Commonwealth Edison
1400 Opus Place
Downers Grove, Illinois 60515

March 22, 1994

Mr. William T. Russell, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Attn: Document Control Desk

SUBJECT: LaSalle County Nuclear Power Station Units 1 and 2
Supplemental Information to the Application for Amendment Request to Facility Operating Licenses NPF-11 and NPF-18, Appendix A, Technical Specifications
Deleting 3/4.6.1.5, "Primary Containment Structural Integrity"
NRC Docket Nos. 50-373 and 50-374

REFERENCES:

(a) P. L. Piet letter to T. E. Murley dated August 20, 1993

(b) G. G. Benes letter to T. E. Murley dated December 27, 1993

(c) A. T. Gody, Jr. letter to D. L. Farrar dated December 2, 1993.

Dear Mr. Russell:

In Reference (a), Commonwealth Edison (CECo) submitted an Application for Amendment to Facility Operating Licenses NPF-11 and NPF-18, Appendix A, Technical Specifications. This proposed Technical Specification amendment deletes Technical Specification 3/4.6.1.5, "Primary Containment Structural Integrity". In Reference (b), CECo submitted a response to a Reference (c), NRC Request for Additional Information (RAI). On February 15, 1994, representatives of CECo met with members of your staff to discuss the proposed Technical Specification amendment. In response to questions asked by members of your Staff at the meeting, CECo is providing supplemental information. This information is provided as attachments to this letter. The original Significant Hazards Consideration, included in the Reference (a) submittal, remains valid based on the information provided as the response to the NRC questions.

The information in the attachments to this letter has been reviewed and approved by CECo On-Site and Off-Site Review in accordance with Commonwealth Edison procedures.

To the best of my knowledge and belief, the statements contained above are true and correct. In some respect these statements are not based on my personal knowledge, but obtained information furnished by other Commonwealth Edison employees, contractor employees, and consultants. Such information has been reviewed in accordance with company practice, and I believe it to be reliable.

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Commonwealth Edison is notifying the State of Illinois of this supplemental information pertaining to an application for a license amendment by transmitting a copy of this letter and its attachments to the designated state official.

Please direct any questions you may have concerning this submittal to this office.

Very truly yours,

Gary G Benes

Gary G. Benes
Nuclear Licensing Administrator

Subscribed and Sworn to before me
on this 22 day of
March, 1994.

Maryellen D Long
Notary Public

OFFICIAL SEAL
MARYELLEN D LONG
NOTARY PUBLIC, STATE OF ILLINOIS
MY COMMISSION EXPIRES 09/01/97

Attachment A: Response to Questions From February 15, 1994 Meeting Regarding LaSalle Tendon Technical Specification Proposed Amendment
Attachment B: Proposed Update to the LaSalle UFSAR
Attachment C: Marked-Up Technical Specification Pages

cc: J. B. Martin, Regional Administrator - RIII
D. E. Hills, Senior Resident Inspector - LSCS
A. T. Gody Jr., Project Manager, NRR
Office of Nucle, Facility Safety - IDNS

ATTACHMENT A
RESPONSE TO QUESTIONS FROM FEBRUARY 15, 1994 MEETING REGARDING LASALLE TENDON TECHNICAL SPECIFICATION PROPOSED AMENDMENT

1. **Request**:

Provide a copy of the proposed UFSAR update. The update should include the following:

a. Tendon surveillance testing history.

b. Program description summary.

c. Acceptance Criteria.

Response:

The proposed UFSAR update is attached as Attachment B.

a. The tendon surveillance testing history and conversion to the new test frequencies is described in section 3.8.1.7.3.1.

b. The description summary of the program is described in subsections 3.8.1.7.3.1.1 through 3.8.1.7.3.1.7.

c. The acceptance criteria is described in subsection 3.8.1.7.3.1.8.

2. **Request**:

Confirm that Technical Specification LCO 3.6.1.1 for each LaSalle Unit will be entered if Primary Containment is determined to be inoperable based on the results of one Unit's tendon testing.

Response:

The actions required for evaluation of the operability of the Primary Containment based on the results of tendon testing failures on one Unit's Primary Containment will be used in the tendon testing program as evaluation for the operability of both Unit 1 and Unit 2 Primary Containment.

A determination that the tested Unit's Primary Containment is inoperable will require declaring the opposite Unit's Primary Containment inoperable, and entry into the required actions of specification 3.6.1.1 for both LaSalle Unit 1 and Unit 2, unless proof of specific isolated root cause is known not to be a generic concern that could effect the opposite unit containment structural integrity. For example, a fire near a tendon anchor point on one containment could be detrimental to a particular tendon or set of tendons in one area, but would not have any effect on the opposite unit containment tendons.

ATTACHMENT A
RESPONSE TO QUESTIONS FROM FEBRUARY 15, 1994 MEETING REGARDING LASALLE TENDON TECHNICAL SPECIFICATION PROPOSED AMENDMENT

3. **Request**:

Include the requirement for primary containment structural integrity in the Technical Specification definition of PRIMARY CONTAINMENT INTEGRITY.

Response:

The Technical Specification definition of PRIMARY CONTAINMENT INTEGRITY is proposed to be changed to add the following as item g. to definition 1.31:

g. "Primary containment structural integrity has been verified in accordance with Surveillance Requirement 4.6.1.1.e."

The marked-up Technical Specification pages are attached as Attachment C.

4. **Request**:

In Tables 3 and 4 of the Reference (b) RAI response, the predicted tendon lift-off forces are listed for each surveyed tendon for each group of tendons in Unit 1 and Unit 2, respectively. For similar tendons in each group, the predicted tendon forces are shown to be different between the two units. Clarification of the data submitted is requested.

Response:

The predicted tendon forces provided in Tables 3 and 4 are computed on a consistent basis for both units but appear different for the following reasons:

a. The predicted tendon lift-off forces for a given inspection period on Unit 1 versus the same inspection period on Unit 2 are greater due to the difference in time between the post-tensioning of the tendons and the first year inservice inspection for each unit. The first inspection of Unit 1 was performed 2 years after the completion of Unit 1 post-tensioning whereas the first inspection of Unit 2 was performed approximately 4 years after the completion of Unit 2 post-tensioning. The 2 year difference in time resulted in a lower first inspection value in current Unit 2 Technical Specification Table 4.6.1.5-2 and Table 4 of Reference (b) for the first inspection of Unit 2 tendon lift-off forces. The tendon end anchor forces predicted for Unit 1 and Unit 2 reflect this difference in the time span in initiating the first inspection for the two units after completion of post tensioning.

b. The predicted values for the first inspection period performed in July, 1980, for Unit 1 post-tensioning tendon lift-off forces are one value for all hoop tendons and another value for all vertical tendons. The predicted tendon lift-off forces for subsequent inspections of Unit 1 and all inspections of Unit 2 vary between tendons. For the first inspection of Unit 1, the prestress loss due to concrete creep and shrinkage was predicted based on a uniform concrete compressive stress of 700 psi for all hoop tendons and 450 psi for all vertical tendons. Therefore, the predicted tendon end anchor forces for the first inspection of Unit 1 are uniform for each group of tendons surveyed.

For all subsequent inspections of Unit 1 and for all inspections of Unit 2, the tendon end anchor forces were predicted considering the variation in concrete compressive stress along the elevation of the containment structure. This is necessary since the resulting variation in the prestress loss due to concrete creep and shrinkage, particularly in the hoop tendons (5.14 to 12.38 ksi), is relatively significant compared to the total prestress loss.

Hence the non-uniformity observed in the predicted tendon end anchor forces.

This variation in the tendon end anchor forces is not design-significant since the variation is relatively small compared to the total prestress load. The structural integrity of the containment structure for this slightly nonuniform tendon end anchor forces has been verified in the design calculations.

5. <u>**Request:**</u>

Discuss the prestress loss considered in the design of the containment structure relative to the minimum required tendon forces, particularly the time-dependent prestress loss due to wire relaxation and concrete creep and shrinkage.

<u>**Response:**</u>

a. **Tendon Wire Relaxation:**

Based on the results of 1000-hour relaxation tests performed on the wire material used in the LaSalle project, a 40-year tendon wire relaxation loss of 13.24% of the nominal seating stress of 168 ksi is considered in the design of the LaSalle containment structures.

b. **Concrete Creep and Shrinkage:**

Long-term concrete tests were performed at 70°F and 130°F to determine the creep and shrinkage characteristics of the concrete mix used for the construction of LaSalle containment structures. Based on the results of these tests, a prestress loss due to concrete creep and shrinkage of 6.19% in the hoop direction and 4.78% in the vertical direction is considered in the design of the containment structure. These values correspond to a representative concrete compressive stress of 700 psi uniform in the hoop direction and 450 psi uniform in the vertical direction. Variation in the concrete compressive stress along the elevation of the structure causing variation in prestress loss due to concrete creep and shrinkage is ignored as not design-significant. This variation is considered only in predicting the individual tendon end anchor forces for the inservice inspection of the tendons.

c. **Minimum Required Tendon Forces:**

In addition to the time-dependent losses due to wire relaxation and concrete creep and shrinkage, prestress loss due to friction and elastic shortening are allowed for in the design. Interaction between relaxation and creep & shrinkage is also taken into account in computing the net 40-year prestress loss.

The effective tendon end anchor forces at the end of 40 years are 620 kips (140.3 ksi) in the hoop tendons and 626 kips (141.7 ksi) in the vertical tendons. These values are above the minimum required 40-year tendon end anchor forces of 575 kips in the hoop tendons and 600 kips in the vertical tendons.

ATTACHMENT B
PROPOSED DRAFT UPDATE TO THE LASALLE UFSAR

3.8.1.7.3 In-Service Testing

3.8.1.7.3.1 Tendon Surveillance

The containment post-tensioning tendons are inspected inservice periodically to ensure the containment structural integrity.

To date, complete ISIs have been performed at 1, 3, 5, 10, and 15 years after the Initial Structural Integrity Test (ISIT) for Unit 1 and at 1, 3, and 5 years after the ISIT for Unit 2. These tests included tendon lift-off, wire material inspection and testing, visual inspection of containment and anchorage components, and filler grease examination and testing. Results of the inspections performed so far show that the tendons in both units are behaving as predicted and that performing the Unit 2 ISIT more than two years after the Unit 1 ISIT was not a factor affecting the performance of the tendons in the two Units. This is an exception to the Regulatory Guide 1.35, Rev. 3, regulatory position C.1.5.b criteria for treating two containments at the same site as twin containments for testing purposes. Therefore, for all future examinations, based on twin unit status granted (pending approval) by the NRC, the tendon testing will be performed by alternating the tests discussed in sections 3.8.1.7.3.1.4, 3.8.1.7.3.1.5, and 3.8.1.7.3.1.6 between the two Units for the remaining life of the plant. The selection of inspection tendons, visual inspection, tendon lift-off, testing of tendons and grease samples, and acceptance criteria are based on the requirements of the tendon ISI program referred to in the Technical Specification Administrative Control Section 6.2.F.6. The program is based on the Regulatory Guide 1.35, Revision 3, and will control the monitoring of any degradation in the post-tensioning system. The following sections contain a brief summary of the tendon ISI program and its acceptance criteria.

3.8.1.7.3.1.1 Inspection Frequency

For the twin Units, on-site inspection frequencies are established in compliance with Regulatory Guide 1.35, Revision 3. After the fifth year inspection of Unit 2, a visual inspection and filler grease inspection shall be performed for each unit at approximately five year intervals and physical testing (i.e., tendon lift-off, detensioning, and wire tensile test) shall be performed for each unit at approximately ten year intervals.

3.8.1.7.3.1.2 Tendon Sample Selection

Since all 1, 3, and 5 year inspections already performed show no evidence of tendon degradation, a total of seven tendons, three vertical and four hoop, shall be selected for all future inspections. One tendon per group has been designated as the common tendon and is kept unchanged after initial selection. Except for the common tendon, the tendons that have been inspected and found intact during previous inspections are excluded from the group population during subsequent inspections. If a randomly selected tendon from a group cannot be inspected due to plant operating conditions, safety or radiological hazard, or due to structural obstructions, an accessible substitute tendon from the group shall be randomly selected.

3.8.1.7.3.1.3 Visual Inspection

The exterior surface of the containment shall be visually examined to detect evidence of large spall, severe scaling, D-cracking in an area of 25 square feet or more, other surface deterioration or disintegration, or grease leakage.

Tendon anchorage assembly hardware such as bearing plates, shims, anchorheads, and buttonheads of the tendons selected shall be visually examined for evidence of corrosion, broken or protruding wires, missing buttonheads, and cracks in tendon anchorage hardware. Concrete surfaces surrounding tendon anchorage shall also be checked visually for indication of abnormal material behavior. Vertical tendons do not require removal of the grease cap, to prevent loss of grease fill. The inspection for the bottom grease caps of all vertical tendons shall be examined visually to detect any grease leakage or grease cap deformation, as well the visible concrete surfaces surrounding the bottom grease cap for indication of abnormal material behavior. Removal of the grease cap is not necessary for this inspection.

3.8.1.7.3.1.4 Prestress Monitoring Test

Tendons selected for prestress monitoring tests shall be subjected to lift-off or other equivalent tests.

3.8.1.7.3.1.5 Detensioning, Retensioning, and Force-Elongation Measurement

One randomly selected tendon from each group of tendons during each inspection shall be subjected to necessary detensioning to identify broken or damaged wires. The detensioned tendon shall be retensioned to 70% of the specified minimum ultimate tensile strength of the unbroken wires in the tendon, but not less than the force predicted for the tendon at the time of the test.

During retensioning, simultaneous measurements of elongation and jacking force shall be made at a minimum of approximately three equally spaced levels of force between zero and the lock-off force.

3.8.1.7.3.1.6 Tendon Material Test and Inspection

A previously stressed tendon wire from one tendon of each group shall be removed for examination over its entire length for any evidence of corrosion or other mechanical damage and tensile testing.

Tensile tests for material yield strength, tensile strength, and elongation shall be made on at least three samples cut from each removed wire, one at each end and one at mid length. The sample shall use the maximum length practical and the gauge length for the measurement of elongation shall be in accordance with the ASTM Specification A-421.

3.8.1.7.3.1.7 Filler Grease Inspection

A sample of sheathing filler grease shall be collected to allow for visual examination and laboratory analysis. The samples shall be visually examined for any abnormal change in color and consistency, and for the presence of free water within the grease samples.

The sample of sheathing filler grease from each selected tendon shall be tested to the following national standards:

- ASTM D95 for water content
- ASTM D974 for reserve alkalinity
- ASTM D512 for water-soluble chlorites
- ASTM D3867 for nitrates
- APHA 428 for sulfides

3.8.1.7.3.1.8 Acceptance Criteria

The acceptance criteria is detailed in the Inservice Inspection Program for Post-tensioning Tendons and conforms to those prescribed in Revision 3 of Regulatory Guide 1.35. The following is a summary of the acceptance criteria:

1. Exterior Visual Inspection

    A. Exterior surface of the containment shall not exhibit signs of surface deterioration or disintegration due to concrete spalling, scaling, or cracking.

B. Exterior surface of the containment shall not exhibit signs of grease leakage.

C. No apparent changes shall have occurred in the visual appearance of the end anchorages or adjacent concrete surfaces since the last inspection.

D. Bottom grease caps of all vertical tendons shall exhibit no deformations or grease leakage.

2. Tendon Anchorage Areas Inspection

A. There shall be no evidence of cracking in the anchor heads, shims, or bearing plates.

B. There shall be no evidence of active corrosion in the anchorage components.

C. There shall be no broken wires, unseated wires, or detached buttonheads other than those that were documented and accepted during tendon installation or during a previous inservice inspection.

D. There shall be no cracks in the concrete adjacent to the bearing plates which exceed 0.01 inch in width.

3. Prestress Monitoring Test

A. Each tendon selected for inspection shall have an observed lift-off force of at least 95% of the predicted value.

B. If the measured lift-off force of a selected tendon in a group lies between 95% and 90% of predicted value, two additional tendons, one on each side of the tendon, shall be tested for their lift off forces. The lift off force of each of these additional tendons shall be above 95% of their predicted value. If the lift-off force of any two adjacent tendons falls below 95% of their predicted value, additional lift-off testing shall be performed to detect the extent and cause of such occurrence.

C. If the measured lift-off force of the selected tendon falls below 90% of the predicted value, the tendon shall be fully investigated and determination shall be made as to the extent and cause of such occurrence.

D. The average of all measured tendon forces for each group shall not be less than the minimum required prestress level at the anchorage location for that group: 575 kips hoop and 600 kips vertical.

E. From consecutive surveillances the measured tendon forces for the same tendon or tendons in a group shall not indicate a trend of prestress loss larger than expected such that the resulting tendon forces will be less than the minimum required for the group before the next scheduled surveillance. Otherwise, additional lift-off testing shall be done to determine the cause and extent of such occurrence.

F. During retensioning of detensioned tendons, the elongation corresponding to a specific load shall not differ by more than 10% from that recorded during installation of the tendons. Otherwise, an investigation shall be made to ensure that the difference is not related to wire failure.

4. Tendon Material Inspection and Test

A. Tendon wires removed for inspection shall be free of corrosion, cracks, or other damage indicative of material deterioration.

B. Tensile test results of the wires shall meet the following mechanical properties:

Ultimate tensile strength:	240 KSI, Minimum
Yield strength:	204 KSI @ 1% strain, Minimum
% elongation:	4% over 10-inch gauge length, Minimum

ATTACHMENT B
PROPOSED DRAFT UPDATE TO THE LASALLE UFSAR

5. Filler Grease Inspection

A. No significant changes shall have occurred in the physical appearance of the sheathing filler grease.

B. Free water shall not be present in the grease samples.

C. The amount of grease replaced shall not exceed 5% of the net volume of the duct when injected at the original installation pressure.

D. Results of the chemical analysis of the sheathing filler grease shall meet the following limits:

Water content	10% by weight, maximum
Chloride	10ppm, maximum
Nitrates	10ppm, maximum
Sulfides	10ppm, maximum
Reserve alkalinity (base numbers)	50% of the installed value, minimum, or not less than zero when the installed value was less than 5