent & Lundy as an Electrical Engineer. In 1963, I became an Electrical Project Engineer and was promoted to Senior Electrical Project Engineer in 1968, the position which I hold today. During this period, I have been responsible for the engineering and design of the electrical aspects of numerous power plants, both fossil and nuclear. In addition to Byron Station, I have performed electrical engineering work for the Dresden, Zion and Braidwood Nuclear Stations.

Q-6. Please describe your duties as Senior Electrical Project Engineer for Byron Station.

A-6. I have principal responsibility for the electrical engineering and design for the Byron project. My duties include the division of work among the Electrical Project Engineers and Electrical Engineers assigned to the Byron project team. I supervise and review the work performed by these engineers and provide the interface between the Electrical Department of Sargent & Lundy and personnel at Commonwealth Edison with respect to Byron Station.

Q-7. Please describe the scope of your testimony.

A-7. My testimony is in response to Issues 5 and 6, relating to potential cable overtensioning, or over-stressing, at Byron Station, as those issues have been limited by the Licensing Board's Order of June 8, 1984. This testimony is intended to supplement the testimony of James O. Binder, of Commonwealth Edison Company, which also relates to potential cable overtensioning. Specifically, my testimony will describe the analysis performed by Sargent & Lundy of all of the safety-related electrical cables installed in conduit at Byron Station prior to December, 1982. The purpose of that analysis was to determine whether or not any of those cables had been rendered unacceptable due to overtensioning. I will describe how the analysis came to be done, the methodology used in performing the analysis, the results of the analysis, and the conclusions which were drawn from it. The attachments to my testimony consist of various letters and an NRC Inspection Report which pertain to this matter. I am familiar with the contents of all of these attachments to the extent that they pertain to the cable overtensioning matter.

Q-8. Did Sargent & Lundy perform an analysis of all of the safety-related electrical cables installed in conduit at Byron Station prior to December, 1982, to determine whether any of those cables had been rendered unacceptable due to overtensioning?

A-8. Yes.

Q-9. Is electrical cable installed only in conduit?

A-9. No. Electrical cable may also be installed in cable trays.

Q-10. Why did the analysis performed by Sargent & Lundy not consider cable installed in cable trays?

A-10. Potential overtensioning of cable installed in trays was not considered to be a problem and thus was not included in the analysis performed by Sargent & Lundy because the majority of these cables are laid in trays by hand. The possibility of exerting too much tension during such cable installations is small. For the remainder of the pulls through trays, the contractor uses pulling guides, or sheaves, for turning the cable around bends in the tray. For a given pulling tension, these guides reduce the sidewall pressure experienced by a cable below that for a conduit of the same radius. Sargent & Lundy's installation drawing addressed cable sidewall pressure by specifying minimum cable pulling guide radii.

Q-11. Please explain why Sargent & Lundy performed an analysis of all of the safety-related electrical cables installed in conduit at Byron Station prior to December, 1982, with respect to potential overtensioning.

A-11. As previously described in the testimony of Mr. Binder, an NRC inspection in the Spring of 1982 identified as

an item of noncompliance the fact that the cable installation procedure used by the electrical contractor, Hatfield Electric, did not address the requirements to calculate allowable cable pulling tensions. Commonwealth Edison's response to this item was to revise the cable installation procedure so as to address the subjects of concern to the NRC. In addition, Commonwealth Edison committed to take appropriate action to ensure that all safety-related cables installed prior to the implementation of the revised procedure in December, 1982, would perform their intended functions. This was to be accomplished by a review of cable pull reports and the performance of additional analysis by Sargent & Lundy.

Q-12. Did you review cable pull reports covering all safety-related cables pulled in conduit prior to December, 1982?

A-12. No. Cable pull reports do not exist for all such cables.

Q-13. Why do they not exist?

A-13. Originally, the electrical contractor's cable installation procedure did not require that cable pull reports be prepared for all safety-related cable installations.

Q-14. Please describe the review of cable pull reports performed by Sargent & Lundy.

A-14. Sargent & Lundy began by reviewing the available cable pull reports for cables pulled in conduit before the revised

cable installation procedure was implemented in December, 1982. In addition, Sargent & Lundy reviewed the cable pull reports attached to Commonwealth Edison Nonconformance Report (NCR) F-747. For each cable covered by a cable pull report, Sargent & Lundy calculated the allowable pulling tension, using criteria supplied by the cable manufacturer, and compared that tension to the tension which had been documented on the cable pull report. This review revealed that 25 of the cable pulls covered by the cable pull reports exceeded the allowable pulling tensions. Of these 25 cases, five cable pulls exceeded the allowable pulling tension determined by tensile strength, 16 cable pulls exceeded the pulling tension determined by sidewall pressure and four cases exceeded the allowable pulling tension determined by both tensile strength and sidewall pressure. For these 25 cable pulls, it was determined that additional analysis was required before it could be concluded whether the monitored pulling tensions were acceptable.

Q-15. How could additional analysis demonstrate that the pulling tensions recorded in the 25 cases mentioned in Answer 14, above, were acceptable?

A-15. The cable pulling criteria as provided to Sargent & Lundy by each cable manufacturer are general pull

criteria. As such, then do not establish the maximum tension which the cable can withstand without damage. The general criteria thus include a margin of conservatism. Sargent & Lundy, using these general criteria from each manufacturer, develops composite criteria applicable to all cables installed in Byron Station. Because these composite criteria are based upon the most stringent of the cable manufacturers' general criteria, they provide an additional margin of conservatism for some types of cables. Sargent & Lundy's analysis of the cable pull reports was based upon each cable manufacturer's general pull criteria. However, due to the manufacturer's margin of conservatism inherent in the general pull criteria, the manufacturer can perform a specific analysis to determine the acceptability of a particular cable pull.

Q-16. What was done regarding the 25 cable pulls in which the allowable pulling tension was exceeded?

A-16. Details of these specific cable pulls were forwarded to the cable manufacturers by Sargent & Lundy with a request that they perform a specific analysis of each cable pull. Based on the cable manufacturers' review, all 25 of these suspect cable pulls were found to be acceptable. See Attachment A (letter from Sargent & Lundy to Commonwealth Edison dated January 26, 1983) and Attachment B (letter from Sargent & Lundy to Commonwealth Edison dated December 12, 1983).

Method 2. Sargent & Lundy determined the critical (maximum) conduit length for each conduit size assuming a worst case conduit configuration and the actual installed cable configuration. If the actual length of the conduit did not exceed the calculated critical length, it was concluded that the cables in that conduit had not been overtensioned. If the actual length of the conduit run exceeded the calculated critical length, that conduit run was subjected to further analysis using Method 3, below.

Method 3. For the remaining conduits, Sargent & Lundy calculated the expected pulling tension for the actual installed conduit configuration containing the actual installed cable configuration. This expected pulling tension was then compared to the allowable pulling tension as determined by the manufacturer's general criteria. If the expected pulling tension (as calculated) did not exceed the allowable pulling tension, it was concluded that the cables in that conduit had not been overtensioned. If the expected pulling tension (as calculated) exceeded the allowable pulling tension, details of the cable installation were forwarded to the manufacturer with a request that a specific analysis be performed.

Out of the approximately 2600 conduit runs analysed using the method(s) described above, only three conduits were identified for which a specific analysis by the manufacturer was required to determine the acceptability of the cables. See Attachment C (letter from Sargent & Lundy to

Commonwealth Edison dated June 23, 1983). Based upon the specific analysis performed by the cable manufacturer, the cables pulled in these three conduits were determined to be acceptable. See Attachment B (letter from Sargent & Lundy to Commonwealth Edison dated December 12, 1983).

Q-19. What conclusion did Sargent & Lundy reach regarding whether any of the safety-related cables installed in conduit at Byron Station before December, 1982, had been rendered unacceptable due to overtensioning?

A-19. Sargent & Lundy concluded that none of the safety-related cables pulled in conduit prior to December, 1982, was unacceptable; that is, their ability to perform their intended functions had not been impaired by overtensioning.

Q-20. Please describe the basis for that conclusion.

A-20. That conclusion is based upon Sargent & Lundy's analysis of the safety-related cables installed in approximately 2600 conduits. This analysis included cables for which cable pull reports were and were not available. Most of the safety-related cables involved were determined to be acceptable based upon Sargent & Lundy's analysis, which indicated that the expected pulling tensions (as calculated) did not exceed the allowable pulling tensions for these cables. For the remaining safety-

related cables, although the allowable pulling tensions as determined by the manufacturer's general criteria had been exceeded, a specific analysis performed by the manufacturer demonstrated that the cables will perform their intended functions. Thus, those cables were also found to be acceptable.

Q-21. Did the NRC accept this analysis of safety-related cables pulled in conduit prior to December, 1982?

A-21. The NRC accepted this analysis in Inspection Report 50-454/84-27; 50-455/84-19, which is Attachment D to my testimony. The NRC inspector concluded that there was a reasonable assurance that the safety-related cables would perform their intended functions. See Attachment D at pages E-14 to E-15.

TREECE ATTACHMENT A

SARGENT & LUNDY
ENGINEERS
55 EAST MONROE STREET
CHICAGO, ILLINOIS 60603
(312) 269-2000
TWX 910-221-2807

January 26, 1983
Project Nos. 4391/2 &
4683/4

Commonwealth Edison Company
Byron/Braidwood Stations - Units 1 & 2

Cable Pull Criteria

Mr. J. T. Westermeier
Project Engineer
Commonwealth Edison Company
P.O. Box 767
Chicago, IL 60690

Dear Mr. Westermeier:

In response to the NRC's findings concerning the Contractor's Cable Pulling Procedures (Byron IE Inspection Reports Nos. 50-454/82-05 and 50-455/82-04), Commonwealth Edison Company's (CECo) letter dated November 5, 1982, stated that cable pull reports would be reviewed to verify that the allowable sidewall pressure was not exceeded for cables installed prior to the implementation of the revised Contractor's Cable Pulling Procedures. The expected date for completion of the review was January 31, 1983. As a basis for this review, Sargent & Lundy received 44 cable pull reports (listed in Attachment A) from Byron Station Construction. This summarizes the results of Sargent & Lundy's review of these cable pull reports.

The cable pull reports were reviewed against the Electrical Installation (EI) drawings to identify the conduit containing the referenced cables. This identification was required to define the factors necessary to calculate the allowable sidewall pressure pulling tension (i.e. conduits smallest bend radius). For 29 of the cable pull reports received, the conduit containing the referenced cables was identified. These 29 cable pull reports covered 35 cable pulls for 54 safety-related cables. For the remaining 15 reports, the review of the electrical installation drawing did not reveal any conduit containing only the referenced cables.

To increase the data base for this review effort, Sargent & Lundy also used the cable pulling information included in Non-Conformance Report (NCR) F-747. This data covered 136 cable pulls for 159 safety-related cables. This NCR had been written for cables pulled following the issuance of ECN's 2579 and 3015 but prior to implementation of the revised Contractor's Cable Pulling Procedures.

Sargent & Lundy's review of the above referenced data revealed that 17 of the 35 cable pulls covered by the cable pull reports, and 8 of the 136 cable pulls covered by the NCR, potentially exceed the allowable pulling tensions (reference Attachment B). In these 25 cases potentially exceeding the allowable pulling tension, five cable pulls exceeded the allowable tensile strength pulling tension, 16 cases exceeded the allowable sidewall pressure tension, and four cases exceeded both the tensile strength and the sidewall pressure pulling tension. Additional analysis is required before it can be determined whether the monitored pulling tensions are acceptable. For example, conversations with Okonite Company indicate that for certain cable configurations the .6 multiplying factor can be increased to .8. Also, for cases where the allowable sidewall pressure pulling tension has been exceeded the location of the bends in the conduit can result in additional relief. A list of the 17 cable pulls and associated cables covered by the cable pull reports requiring additional analysis have been given to Mr. J. O. Binder for his use in preparing an NCR.

Sargent & Lundy will continue work in this area to provide calculations and/or analysis to address the safety-related cables pulled in conduit prior to the implementation of the revised Contractor's Cable Pulling Procedures for which pull reports do not exist.

If you have any questions, please contact me.

Yours very truly,

T. R. EISENBART

T. R. Eisenbart
Electrical Engineer

TRE:sh
In duplicate
Enclosure
Copies:
G. Sorensen/J. O. Binder (1/1)
D. L. Leone/W. C. Cleff (1/1)
R. J. Netzel (1/1)

SARGENT & LUNDY
ENGINEERS
CHICAGO

ATTACHMENT "A" to
Sargent & Lundy's
(T. R. Eisenbart)
letter dated
January 26, 1983

Commonwealth Edison Company
Byron/Braidwood Stations - Units 1 & 2
Project Nos. 4391/2 & 4683/4

CABLE PULL REPORTS SUBMITTED FOR REVIEW

PITTSBURGH TESTING LABORATORY REPORT NUMBERS

CP-40	CP-316
CP-80	CP-319
CP-81	CP-320
CP-90	CP-336
CP-91	CP-338
CP-109	CP-339
CP-124	CP-340
CP-218	CP-323
CP-250	CP-321
CP-251	CP-322
CP-293	CP-330
CP-294	CP-324
CP-298	CP-317
CP-299	CP-318
CP-300	CP-295
CP-308	CP-313
CP-309	CP-331
CP-311	CP-310
CP-312	CP-337
CP-314	CP-8
CP-315	CP-7
CP-219	CP-301
	CP-125

SARGENT & LUNDY
ENGINEERS
CHICAGO

ATTACHMENT "B" to
Sargent & Lundy's
(T. R. Eisenbart)
letter dated
January 26, 1983

Commonwealth Edison Company
Byron/Braidwood Stations - Units 1 & 2
Project Nos. 4391/2 & 4683/4

CABLE PULLS POTENTIALLY EXCEEDING ALLOWABLE PULLING TENSIONS

Cable Pull Report Numbers	Cable Numbers
CP-40	1AP183
CP-80	1AP073, 1AP320, 1AP322
CP-81	1AP072, 1AP319, 1AP321
CP-90	2SX138, 2SX140, 2SX153, 2SX258, 2SX100, 2SX110, 2SX260, 2SX139, 2SX149, 2SX157, 2SX137, 2SX102, 2SX112, 2DC073
CP-91	2AP179, 2AP182, 2AP300, 2AP401
CP-218	1VC028
CP-250	1IP005, 1IP006
CP-251	1IP033, 1IP034
CP-315	1VA578, 1VA579
CP-316	1VA580, 1VA581
CP-319	1VA558, 1VA559, 1VA560
CP-320	1VA374, 1VA376, 1VA548, 1VA549

December 12, 1983
Project Nos. 4391/2-00

Commonwealth Edison Company
Byron Station - Units 1 & 2

Byron-IE Inspection Report
Nos. 50-454/82-05 and 50-455/82-04

Cable Pull Criteria

Reference: (a) Letter dated January 26, 1983, S&L (TRE) to CECo (JTW)
(b) Letter dated June 23, 1983, S&L (TRE) to CECo (JTW)
(c) Letter dated June 22, 1983, S&L (JPC) to Okonite (CD)

Mr. J. T. Westermeier
Project Engineer
Commonwealth Edison Company
P. O. Box 767
Chicago, IL 60690

Dear Mr. Westermeier:

Reference (a) summarized the results of an S&L review of cable pull reports obtained from Byron Station. Reference (b) summarized the results of an S&L analysis of safety-related cable pulls (in conduit), prior to the implementation of a revised pulling procedure, for which cable pull reports did not exist. As noted in Reference (b), three of the conduits required further analysis by the cable manufacturer. Reference (c) transmitted the necessary cable pull information to the Okonite Company and requested their analysis of same.

Based on Okonite Company's October 11, 1983 letter (copy attached) and subsequent discussions with Hatfield Electric Company (i.e., a review of Hatfield cable pull records to determine actual direction of pull), we have concluded that the cable pulled in these three conduits are acceptable. The finding in this letter, together with References (a) and (b), complete the S&L review of the subject IE Inspection Reports.

Based on our findings, we recommend that you supplement your previous responses to the NRC as follows:

As discussed in Commonwealth Edison Company's (CECo) November 5, 1982 and January 24, 1983 letters, CECo concurs with the NRC findings relative to the contractor's cable pulling procedures not addressing cable side-wall pressure criteria. As indicated in CECo's November 5, 1982 letter, revised design documents were issued (May 19, 1982) which specified the allowable cable pulling tensions for cables in conduit, considering both the conductor tensile strength and the cable side-wall pressure criteria. The contractor's cable pulling procedures have also been revised accordingly. Cable pulled in tray was not considered a potential problem since the architect-engineer's cable information drawing addressed cable side-wall pressure by specifying minimum cable pulling guide radii. In addition, the majority of cable pulled in tray was hand pulled.

In order to verify the acceptability of cables installed prior to the issuance of revised procedure, the architect-engineer (a) reviewed cable pull reports, where available, and (b) performed generic analyses/calculations, where cable pull reports were not available.

The architect-engineer's review of the cable pull reports identified several cable installations in which the recorded pulling tension exceeded the allowable pulling tension, as determined from cable manufacturer's general pull criteria. Each of these cable pulls was identified and a Non-Conformance Report was issued by CECo to track their resolution. The architect-engineer forwarded the details of these specific cable pulls to the cable manufacturer with a request that the manufacturer perform a specific analysis to determine the acceptability of each cable pull. Based on the cable manufacturers review, all of these suspect cable pulls were found to be acceptable.

Where cable pull reports did not exist, the architect-engineer performed an analysis, utilizing one of the following (generic or specific, as appropriate) calculations to determine the acceptability of each cable installation:

(1) Calculation for an assumed worst case conduit configuration containing the worst case cable configuration.

(2) Calculation for an assumed worst case conduit configuration containing the actual cable configuration.

(3) Calculation utilizing the actual conduit configuration containing the actual cable configuration.

This analysis identified several cable installations which could not be verified acceptable, based on the cable manufacturer's general pull criteria. The details of each such cable installation were forwarded to the cable manufacturer, with a request that the manufacturer perform a specific analysis to determine acceptability of each cable pull. Based on the cable manufacturer's review, all of these suspect cable pulls were found to be acceptable.

The cable pull reports, analyses, calculations, and other supporting documentation used in responding to these inspection reports are available for NRC review.

If you have any questions, please call me.

Yours very truly,

T. R. EISENBART

T. R. Eisenbart
Electrical Engineer

TRE:daa
In duplicate
Enclosures
Copies:
D. L. Leone/W. C. Cleff (1/1)
R. J. Netzel (1/0)

THE OKONITE COMPANY

1515 Centre Circle
Post Office Box 626
Downers Grove, Illinois 60515
312 932-1200

October 11, 1983

SARGENT & LUNDY
EPED
OCT 13 1983
RECEIVED

Mr. J. F. Clancy, E.E.
Sargent & Lundy
Mail Code 25D15
55 East Monroe
Chicago, Illinois 60603

Subject: Commonwealth Edison Company
Byron/Braidwood Stations-Units 1 & 2
Cable Pull Criteria
S&L Spec. F/L-2823 & 2851
CECo P.O. Nos. 203608, 203609, 207113 & 207114

Dear Mr. Clancy:

In response to your letter dated June 2[illegible], 1983 please be advised of the following as you requested.

Attached are calculations for the cable pulls for the drawings submitted by you. Pulling from 1JB261A to gear in one continuous length provides excessively high pulling tension and sidewall pressures. This is caused by the excessive number of offsets located in this run. The total tension calculates out to 52,000 lbs. in this direction. The coefficient of friction actual was probably lower than 0.35 but in any case the allowable tension and sidewall pressures were exceeded by the wide margin. These calculations appear on pages 1 and 2 of the attached sheets.

If cable had been pulled from the gear to 1JB261A, they would have reduced the total tension down to approximately 16,000 lbs. and a maximum sidewall pressure of 3[illegible]26 lbs./ft. These values although extremely high are well below the pull in the other direction. It would have been helpful if the pulling crew had used a dynamometer to give us an idea what the actual tension was, but it is assumed they did not.

If the cable was pulled from 1JB261A to gear it should be replaced because of the very high pulling tension and sidewall pressure that would have been experienced.

The cable is okay for use if it was pulled from the rear to 1JB261A since the calculations show pulling tension and sidewall pressure to be acceptable.

Please call if we can be of further service.

Very truly yours,

THE OKONITE COMPANY

Charles L. Doerr

Charles L. Doerr
District Manager

CLD/cmj

ENGINEERING CALCULATION

By L.J. Kelly Date 9/27/85 Sheet 1 of 4

Chkd. By _____ Date _____ Inquiry/P.O. No. _____

Client/Project SARGENT AND LUNDY / COMMONWEALTH EDISON

Specification No./Rev./Date _____

Subject PULLING TENSION CALCULATION FOR JACK CLANCY

CABLES - 3 x 1/C 750MCM, .140" OKOSOLID, SHIELDED, OKOLON-5RV

CABLE WT 1/C = 3.25 LBS/FT

CABLE O.D. - 1/C = 1.65"

MAXIMUM TENSION = .008 x 3 x CMA = 18,000 LBS (ABSOLUTE)

FRICTION = 0.35 (LUBRICATED) CONDUIT SIZE = 5" = 5.047" I.D.

WT. CORR FACTOR (C) = $1 + \frac{4}{3}\left[\frac{1.65}{5.047-1.65}\right]^2 = 1 + .315 = 1.315$

CABLE WT x NO. OF CONDS x FRICTION x WT CORR FACTOR = WT FACTOR

3.25 x 3 x 0.35 x 1.315 = 4.5 LBS/FT

WT FACTOR = 4.5 LBS PER FT

(Cf) FACTOR = 1.315 x 0.35 = 0.46 ($e^{cf\alpha}$ CALCULATIONS)

1SB261A TO 15° BEND = 11 FT x 4.5 LBS/FT = 49 LBS

AROUND 15° BEND = $49 e^{cf\alpha} = 49 e^{(.46)(.26)} = 49 e^{(.12)} = 49(1.13) = 55$ LBS

15° BEND TO 15° BEND = 2.5 FT x 4.5 LBS/FT = 11 LBS + 55 LBS = 66 LBS

AROUND SECOND 15° BEND = 66 LBS x 1.13 = 76 LBS.

15° BEND TO 44° BEND = 49 FT x 4.5 LBS/FT = 220 LBS + 76 LBS = 296 LBS

AROUND 44° BEND = $296 \times e^{(.46)(.787)} = 296$ LBS x 1.424 = 422 LBS

44° BEND TO 44° BEND = 5 FT x 4.5 LBS/FT = 23 LBS + 422 LBS = 445 LBS.

AROUND 44° BEND = 445 x 1.424 = 634 LBS.

44° BEND TO 26° BEND = 65 FT x 4.5 LBS/FT = 293 LBS + 634 LBS = 927 LBS.

AROUND 26° BEND = 927 LBS x 1.232 = 1142 LBS.

26° BEND TO 26° BEND = 2 FT x 4.5 LBS/FT = 9 LBS + 1142 LBS = 1151 LBS

AROUND 26° BEND = 1151 LBS x 1.232 = 1418 LBS.

26° BEND TO 32° BEND = 20 x 4.5 = 90 LBS + 1418 LBS = 1508 LBS

AROUND 32° BEND = 1508 LBS x 1.293 = 1950 LBS.

32° BEND TO 32° BEND = 2 x 4.5 = 9 LBS + 1950 LBS = 1959 LBS.

AROUND 32° BEND = 1.293 x 1959 LBS = 2533 LBS.

32° BEND TO 1SC262 = 60 FT x 4.5 LBS/FT = 270 LBS + 2533 LBS = 2803 LBS.

TENSION AROUND LAST 32° BEND = $\frac{2533 \text{ LBS}}{3.42 \text{ FT RADIUS}}$ = 740 LBS/FT

740 LBS/FT OK SINCE BELOW 1000 LBS/FT MAX.

1SB261A TO 1SB262 - PULL OK MAX TENSION = 2803 LBS

MAX SIDEWALL PRESSURE = 740 LBS/FT

E/680

ENGINEERING CALCULATION

By L.J. Kelly Date 9/27/83 Sheet 2 of 4

Chkd. By ______ Date ______ Inquiry/P.O. No. ______

Client Project: Sargent and Lundy / Commonwealth Edison

Specification No. Rev./Date

Subject: Pulling Tension Calculation for Jack Clancy

1JB262 TO 47° BEND = 10 FT X 4.5 = 45 LBS + 2803 = 2848 LBS.

AROUND 47° BEND = 2848 LBS X 1.46 = 4158 LBS

SIDEWALL PRESSURE = $\frac{4158}{3.5}$ = 1188 LBS/FT EXCEEDS 1000 LBS/FT

47° BEND TO 43° BEND = 11 X 4.5 = 50 LBS + 4158 = 4208 LBS

AROUND 43° BEND = 4208 X 1.412 = 5942 LBS

SIDEWALL PRESSURE = $\frac{5942}{3.67}$ = 1620 LBS/FT EXCEEDS 1000 LBS/FT

43° BEND TO 90° BEND = 2 X 4.5 = 9 LBS + 5942 LBS = 5951 LBS

AROUND 90° BEND = 5951 LBS X 2.05 = 12,200 LBS

SIDEWALL PRESSURE = $\frac{12200 \text{ LBS}}{3 \text{ FT}}$ = 4067 LBS/FT EXCEEDS 1000 LBS/FT

90° BEND TO 22° BEND = 22 X 4.5 = 99 LBS + 12200 = 12,299 LBS

AROUND 22° BEND = 12,299 X 1.193 = 14,670 LBS

SIDEWALL PRESSURE = $\frac{14,670}{3}$ = 4890 LB/FT EXCEEDS 1000 LBS/FT

22° BEND TO 22° BEND = 3 X 4.5 = 14 LBS + 14,670 LBS = 14,684 LBS.

AROUND 22° BEND = 14,684 X 1.193 = 17,518 LBS

SIDEWALL PRESSURE = $\frac{17,518 \text{ LBS}}{3.5}$ = 5000 LBS/FT EXCEEDS 1000 LBS/FT

22° BEND TO 45° BEND = 31 FT X 4.5 = 140 LBS + 17,518 = 17,658 LBS.

AROUND 45° BEND = 17,658 X 1.44 = 25,428 LBS

SIDEWALL PRESSURE = $\frac{25428}{3.25}$ = 7824 LBS/FT EXCEEDS 1000 LBS/FT

45° BEND TO 90° BEND = 9 X 4.5 = 40.5 X 25,428 LBS = 25,469 LBS

AROUND 90° BEND = 25,469 X 2.05 = 52,211 LBS

SIDEWALL PRESSURE = 52,211/3.33 = 15,676 LBS/FT

BREAKING STRENGTH of 3 (750 MCM) CABLES 63,000 LBS.

B-7

E-680

ENGINEERING CALCULATION

By L.S. Kay Date 9/21/11 Sheet 3 of 4

Chkd. By _____ Date _____ Inquiry/P.O. No. _____

Client/Project SARGENT & LUNDY / COMMONWEALTH EDISON

Specification No./Rev./Date _____

Subject _____

CALCULATION PULLING FROM GEAR TO 1SB261A
SEE PAGES 1 AND 2 FOR CALCULATIONS OF STRAIGHT RUNS

TO FIRST 90° AT GEAR = 4 1/4 x 3.25 x 3 = 41 LBS

AROUND 90° BEND = 2.05 x 41 = 84 LBS

90° BEND TO 45° BEND = 40.5 LBS + 84 LBS = 125 LBS

AROUND 45° BEND = 125 LBS x 1.44 = 180 LBS

45° BEND TO 22° BEND = 140 LBS + 180 LBS = 320 LBS

AROUND 22° BEND = 320 LBS x 1.193 = 382 LBS

22° BEND TO 22° BEND = 14 LBS + 382 LBS = 396 LBS

AROUND 22° BEND = 396 LBS x 1.193 = 472 LBS

22° BEND TO 90° BEND = 99 LBS + 472 LBS = 571 LBS

AROUND 90° BEND = 571 LBS x 2.05 = 1170 LBS

90° BEND TO 43° BEND = 9 + 1170 = 1179 LBS

AROUND 43° BEND = 1179 x 1.412 = 1665 LBS

43° BEND TO 47° BEND = 50 LBS + 1665 LBS = 1715 LBS

AROUND 47° BEND = 1715 x 1.46 = 2503 LBS

47° BEND TO 1SB262 = 45 + 2503 = 2548 LBS

1SB262 TO 32° BEND = 270 LBS + 2548 LBS = 2818 LBS

32° BEND TO 32° BEND = 9 LBS + 2818 LBS = 2827 LBS

AROUND 32° BEND = 2827 x 1.293 = 3655 LBS

SIDEWALL = $\frac{3655}{3.41}$ = 1075 LBS/FT EXCEEDS 1000

32° BEND TO 26° BEND = 90 + 3655 = 3745 LBS

AROUND 26° BEND = 3745 LBS x 1.232 = 4613 LBS

SIDEWALL = 4613/3.75 = 1230 LBS/FT EXCEEDS 1000

26° BEND TO 26° BEND = 9 LBS + 4613 = 4622 LBS

AROUND 26° BEND = 4622 x 1.232 = 5694 LBS

SIDEWALL = 5694/3.5 = 1627 LBS/FT EXCEEDS 1000

26° BEND TO 44° BEND = 293 LBS + 5694 = 5987 LBS

AROUND 44° BEND = 5987 LBS x 1.424 = 8525 LBS

SIDEWALL = 8525/3.84 = 2220 LBS/FT EXCEEDS 1000

44° BEND TO 77° BEND = 23 LBS + 8525 = 8548 LBS

AROUND 44° BEND = 8548 x 1.424 = 12,172 LBS

SIDEWALL = 12,172/4.09 = 2993 LBS/FT EXCEEDS 1000

44° BEND TO 15° BEND = 220 LBS + 12172 LBS = 12,392 LBS.

ENGINEERING CALCULATION

By L.S.Kau Date 9/28/12 Sheet 4 of 4

Chkd. By ____ Date ____ Inquiry/F.O. No. ____

Client/Project SARGENT & LUNDY / COMMONWEALTH EDISON

Specification No. Rev./Date ____

Subject PULLING TENSION CALCULATION FOR JACK SCREW

AROUND 15° BEND = 12,392 x 1.13 = 14,002 LBS

SIDEWALL = 14,002 / 4.76 = 2941 LB/FT EXCEEDS 1000

15° BEND TO 15° BEND = 11 LBS + 14002 = 14013 LBS

AROUND 15° BEND = 14013 X 1.13 = 15,834 LBS

SIDEWALL = 15,834 / 4.76 = 3326 LBS/FT EXCEEDS 1000

15° BEND TO 1SB261A = 49 LBS + 15,834 LBS = 15,893 LBS.

TOTAL TENSION GEAR TOWARD 1SB261A = 15,893 LBS

WORST SIDEWALL PRESSURE = 3326 LBS/FT

E/680

SARGENT & LUNDY
ENGINEERS
55 EAS. MONROE STREET
CHICAGO, ILLINOIS 60603
TELEPHONE 312-269-2000

June 23, 1983
Project Nos. 4391/2 & 4683

Commonwealth Edison Company
Byron/Braidwood Stations - Units 1 & 2

Cable Pull Criteria

Mr. J. T. Westermeier
Project Engineer
Commonwealth Edison Company
P.O. Box 767
Chicago, IL 60690

Dear Mr. Westermeier:

This letter supplements my January 26, 1983, letter concerning an initial response to the NRC findings regarding the Contractor's Cable Pulling Procedures (Byron IE Inspection Report Nos. 50-454/82-05 and 50-455/82-04). That letter summarized Sargent & Lundy's (S&L) review of cable pull reports obtained from Byron Station Construction. In addition to a review of cable pull reports, an analysis was required to address safety-related cable pulls in conduit prior to implementation of the revised Contractor's Cable Pulling Procedures for which pull reports did not exist. This letter summarizes the result of this additional analysis.

As a basis for this additional analysis, S&L received a listing of all safety-related cables pulled in conduit prior to December, 1982, from Byron Station Construction. This listing identified approximately 2600 conduits requiring analysis. S&L has completed the analysis for these conduits by utilizing one of the following methods:

1. Calculations for an assumed worst case conduit configuration containing a worst cable configuration.

2. Calculations for an assumed worst case conduit configuration containing the actual cable configuration.

3. Calculations for the actual conduit configuration containing the actual cable configuration.

S&L's review identified three conduits that recuire additional analysis by the cable manufacturer. Cable pulling information for these conduits has been forwarded to Okonite Company, by S&L letter dated June 22, 1983, copy enclosed, for their use in performing a

detailed analysis. We will advise you of their findings at a later date. S&L's analysis concludes that the remaining conduits/cable pulls are acceptable.

The results of this analysis and the supporting calculations are presently being put together into an auditable format. We expect to complete this effort by July 22, 1983.

If you have any questions, please contact me.

Yours very truly,

T. R. EISENBART

T. R. Eisenbart
Electrical Engineer

TRE:dw
In duplicate
Enclosure
Copies:
G. Sorensen/J. O. Binder (1/1)
D. L. Leone/W. C. Cleff (1/1)
R. J. Netzel (1/1)

SARGENT & LUNDY
ENGINEERS
55 EAST MONROE STREET
CHICAGO, ILLINOIS 60603
(312) 269-2000
TWX 910-221-2807

June 22, 1983
Project Nos. 4391/2 &
4683/4

Commonwealth Edison Company
Byron/Braidwood Stations - Units 1 & 2

Cable Pull Criteria
S&L Specifications F/L-2823 & F/L-2851
CECo P.O. Nos. 203608, 203609, 207113 & 207114

Mr. C. L. Doerr
The Okonite Company
1515 Centre Circle
Downers Grove, Illinois 60515

Dear Mr. Doerr:

Enclosed are copies of two sketches covering three separate cable installations at Byron Station. Records of the tensions experienced during the cable pulls are not available, and the acceptance of these installations is dependent upon the acceptance of calculated pulling tensions.

These sketches are being sent to you for your analysis and comment, because our preliminary calculations for these installations indicate that the maximum allowable pulling tensions for the installed cables, based on Okonite's cable pulling criteria, may have been exceeded.

Will you please analyze these cable installations and give us your recommendation covering the disposition of the installed cables.

If you have any questions about the installations shown on the sketches, please contact us.

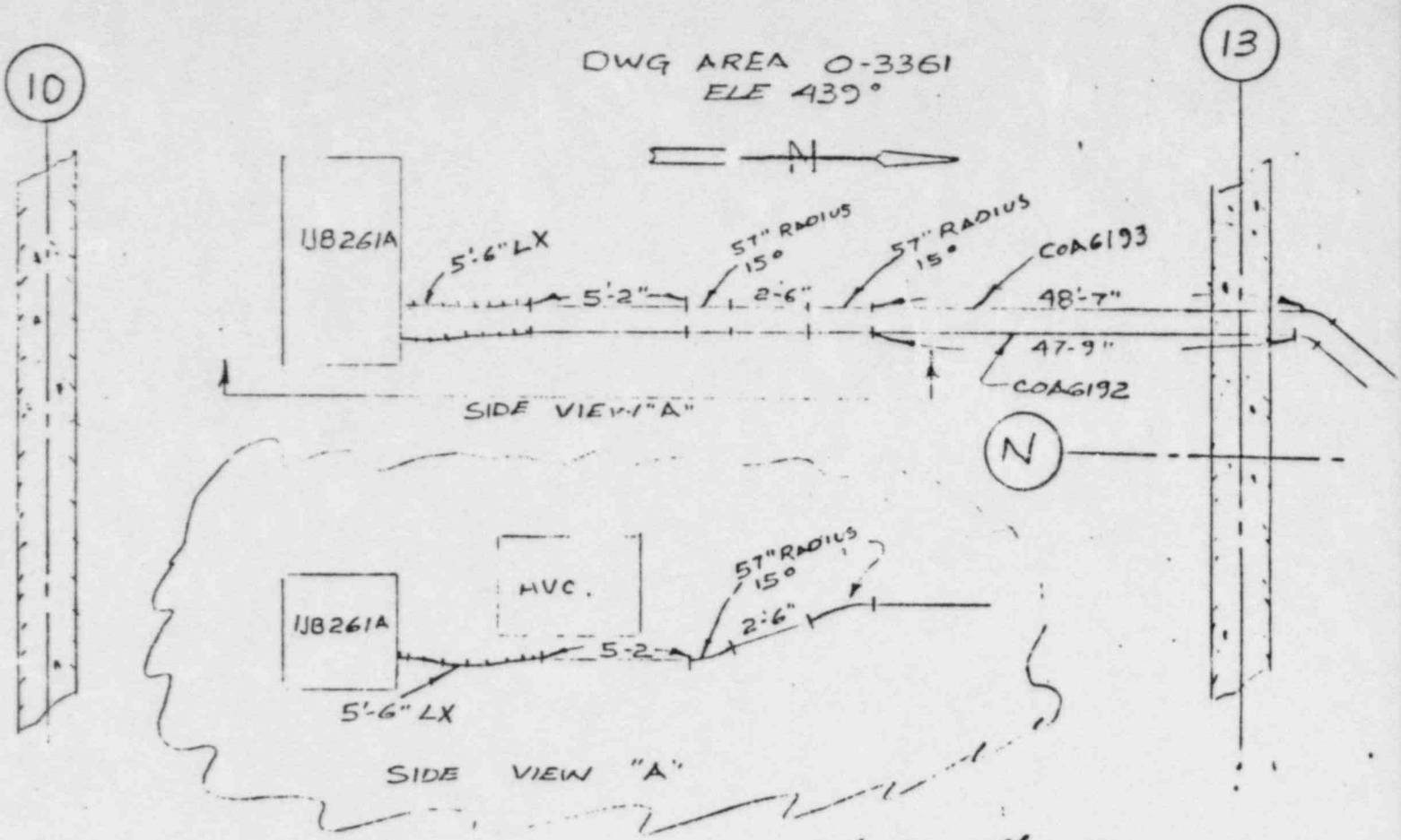
Yours very truly,

J. F. Clancy

J. F. Clancy
Electrical Engineer

JFC:dmm
In duplicate
Enclosure
Copies:
J. T. Westermeier (1/1)
G. Sorensen (1/1)
D. L. Leone/M. C. Cleff (1/1)

COPY



J Durrett JUNE 15-83
LEVEL II QC

PAGE 1 OF 4

DIRECTION OF PULL ⟶ (STARTS AT IJB261A)

INSTALLED CABLES: 3-1/c 750 KcMIL .5KV (BOTH CONDUITS)

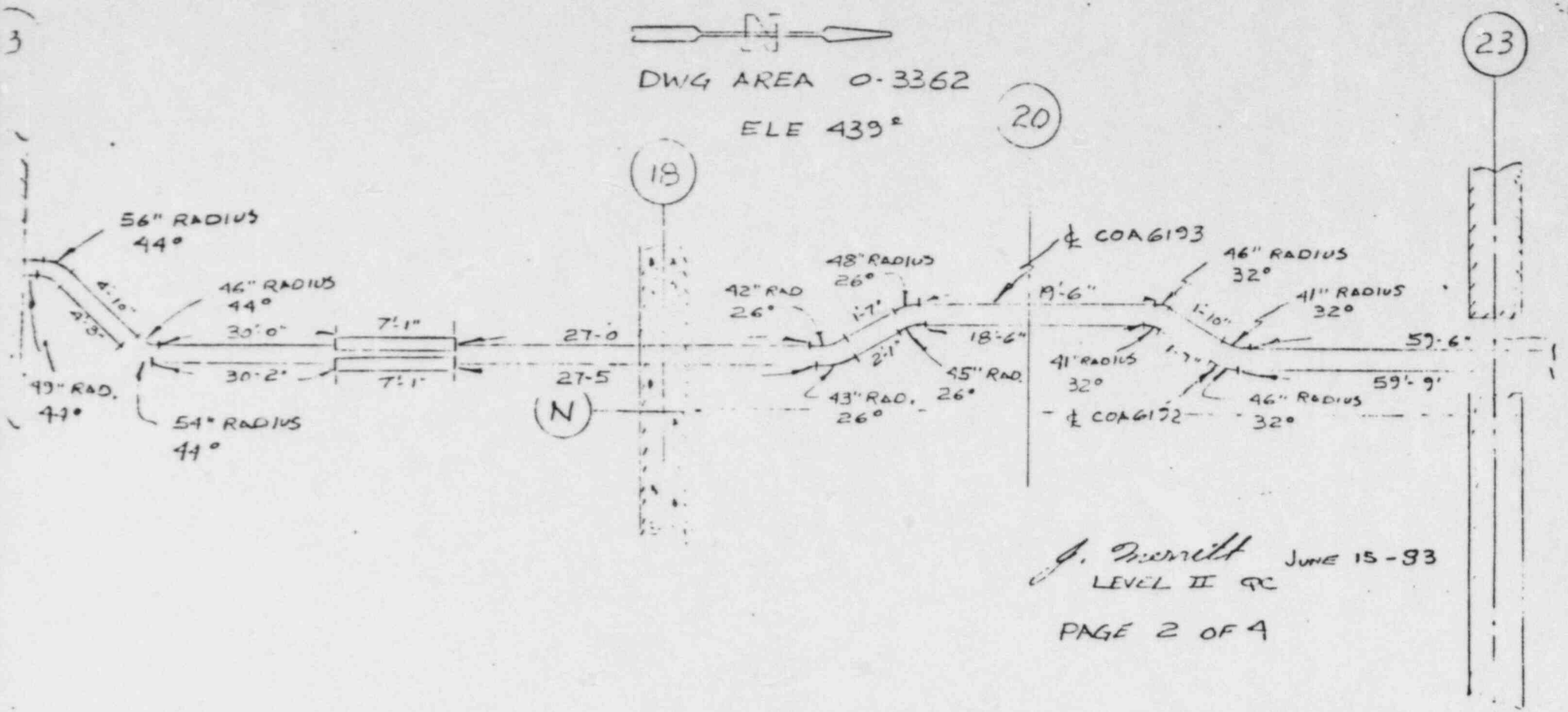
PULLING EYE USED - ONE CONTINUOUS PULL, PULL SLEEVE NOT UTILIZED.

CABLE PULLED FROM IJB261A TO IJB261B FOR CONDUIT COA1193

CABLE PULLED FROM IJB261A TO [illegible] FOR CONDUIT [illegible]

SKETCH S-C-1

C-4

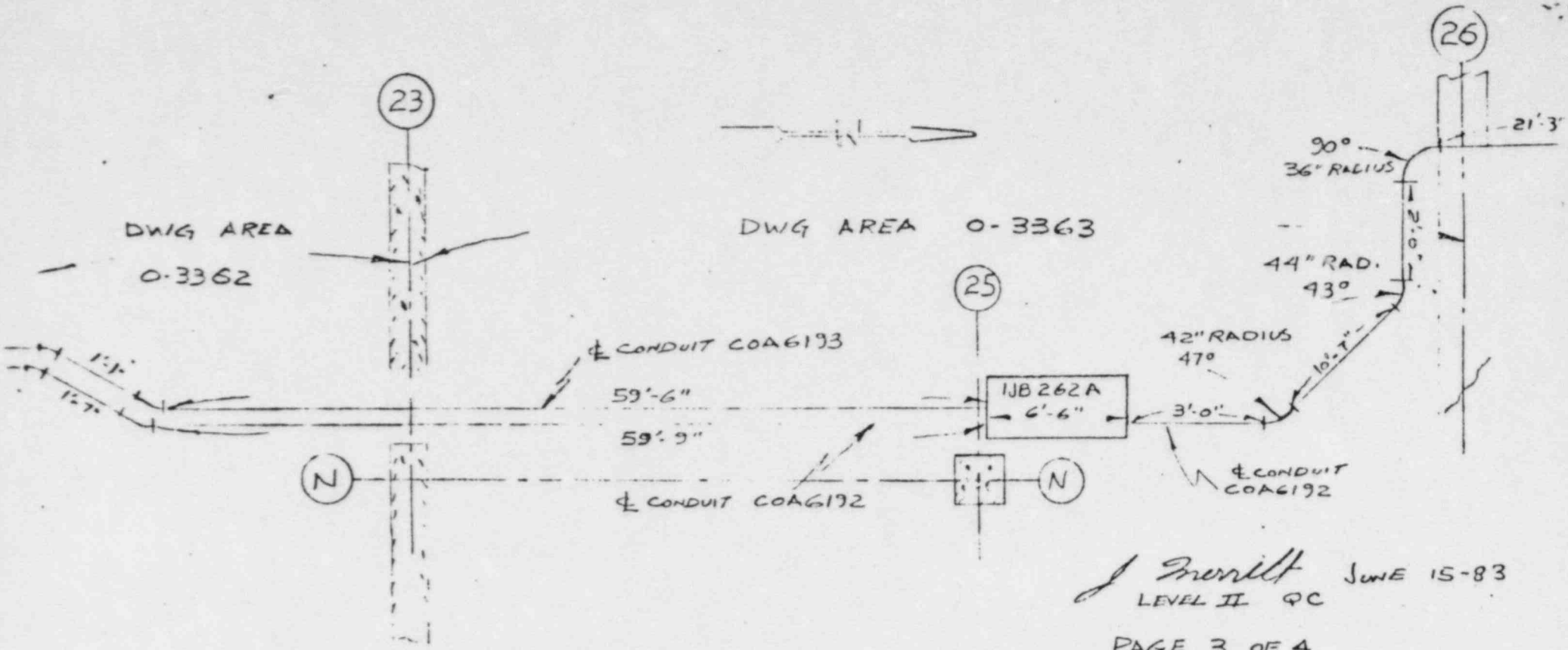


J. Durrett JUNE 15-93
LEVEL II QC

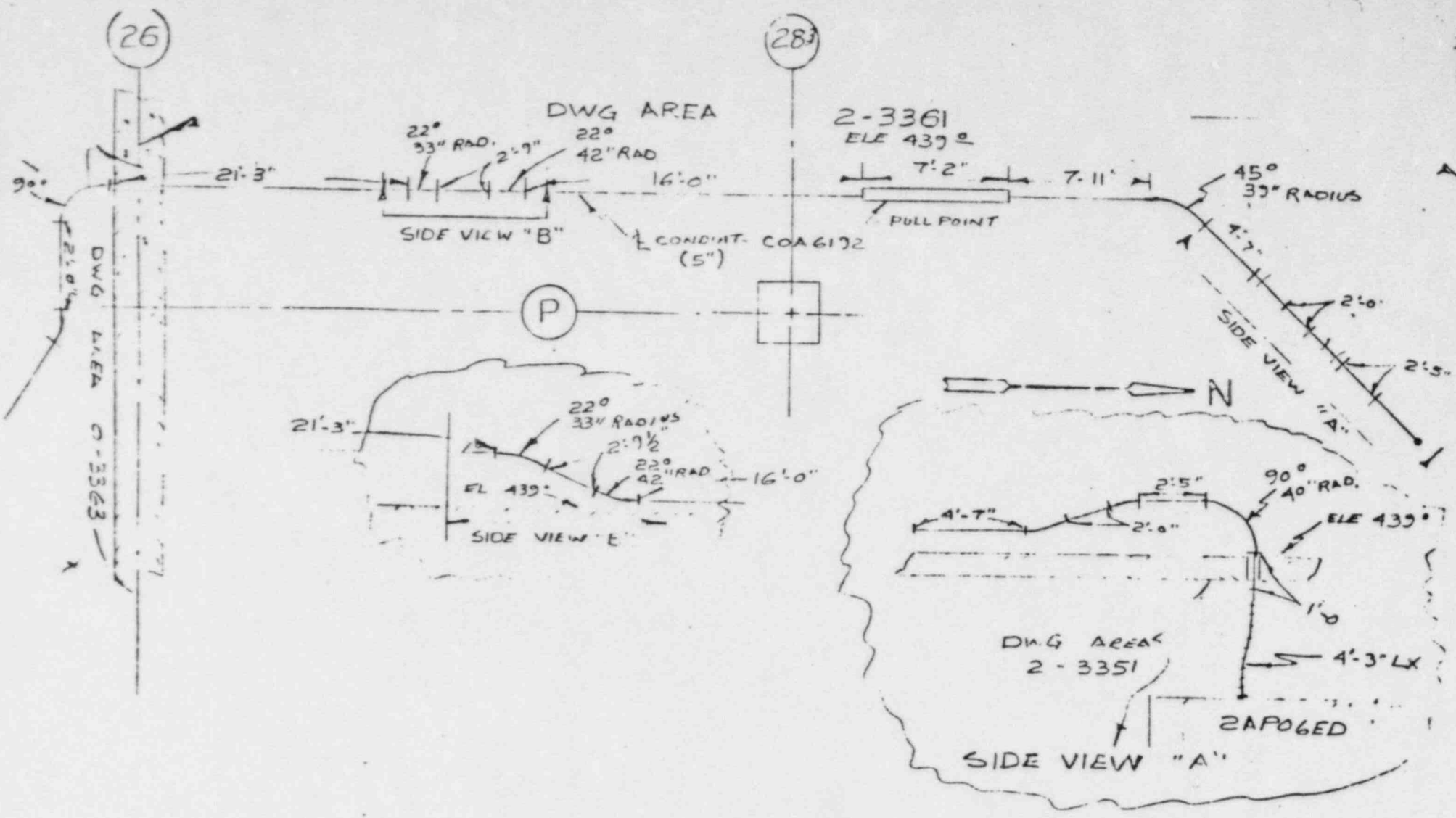
PAGE 2 OF 4

C-5

SHEET 1 OF 1



J Merritt JUNE 15-83
LEVEL II QC



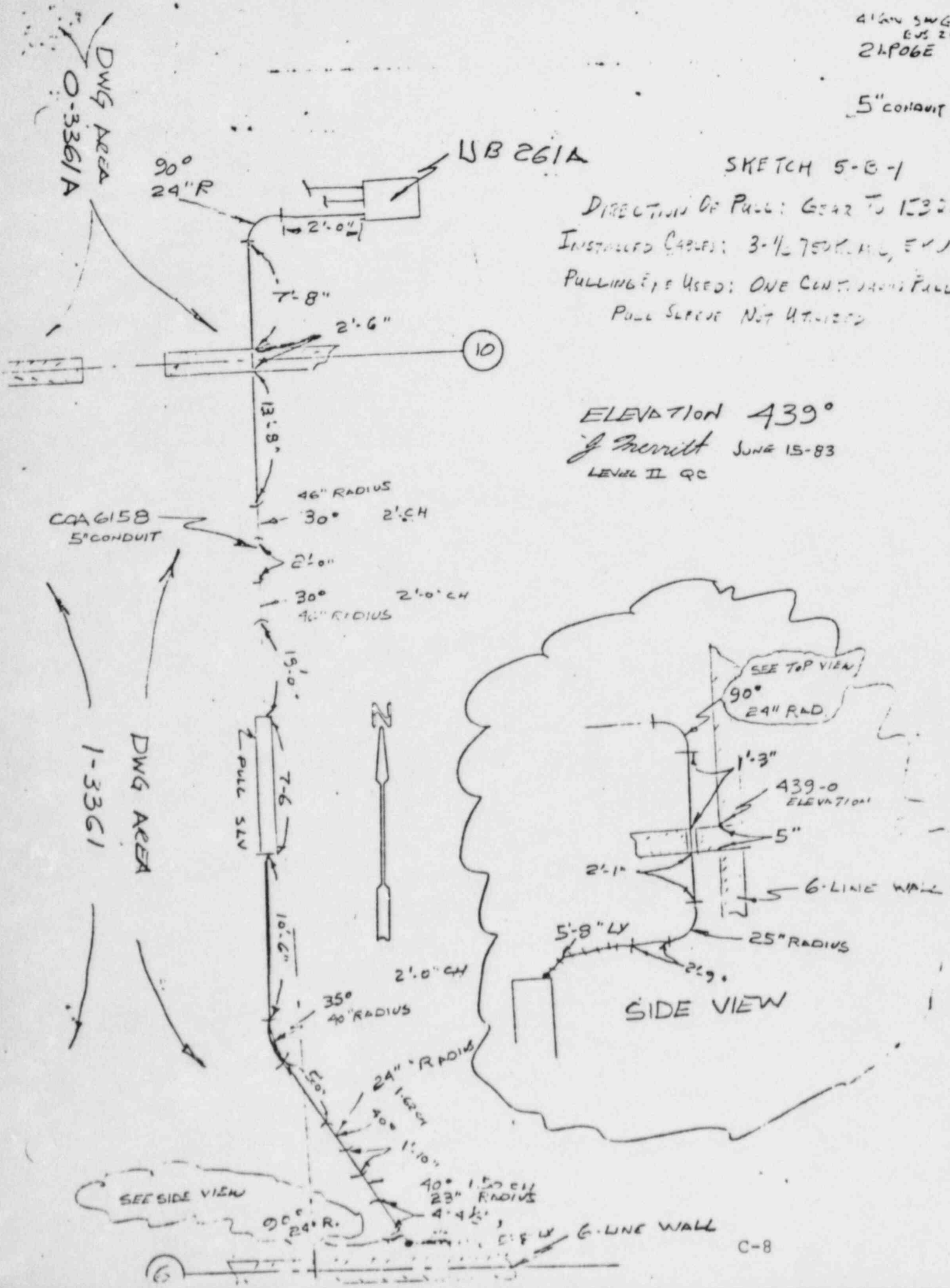
J Brandt JUNE 15-93
LEVEL II QC

PAGE 4 OF 4

C-7

4'GEN SWGR
EVS 292
2LP06E

5" CONDUIT



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION III
799 ROOSEVELT ROAD
GLEN ELLYN ILLINOIS 60137

JUN 6 1984 JUN -7 RECD

Docket No. 50-454
Docket No. 50-455

Commonwealth Edison Company
ATTN: Mr. Cordell Reed
Vice President
Post Office Box 767
Chicago, IL 60690

Gentlemen:

This refers to the routine safety inspection conducted by Messrs. R. S. Love and E. Christnot of this office on April 24-27, April 30-May 4, and May 10-11, 1984, of activities at Byron Station authorized by NRC Construction Permits No. CPPR-130 and No. CPPR-131 and to the discussion of our findings with Messrs. R. Tuetken and R. B. Klingler and others of your staff at the conclusion of the inspection.

The enclosed copy of our inspection report identifies areas examined during the inspection. Within these areas, the inspection consisted of a selective examination of procedures and representative records, observations, and interviews with personnel.

During this inspection, certain of your activities appeared to be in noncompliance with NRC requirements, as specified in the enclosed Appendix. A written response is required.

As a result of this inspection, it is our understanding that you will conduct a reinspection of all electrical conductor butt splices at Byron Station, Units 1 and 2, as outlined in your letter of May 17, 1984, D. Farrar to James G. Keppler.

In accordance with 10 CFR 2.790(a), a copy of this letter and the enclosure(s) will be placed in the NRC Public Document Room unless you notify this office, by telephone, within ten days of the date of this letter and submit written application to withhold information contained therein within thirty days of the date of this letter. Such application must be consistent with the requirements of 2.790(b)(1). If we do not hear from you in this regard within the specified periods noted above, a copy of this letter, the enclosure(s), and your response to this letter will be placed in the Public Document Room.

The responses directed by this letter (and the accompanying Notice) are not subject to the clearance procedures of the Office of Management and Budget as required by the Paperwork Reduction Act of 1980, PL 96-511.

We will gladly discuss any questions you have concerning this inspection.

Sincerely,

R. L. Spessard

R. L. Spessard, Director
Division of Engineering

Enclosures:
1. Appendix, Notice of Voilation
2. Inspection Reports No. 50-454/84-27 and No. 50-455/84-19

cc w/encls:
D. L. Farrar, Director of Nuclear Licensing
V. I. Schlosser, Project Manager
Gunner Sorensen, Site Project Superintendent
R. E. Querio, Station Superintendent
DMB/Document Control Desk (RIDS)
Resident Inspector, RIII Byron
Resident Inspector, RIII Braidwood
Phyllis Dunton, Attorney General's Office, Environmental Control Division
Ms. Jane M. Whicher
Diane Chavez, DAARE/SAFE
R. Rawson, ELD

Appendix

NOTICE OF VIOLATION

Commonwealth Edison Company

Docket No. 50-454
Docket No. 50-455

As a result of the inspection conducted on April 24-27, April 30-May 4, and May 10 and 11, 1984, and in accordance with the General Policy and Procedures for NRC Enforcement Actions, (10 CFR Part 2, Appendix C), the following violations were identified:

1. 10 CFR 50, Appendix B, Criterion V, as implemented by Commonwealth Edison Company Topical Report (CE 1-A), Section 5, requires that activities affecting quality be prescribed by documented instructions or procedures.

   Contrary to the above, the licensee failed to assure that the requirements of S&L Drawing 6E-0-3237 B, February 1983 Revision, Note 47, were translated into instructions or procedures. Note 47 requires the electrical contractor to inspect for cable tray separation and add cable tray covers when the minimum separation requirements have been violated. This is exemplified by the fact that 124 units of safety-related cable tray has been installed since February 1983 and this tray has not been inspected for separation requirements. Additional details are discussed in Paragraph 2.d of Inspection Report 454/84-27; 455/84-19(DE).

   This is a Severity Level V violation (Supplement II).

2. 10 CFR 50, Appendix B, Criterion XVI, as implemented by Commonwealth Edison Company Topical Report (CE 1-A), Section 16, requires that measures be established to assure that conditions adverse to quality such as nonconformances are promptly identified and corrected.

   Contrary to the above, the licensee failed to assure that nonconforming cable tray hangers were identified and corrected. This is exemplified by the fact that as a result of this NRC inspection, 345 previously accepted cable tray hangers were reinspected and 119 were found defective and 19 were indeterminate because they were inaccessible for reinspection. A contributing factor to this item is that CECo Quality Assurance failed to determine the effectiveness of the electrical contractor's cable tray hanger reinspection program (Reference - HECo NCR 407R). Additional details are discussed in Paragraph 2.c of Inspection Report 454/84-27; 455/84-19(DE).

   This is a Severity Level IV violation (Supplement II).

Pursuant to the provisions of 10 CFR 2.201, you are required to submit to this office within thirty days of the date of this Notice a written statement or explanation in reply, including for each item of noncompliance: (1) corrective action taken and the results achieved; (2) corrective action to be taken to avoid further noncompliance; and (3) the date when full compliance will be achieved. Consideration may be given to extending your response time for good cause shown.

JUN 5 '84
Dated

R. L. Spessard
R. L. Spessard, Director
Division of Engineering

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-454/84-27(DE); 50-455/84-19(DE)

Docket Nos. 50-454; 50-455 Licenses No. CPPR-130; CPPR-131

Licensee: Commonwealth Edison Company
Post Office Box 767
Chicago, IL 60690

Facility Name: Byron Station, Units 1 & 2

Inspection At: Byron Site, Byron, Illinois

Inspection Conducted: April 24-27, April 30-May 4 and May 10-11, 1984

Inspectors: R. S. Love _____ Date

E. Christnot _____ Date

Approved By: C. C. Williams, Chief _____ Date
Plant Systems Section

Inspection Summary

Inspection on April 24-27, April 30, May 4, and May 10-11, 1984 (Report No. 50-454/84-27(DE); 50-455/84-19(DE))

Areas Inspected: Review of licensee action on previously identified items. This involved the review of applicable procedures, drawings, records and calculation on-site and at Sargent and Lundy (licensee's A/E). This inspection involved a total of 146 inspection hours by two NRC inspectors. Six of these inspector hours were expended in Nuclear-General Employee Training which will be required for unfettered access (Ref. 10 CFR 50.70).

Results: In the areas inspected, two items of noncompliance were identified (Paragraph 2.c, failure to identify and control nonconforming conditions-Criterion XVI, and Paragraph 2.d, failure to assure that activities affecting quality are prescribed in instructions or procedures-Criterion V).

DETAILS

1. Persons Contacted

Commonwealth Edison Company (CECo)

G. Sorensen, Construction Superintendent
K. J. Hansing, Quality Assurance Superintendent
*J. O. Binder, Project Electrical Supervisor
*R. B. Klingler, Project Quality Control Supervisor
*J. L. Bergner, Quality Assurance Supervisor
*M. V. Dellabetta, Electrical Quality Assurance Engineer
*E. T. Sager, Electrical Field Engineer
*J. W. Rappeport, Quality Assurance Engineer
E. L. Martin, Quality Assurance Supervisor
J. W. Zid, Quality Assurance Engineer
P. T. Myrda, Quality Assurance Supervisor

Hatfield Electric Company (HECo)

D. L. Heider, QA/QC Manager
S. Hubler, Lead Quality Control Inspector

Sargent and Lundy (S&L)

J. D. Regan, Electrical Engineer
B. G. Treece, Senior Electrical Project Engineer
J. F. Clarcy, Quality Assurance
T. R. Eisenbart, Electrical Engineer
J. J. Kanda, Senior Structural Engineer
T. J. Ryan, Structural Project Engineer

The inspectors also contacted and interviewed other licensee and contractor personnel during this reporting period.

*Denotes those present at the exit interview conducted on May 4, 1984

2. Action on Previously Identified Items

a. (Closed) Noncompliance (50-454/80-09-01; 50-455/80-08-01): During a previous inspection it was identified that the requirements of the Byron SAR and Specification 2831 were not adequately translated into Specification 2815 in that corrosion protection (painting) was not specified for the exposed carbon steel material and exposed spot welds utilized in the installation of seismic Category I electrical raceway hanger supports. Engineering Change Notice (ECN) Number 4362 was issued to revise Specifications F/L 2815 and F/L 2831. The licensee's painting contractor (Midway Industrial Contractor, Inc.) has a program in place that will assure that the items have been painted. CECo Project Construction Department (PCD) is monitoring the progress of the painting contractor. This item is closed.

b. (Closed) Unresolved Item (50-454/82-17-02; 50-455/82-12-02): During a previous inspection it was identified that conduit and cable tray hanger bolts no longer met the bolt torque requirements as specified in the applicable procedures. The licensee was requested to evaluate these relaxed torque conditions and determine if they were acceptable. With respect to cable tray hangers, as part of the hanger reinspection program, the hanger bolt torque was verified and any bolts found not meeting the torque requirements were re-torqued to procedure requirements. With respect to conduit hangers, a reinspection of 300 conduit hangers was conducted. This reinspection identified 89 conduit hanger bolts with less than the specified torque. These hangers were then analyzed for worst case conditions. This analysis was reviewed by the inspectors and found to be adequate. The analysis identified that the conduit hanger would have performed their design function in the as-found condition. This item is closed.

c. (Open) Unresolved Item (50-454/82-17-04; 50-455/82-12-04): During a previous inspection it was identified that the hanger connection details under fireproofing were being accepted without QC inspection. The HECo QA Manager had instructed the QC inspectors to accept connection details covered by fireproofing based on the information on the weld traveler for the subject connection detail. These instructions were documented in QA/QC Memorandum Number 295. These instructions were provided in conjunction with the cable pan hanger reinspection required by HECo NCR 407. At that time, the Region III inspector informed the licensee that the weld traveler could be utilized for acceptance providing the hanger connection detail used was noted on the traveler. In accordance with a CECo letter, dated September 22, 1982, HECo was required to submit certain data pertaining to this reinspection program on a periodic basis. During this reporting period, the Region III inspector reviewed these data provided by HECo. These data indicated that of 4,308 hangers reinspected, fireproofing had to be removed from 131 hangers to determine acceptance. This report indicated that 3 of the hangers were rejected after the fireproofing was removed. To determine why these three hangers were rejected, the inspectors reviewed the applicable weld travelers, hanger de-hang/re-hang forms (HDRF), rework requested, field change request(FCR), deficiency reports (DR), nonconformance reports (NCR), and the hanger inspection checklists. Following are the results of this review:

(1) Hanger 8HV11 on Drawing 0-3097H, Revision T.

- HDRF 1151 indicates hanger originally installed August 19, 1980. HECo could not locate a weld traveler for this installation.
- FCR 1807, dated August 19, 1980, was issued to relocate the hanger.
- DR 119, dated June 11, 1982, stated that the hanger could not be inspected due to installation of fireproofing. This DR was closed on December 21, 1982.
- HDRF-1151, dated September 30, 1982, indicates that the hanger was not installed per the drawing and FCR 1807. Hanger was removed on October 12, 1982.

- Weld Traveler 19038, dated October 12, 1982, states, "Welded plate to tube steel and structural steel (South side only)." Accepted by QC Welding Inspector.
- Weld Traveler 19039, dated October 15, 1982, states, "Repaired weld on plate to structural and tube steel". Accepted by QC Welding Inspector.
- HDRF 1151 indicates hanger was reinstalled on October 22, 1982.
- Hanger installation was accepted by QC.
- The following discrepancies were observed:
  Initial weld traveler missing,
  Weld traveler for North side of hanger missing,
  NCR, DR, or Inspection Report (as applicable) identifying that the hanger was not installed per drawing and FCR 1807 was missing.

(2) Hanger H005, Drawing 1-3051H, Revision H

- Weld Traveler 24943, dated July 25, 1978, documents the installation of the hanger. Accepted by QC Welding Inspector.
- Inspection checklist, dated September 27, 1982, rejected the hanger because the inspector could not verify the hanger type and configuration. Was later accepted by Memo #295.
- HECo to CECo summary report, dated October 10, 1983, indicates this hanger was rejected during the reinspection.
- The following discrepancies were observed:
  No documentation to show why the hanger was rejected,
  No documentation to indicate that the hanger was repaired or reworked, as applicable,
  No inspection checklist/weld traveler to indicate that the hanger is now acceptable.

(3) Hanger H 153, Drawing 1-3061H, Revision S,

- Inspection checklist, dated February 22, 1984, was a final acceptance of this hanger. The checklist referenced: FCR 22920, Revision 1; FCR 21871; Rework Request 648; DR 1025; and HDRF 2197.
- Work Request 648 involved the removal and replacement of the hanger horizontal members.
- FCR 21871 involved the pan to hanger attachments. Work Request 648 and FCR 21871 were not in the area of concern and the inspector chose not to followup on these items during this inspection.
- DR 1025, dated October 23, 1982, documents that Connection No. 1 was a DV5 detail instead of a DV4 as specified, and Connection No. 2 was a DV89C2 instead of a DV89E1 as specified.
- FCR 22920, dated November 8, 1983, changed connection No. 1 to a DV3 detail and Connection No. 2 to a DV89G2.

The following discrepancies were observed:
The inspectors could not determine how FCR 22920 was implemented in that a HDRF/Work Request was not available for review. The inspection checklist, dated February 22, 1984, indicated that Details DV3 and DV8902 were actually installed.

(4) Based on the results of the records review of the three rejected hangers, the inspectors elected to review a random sample of the records for hangers that had been reinspected and accepted by HECo QC. Following are the results of this review:

(a) Hanger H043, Drawing 0-3061H, Revision M, was accepted on Inspection Report 4270, dated October 5, 1982. Inspection appeared to be adequate.

(b) Hanger H148, Drawing 0-3063H, Revision L, was accepted on Inspection Report 4172, dated October 21, 1982. Inspection appeared to be adequate.

(c) Hanger H001, Drawing 1-3051H, Revision H, was accepted on Inspection Report 3650, dated September 17, 1982. Connection details 1 and 2 were accepted on the Inspection Report based on Weld Traveler 24900, dated July 18, 1978. A review of the traveler indicated that a DV84 connection detail was utilized as specified on the drawing. This was found to be acceptable.

(d) Hanger H03B, Drawing 1-3051H, Revision H, was accepted on Inspection Report 3657, dated October 7, 1982. Connection details 1 and 2 were accepted based on Weld Traveler 24840, dated July 26, 1978. During a review of the traveler, it was observed that the traveler did not indicate which connection details were used to attach the hanger to the structural steel, i.e., details 1 and 2. Based on the documentation presented, this hanger installation could not be accepted by the Region III inspectors.

(e) Hanger H080, Drawing 0-3051H, Revision L, was accepted on Inspection Report 3484, dated October 16, 1982. Connection details 1 and 2 were accepted based on Weld Travelers 24801, 24804, and 24834. During a review of these travelers, it was observed that the travelers did not denote which connection details were used to attach the hanger to the structural steel. Based on the documentation presented, this hanger installation could not be accepted by the Region III inspectors.

(f) Hanger H028, Drawing 0-3051H, Revision L, was inspected on Inspection Report 3433, dated October 5, 1982. This Inspection Report referenced DR542. During a review of this DR, it was observed that the auxiliary steel plate size was listed as being the wrong size. This item was not disposition nor corrected and the DR was improperly

closed. Based on the documentation presented, this hanger installation could not be accepted by the Region III inspectors.

(g) Hanger HC85, Drawing 1-3051H, Revision H, was noted as being unacceptable on Inspection Report 3734, dated July 30, 1982. Reasons noted were: (1) unable to verify connection details 1 and 2 because they were covered with fireproofing, and (2) weld travelers did not specify the connection details installed. On September 27, 1982, this hanger was accepted per Memo 295. Based on the documentation presented, this hanger could not be accepted by the Region III inspectors.

(5) Based on the results of the documentation review for the ten above listed hangers, the Region III inspectors terminated their review of cable tray hanger documentation. On April 25, 1984, the inspectors conducted a mini-exit-interview with CECo and HECo QA and construction personnel. During this interview, the inspectors reviewed their concerns with the acceptability of the cable tray hanger documentation. The inspectors requested that the licensee review the hanger documentation and determine what hangers were unacceptable. On May 1, 1984, the inspectors were informed by the licensee that there were approximately 345 hanger that were accepted based on Memo 295

The licensee stated that approximately 6000 hanger packages were reviewed by CECo QA and HECo QC personnel. The licensee continued to provide daily updates on the progress of the hanger reinspection effort and their findings. During a telephone conversation between Mr. J. Binder (CECo) and Mr. R. S. Love (RIII) on May 11, 1984, Mr. Binder provided the following results of the reinspection effort:

. Total number of hangers requiring reinspection	314
. Number of hangers inaccessible	19
These hangers were documented on HECo NCR 990	
. Total number of hangers reinspected	295
. Total number of deficiencies identified	129
. Deficiencies by attribute:	
Welding fitup	91
Wrong connection detail	7
Wrong weld length, elevation, auxiliary steel plate size, and missing bolts	31

Fit up deficiencies are documented on HECo NCR 989. Connection detail and steel plate deficiencies, etc. are documented on HECo DRs 4921-4928, 4930, 4932, 4934-4937, 4943, 4945-4948, 5003, 5007, 5013-5017, 5019, and 5022-5032.

(6) As a result of the inspector's observations noted above, the inspectors requested that the licensee provide the last three audit/surveillance reports performed by CECo in the area of hanger acceptance for the subject reinspection program. As stated earlier in this report, this initial reinspection effort involved 4308 hangers. The CECo QA Engineer informed the inspectors that to the best of his knowledge, no audits or surveillances were performed in this area and furthermore, he (CECo QA Engineer) was not aware of this hanger reinspection program. On May 10, 1984, Messrs. C. C. Williams and R. S. Love of the Region III staff contacted Mr. K. J. Hansing, CECo QA Superintendent, by telephone and discussed the reinspection program and lack of CECo QA audits and/or surveillances in this area. In summary, Mr. Hansing stated that: (1) CECo QA was aware of the hanger reinspection program; (2) CECo QA chose not to perform a special audit/surveillance of this hanger reinspection program; (3) CECo QA was not aware of Region III's interest in this program. It should be noted that Region III's involvement with this reinspection effort was documented in Inspection Reports 454/82-17; 455/82-12 and 454/83-48.

On May 11, 1984, Mr. R. S. Love, Region III, contacted Messrs. J. O. Binder, J. L. Bergner and others of the CECo PCD and QA Byron site organization by telephone. During this conversation it was learned that CECo QA had in fact performed an audit of the subject reinspection program in June 1983 and had a concern with HECo Memo 295. Mr. Bergner did not elaborate on this concern. Mr. Binder stated that during this inspection period, he (Mr. Binder) directed the HECo QA/QC Manager to prepare a letter to cancel Memo 295. Upon review of the sequence of events and the results of the hanger reinspection effort, it would appear that the 129 deficiencies observed on 119 safety-related cable tray hangers would have gone undetected if the Region III inspectors had not uncovered the problem areas and requested CECo to perform an indepth review of hanger documentation and the subsequent reinspection program. The licensee was informed that failure to establish a program to assure that conditions adverse to qualify are promptly identified and corrected is an item of noncomplaicance in accordance with Criterion XVI of 10 CFR 50, Appendix B (50-454/84-27-01; 50-455/84-19-01).

d. (Open) Noncompliance (50-454/82-17-05; 50-455/82-17-05): During a previous inspection it was identified that the licensee was not identifying, controlling, and correcting cable tray separation violations. As part of the corrective action, during the latter part of 1982 and early 1983 a concerted effort was made by CECo, HECo and S&L to identify all cable tray separation violations. This information was compiled and analyzed by S&L. The corrective action were: (1) relocate one or more cable trays to correct the violations; or (2) install cable tray covers on one or more of the cable trays (by the installation of covers, the separation criteria is reduced

from 3" horizontal and 12" vertical to 1" horziontal and 1" vertical); or (3) based on the analysis, accept the installation as installed; and (4) place a distinctive mark (black octagon mark) on the applicable drawings to indicate that a separation violation had been identified in that area and that the violation had been analyzed by the engineer, S&L.

During this reporting period, the inspectors: (1) reviewed the engineer's analysis and found it to be adequate; (2) reviewed selected drawings and verified that they were marked to indicate that the engineer had analyzed the separation violations; (3) reviewed select drawing to verify that tray covers were specified as part of the corrective action; and (4) toured the power block and identified separation violations and verfied that the violations had been addressed by the engineer and appropriate action taken. During interviews with S&L personnel identified in Paragraph 1 of this report, the inspectors were informed that several notes had been added or revised on Drawing 6E-0-3237B, February 1983 revision, to prevent recurrance of cable tray separation violations. During a review of Drawing 6E-0-3237B, Revision L, it was observed that Note 47 directed the electrical contractor, HECo, to install cable tray covers in accordance with the electrical specifications when the 3" horizontal and 12" vertical separation requirements were violated even though the applicable drawing does not show the subject tray to be covered. Note 48 directs the electrical contractor to notify S&L if the 1" metal to metal separation is violated after the installation of cable tray covers. During a review of HECo 9 Series procedures, it was observed that the requirements of Note 48 were adequately addressed but the requirements of Note 47 were not addressed. During interviews with the CECo Project Electrical Supervisor, CECo Electrical QA Engineer, CECo Electrical Field Engineer, HECo QA QC Manager, and HECo Project Engineer, it appeared that these personnel were not aware of the requirement of Note 47 on Drawing 6E-0-3237B until it was brought to their attention by the Region III inspectors. It was also learned that HECo QC, engineering, and construction were not verifying cable tray separation.

During this reporting period, the licensee instituted a program to determine the amount of safety-related cable tray installed in Units 1 and 2 since February 1983 (effective date of Note 47). As a result of this review, it was determined that 83 cable tray inspection reports (Note: each report can address 1 or more sections of cable tray) had been prepared for Unit 1, and cable tray separation requirements were not verified (Reference: HECo NCR 975, dated May 4, 1984), and 41 reports were submitted for Unit 2 (Reference: HECo NCR 976, dated May 4, 1984). The licensee was informed that failure to assure that activities affecting quality are prescribed in documented instructions or procedures is an item of noncompliance in accordance with Criterion V of 10 CFR 50, Appendix B (50-454/84-27-02; 50-455/84-19-02).

e. (Closed) Noncompliance (50-454/82-17-06; 50-455/82-12-06): During a previous inspection it was identified that the licensee was not identifying, controlling, and correcting cable separation violations inside of panels, cabinets, motor control centers, switchgear, etc. As part of the corrective action, during the latter part of 1982 and early 1983, a concerted effort was made by CECo, HECo and S&L to identify all cable separation violations inside of equipment. This information was compiled and analyzed by S&L. The corrective actions were: (1) relocate/reroute one or more of the cables to correct the violation, or (2) install fire barriers between the involved cables; or (3) route one of the involved cable inside a conduit that qualifies as a fire barrier; or (4) based on the analysis, accept the installation as installed; and (5) establish a program to inform S&L of future violations so that they could be analyzed and corrective action assigned.

During this reporting period, the inspectors: (1) reviewed the engineer's analysis and found it to be adequate; (2) reviewed the electrical contractor's (HECo) termination inspection procedure and identified that the QC inspector was required to inspect for and identify separation violations between safety-related and nonsafety-related cables and between redundant cables; and (3) verified implementation of this program by reviewing cable separation problem reports that were being forwarded to the engineer for analysis. The corrective actions and the corrective actions to prevent recurrence appeared to be adequate. This item is closed.

f. (Closed) Noncompliance (50-454 83-37-01): During a previous audit, it was identified that the CECo Manager of Quality Assurance had established an Interim Lead Auditor certification program that was not documented in the CECo Quality Assurance Manual, or in the CECo Topical Report nor is it permitted by ANSI N45.2.23-1978, "Qualification of Quality Assurance Program Audit Personnel for Nuclear Power Plants." This informal program had been established within CECo to certify an individual as an Interim Lead Auditor when he/she did not meet the qualification requirements of a lead auditor as specified in ANSI N45.2.23-1978.

As part of CECo's corrective action, the Interim Lead Auditor concept was discontinued, the personnel holding Interim Lead Auditor certifications were de-certified, and records were reviewed to determine the names of personnel that had been certified that did not meet the minimum qualification requirements. The records review indicated that between 1977 and 1983, eight (8) CECo personnel had been certified as Interim Lead Auditors by the CECo Manager of Quality Assurance. The audits performed by these 8 people were reviewed and evaluated by qualified CECo Lead Auditors. With a few exceptions, the audit reports and the objective evidence and the audit deficiency close outs were in compliance with the CECo audit program. During a review of these audit evaluations, the most significant audit deficiencies observed by the Region III inspectors were:

(1) One item on the checklist had insufficient objective evidence for acceptance. This attribute was adequately covered on a subsequent audit by a different auditor and found acceptable.

(2) One item as relating to records storage was marked acceptable and from the information documented in the report, it should have been listed as a deficiency. This item was subsequently identified and corrected.

The corrective action and corrective action to prevent recurrence appears to be adequate. This item is closed.

g. (Open) Noncompliance (50-454/83-49-04). During a previous inspection, it was identified that Kellem type cable grips (used to support electrical cables in cable pan risers and in vertical conduit runs) were not installed in accordance with the electrical specifications. This item is also identified in 10 CFR 50.55(e) reports 454/83-14-EE and 455/83-14-EE. During this reporting period, the Region III inspectors observed that the installation of cable grips in safety-related risers R277, R345, R368, and R369 were deficient in that they were not supporting the cables in accordance with the design specifications. Pending verification of the licensee's corrective action, this item remains open. This item has been assigned Category 1 and must be closed prior to fuel load.

h. (Closed) Open Item (50-454/84-02-03; 50-455/84-02-03): During the ASLB hearing for Byron Station, Unit 1, the licensee stated that the cable pull reports for cables already installed are being reviewed to ensure that the maximum allowable cable pulling tension and maximum allowable cable sidewall pressure had not been exceeded. As documented in Inspection Report No. 50-454/84-09 and 50-455/84-07, the Region III inspector reviewed the on-site records and with one exception (Noncompliance 454/84-09-02; 455/84-07-02), these records were found to be adequate. During this reporting period, the Region III inspectors reviewed the engineering calculations at the engineer's facilities. The engineering analysis was performed utilizing one or more of the following methods:

(1) Calculations for an assumed worst case conduit configuration containing a worst cable configuration, i.e. conduit run with four 90° bends with minimum bend radius (270° total bends allowed at Byron Station) and with the maximum cable density. Utilizing this methodology, a critical conduit length was calculated for each conduit size. Using this information, a review of the approximate 2600 conduit runs was made. If the actual length of the conduit run approached the calculated critical length, that run was flagged for further analysis per paragraph (2) below. Worst case accepted, as observed by the inspectors, during this first cut, had a safety factor of approximately four, i.e. allowable pulling tension 400# versus calculated of approximately 100#.

(2) Calculations for an assumed worst case conduit configuration (4-90° bends) containing the actual installed cable configuration. The worst case accepted, as observed by the inspectors, had a safety factor of approximately 3.3. Again, questionable conduit runs were flagged for analysis per paragraph (3) below.

(3) Calculations for actual conduit configuration containing the actual cable configuration. Worst case accepted, as observed by the inspectors, had a safety factor of approximately 4.7. Upon completion of this three step analysis, three conduit runs were questionable. They were analyzed by Okonite Company, cable manufacturer, as described in paragraph (4) below.

(4) The following information was forwarded to Okonite to assist in their evaluation of cables installed in conduits CCA-6188, CCA-6192 and CCA-6193:

- Conduit size - all 5"
- Conduit configuration from as-built drawings
- Cable configuration from cable pull cards
  - Conduit CCA-6188 - 2 - 1/C-750 MCM, 5kV, cables
  - Conduit CCA-6192 and 6193 - 3 - 1/C-750 MCM, 5kV, cables
- Cable pull direction

The maximum cable pulling tension for the subject cables was not in question for these three installations in that the maximum allowable tension for the 2-1/C-750 MCM cable pull is 120,000# and 180,000# for the 3-1/C-750 MCM cable pull. Due to conduit configuration, Okonite was requested to perform an analysis for possible cable sidewall pressure violations. Okonite's letter of October 11, 1983 indicates that they performed their analysis and found no sidewall pressure violations. It should be noted that each cable manufacturer establishes the maximum cable sidewall pressure that their cables are designed to withstand without causing damage to the conductor insulation. Based on the results of previous inspections and documentation reviewed during this inspection, the inspectors have a reasonable assurance that these safety-related cables will perform their intended function. This item is closed.

i. (Closed) Unresolved Item (50-454/84-09-01; 50-455/84-07-01): During a previous inspection, it was observed that there were several outstanding NCRs that were prepared to document possible over tensioning of safety-related cables during initial installation or during rework (pull back). During this reporting period, the inspectors reviewed the disposition and implementation of CECo. NCRs F838, F839, F848, F864, and F865. The inspectors also reviewed the back up data for these NCRs and found it to be adequate. This item is closed.

j. (Closed) Noncompliance (50-454/84-09-02; 50-455/84-07-02): During a previous inspection it was identified that HECo DR 3382 was inadequately dispositioned, resulting in 12 cables being installed whose quality was indeterminate. Subsequent to the inspectors findings, HECo prepared NCR 841 to document the overstressed cables. During this inspection, the inspectors verified that the cables had been replaced, and action to prevent recurrence had been implemented. This item is closed.

3. Licensee Action on 10 CFR 50.55(e) Reports

(Closed) 10 CFR 50.55(e) Report (454/82-07-EE and 455/82-07-EE): Direct current (DC) control power cable failures. Several single conductor ASW #2 DC control power cables, which run from the auxiliary building to the essential service water cooling tower in an underground duct, have failed to ground. The failures occured after the cables had been tested and placed in service. The inspectors reviewed the licensee's action on the failure of DC cables 1 DC 073 and 1 DC 075 in Unit 1 and DC cables 2 DC 073, 2 DC 074 and 2 DC 075 in Unit 2. Records indicated the following:

a. Cables, 1 DC 073 and 1 DC 075 in Unit 1 were replaced by multi-conductor cables 1 DC 742 and 1 DC 243 respectively.

b. Cables 2 DC 073, 2 DC 074 and 2 DC 075 in Unit 2 were replaced by multi-conductor cables 2 DC 244, 2 DC 245 and 2 DC 243 respectively.

c. Two nonconformance reports (NCR) 666 and 732 were written documenting the failures and both NCR's were closed out on April 18, 1984.

d. A sample of the cables was pulled and tested by the manufacturer. The sample failed a production test (e.g. a 13,000 volt spark test) which it had passed prior to shipment.

e. The probable failure to pass the test was due to elongation of the cable insulation.

The inspectors determined from a review of installation records that the cables were replaced in accordance with approved procedures. This item is closed.

4. Conductor Butt Splices

Due to the problems encountered with conductor butt splices at other Nuclear Plants, the inspectors queried the licensee as to what actions had been taken or were planned to verify the acceptability of the butt splices at the Byron Station. The inspectors were informed that CECo QA initiated a review of approximately 11,000 cable termination reports and identified 646 of these reports that documented the installation of butt splices. Between March 13-16, 1984, CECo QA and HECo QC randomly checked 221 safety-related and 78 non-safety-related conductor butt splices. Following are the results of the checks made on the 221 safety-related butt splices as documented in CECo QA Surveillance Report 5944, dated March 27, 1984:

- 27 splices were not inspected because they were covered with tape or heat shrink material.
- 194 splices were visually inspected and 72 were "tug-tested".
- 1 butt splice failed the tug-test and was replaced.
- 16 splices were identified as defective and replaced. Failure attributes were not provided.
- All 194 butt splices were installed with the proper crimping tool.

CECo NCR F899, dated April 5, 1984, was prepared to document that the conductor insulation on cables provided by Okonite Company would not fit inside the insulation barrel of Amp butt splice connectors. This NCR has been forwarded to CECo Project Engineering Department (off-site) for resolution. As of May 4, 1984, a resolution/disposition had not been received on-site.

To understand why the conductor butt splices were rejected, the inspectors requested the applicable inspection checklists/termination reports for review. The inspectors reviewed the following Cable Inspection Termination Reports (CITR) and Equipment Modification Inspection Requests (EMIR):

Report No.	Cable No.	No. Rejects	Remarks
CIRT 12318	2SX033	1	Butt Splice Replaced
CITR 12130	1RH058	2	Butt Splice Replaced
CITR 12119	1RH062	1	Butt Splice Replaced
CITR 12143	1R-053	3	Butt Splice Replaced
CITR 12145	10G060	2	Butt Splice Replaced
CITR 12144	1R-112	2	Butt Splice Replaced
CITR 12131	1R-059	3	Butt Splice Replaced
CITR 12150	1R-042	1	Butt Splice Replaced
CITR 12123	1R-043	1	Butt Splice Replaced
EMIR 5990	10G166	1	Cut insulation between Butt Splice and terminal lug-replaced.
EMIR 5988	1RC138	1	Cut insulation-repaired with shrink-fit material
	1RC137	1	Bad crimp on connector-replaced
	1RC147	3	Cut insulation-replaced
	1RC168	1	Exposed copper at splice replaced
	1RC170	1	Exposed coper at Splice-replaced
	10G157	1	Butt splice replaced
	10G158	1	Cut insulation-repaired with shrink-fit material
	10G163	1	Butt splice replaced
		27 Total	

From the above information, it would appear that an addition ten butt splices were rejected and repaired during the repair of the 17 rejected by CECo QA. Utilizing this latest information, it would appear that the reject rate 27/194 is 13.9%. During interviews with the CECo and HECo personnel involved in this reinspection effort, the inspectors were informed that the largest number of rejected butt splices were because the conductor (copper) was not visible at the connector crimp.

The inspectors also performed a general review of the 646 CITRs identified by the licensee that doucmented butt splices. It was observed that a large percentage of these splices were associated with the termination of

metal shielding braid or tape-shield on control or instrument cables as addressed in S&L Standard EA-215. The inspectors made a detailed review of 34 of these CITRs. Following are the results of this review:

CITR No.	Cable No.	No. of Splices	Remarks
119	1MS528	1	
11942	1AF181	1	
11941	1AF180	1	
11940	1AF179	1	
11939	1AF170	1	
11935	1VA053	1	Replaced-damaged conductor insulation
11933	1VA533	1	
11918	1DC046	1	
11906	1VC590	1	Replaced-damaged conductor insulation
11905	1CV548	2	Replaced-damaged conductor insulation
11904	1CV491	2	Replaced-damaged conductor insulation
11891	1CS116	2	
11860	1ST508	1	Replaced butt splice
11859	1ST523	1	Replaced butt splice
11858	1VA043	1	Replaced butt splice
11857	1VA102	1	Replaced butt splice
10838	1NR208	1	Shield braid splice
10837	1NR227	1	Shield wire splice
10836	1NR226	1	Shield wire splice
8037	1VA818	1	
8033	1VA707	1	
7985	1VA709	1	
7984	1VA705	1	
7983	1VA817	1	
5594	1NR014	1	In process inspection
5550	1CC010	1	
5549	1CC001	1	In process inspection
5534	1FW218	3	
5528	1RC439	1	In process inspection
5527	1NR102	1	In process inspection
5526	1RC436	1	In process inspection
5272	1FW221	5	
4561	1MS308	4	
4391	1FW055	1	Crimp tool not calibrated-replaced butt splice.

Dates of these inspections ranged from March 3, 1982 thru February 25, 1984. It was observed that all of the inspection reports randomally selected were for Byron Station Unit 1. In the 34 reports reviewed, it appeared that there were five defective butt splices and six examples of damaged/cut conductor insultation identified.

To determine if all QC termination inspectors were documenting butt splices on CIRTs, the CECo Electricl Field Engineer interviewed the HECo Electrical QC termination inspectors and determined that only approximately 50% of those interviewed documented their inspection of butt splices. In view of the information obtained by CECo during their review of potential butt splice problems at the Byron Station (i.e., 13.9% reject rate), the Reigon III inspector expressed his concern as to why CECo failed to implement a 100% reinspection/inspection of conductor butt splices. As a result of the inspector's concern, CECo, Byron Station, provided a verbal notification to Region III of a potential 10 CFR 50.55(e) report on May 10, 1984, relative to electrical conductor butt splices. As a result of telephone conversations between Mr. R. Tuetken (CECo Byron Staff) and Mr. C. C. Williams (Region III) on May 10 and 11, 1984, CECo developed an inspection plan for the reinspection of electrical conductor butt splices at the Byron Station, Units 1 and 2. This inspection plan is documented in Mr. D. Farrar (CECo Director of Nuclear Licensing) letter to Mr. James G. Keppler (NRC Regional Administrator), dated May 17, 1984.

Region III has assigned an inspector to monitor the conductor butt splice reinspection program. Upon completion of the reinspection program, separate inspection reports (50-454/84-29 and 50-455/84-21) will be issued to document the findings and corrective action taken.

5. Exit Interview

The inspectors met with the licensee representatives (denotes in paragraph 1) at the conclusion of the onsite portion of the inspection on May 4, 1984, and discussed the scope and concerns of this inspection. As stated in paragraph 4 of this report, Region III personnel discussed the concerns of this inspection with Mr. R. Tuetken on May 10 and 11, 1984 by telephone. On May 25, 1984, Mr. R. Love telephonically presented the findings of this inspection to Mr. R. B. Klingler (CECo Byron Station staff). The licensee acknowledged this information.