



Commonwealth Edison

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April 19, 1983

Director of Nuclear Reactor Regulation
Attention: Mr. A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: LaSalle County Station Units 1 and 2
Masonry Walls - Supplemental Information
NRC Docket Nos. 50-373 and 50-374

Reference (a): License NPF-11, Condition 2.C.8.

Dear Sir:

During a telecon on March 29, 1983 with Dr. A. Bournia, et al., of your staff, Commonwealth Edison Company agreed to provide additional information regarding Masonry Walls at LaSalle County Station. The purpose of this letter is to provide you with the Commonwealth Edison Company's "Response to NRC's Request for Additional Information on Masonry Wall Design Based on Telephone Conversation of March 29, 1983 for LaSalle County Station" dated April 12, 1983. Based on our understanding of your position, this information should allow the NRC to close out Reference (b).

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

Enclosed for your use are one (1) signed original and forty (40) copies of this letter and the enclosure.

If there are any further questions regarding this matter, please contact this office.

Very truly yours,

C. W. Schroeder 4/19/83

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C. W. Schroeder
Nuclear Licensing Administrator

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cc: NRC Resident Inspector - LSCS

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RESPONSE TO NRC'S REQUEST FOR ADDITIONAL
INFORMATION ON MASONRY WALL DESIGN BASED ON
TELEPHONE CONVERSATION OF MARCH 29, 1983

FOR
LASALLE COUNTY STATION

THE COMMONWEALTH EDISON COMPANY
CHICAGO, ILLINOIS

APRIL 12, 1983

RESPONSE TO NRC REQUEST FOR ADDITIONAL
INFORMATION ON MASONRY WALL DESIGN
BASED ON TELEPHONE CONVERSATION OF MARCH 29, 1983

1.0 Introduction

This report covers the following additional information which was requested by the NRC during the telephone conference call on March 29, 1983. The report:

- a. Provides a summary of all the safety related walls. Summarizes the number of walls which were modified to meet the requirements of IE Bulletin 80-11 and describes the nature of the modifications.
- b. Verifies that LaSalle County Station's safety related masonry walls were built to or meet the intent of 10CFR50, Appendix "B".
- c. Provides the actual stresses for walls which were identified in Commonwealth Edison Company's report dated November 19, 1982, as exceeding the ACI 531-79 (SEB) criteria and clarifies why only six walls currently exceed the criteria and not fifteen (15) as previously stated.
- d. Discusses the applicability of the Clinton Station's masonry wall tests to the LaSalle County Station's walls.
- e. Confirms that the LaSalle Station's safety related masonry walls meet the IE Bulletin 80-11 requirements.

This report gives the final status of masonry walls at LaSalle County Station and supplements the information presented in the report submitted by Commonwealth Edison Company (CECo) and listed as Reference 1.

It is Commonwealth Edison Company's judgement that safety-related concrete masonry walls currently satisfy the requirements of IE Bulletin 80-11 and no further modifications are justified or warranted.

2.0 Current Design Status of Masonry Walls

As mentioned in earlier responses, the masonry wall construction at LaSalle County Station Unit 1 and Unit 2 has been performed under Sargent & Lundy's Specification No. J-2598. The construction requirements contained in the specification are such that the safety-related masonry walls would comply with 10CFR50, Appendix B. In response to NRC IE Bulletin 80-11, some concrete masonry walls were reassessed and reclassified as safety-related. For the

reclassified walls, a sample core testing program was performed to verify that the installed masonry and mortar met the required safety-related wall strength requirements. Based on the reassessment and the testing program, it was found that the reclassified walls met the same strength and performance criteria that they would have met if they had been fully designed and constructed in accordance with 10 CFR50, Appendix "B". Based on this, we believe the walls met the intent of 10 CFR50, Appendix "B".

Two additional masonry walls have been reclassified as Category I since CECO's report dated November 19, 1982 (Reference 1), thus increasing the total number of Category I masonry walls from 442 to 444. This increase was necessary to create separation between safety-related panels in Auxiliary Equipment Room based on the Unit 2 fire hazard analysis. The total number of 444 safety-related masonry walls represents a final count as of this date. Should future modifications require upgrading of masonry walls, they will be upgraded in accordance with SEB criteria.

The attached Table 1 lists, for each building, the number of safety-related masonry walls which were modified because the design stresses exceeded the project allowable stresses based on the reevaluation criteria in response to IE Bulletin 80-11. A typical fix for a wall was to add steel columns as additional lateral support for the walls. Some walls were also provided with angles and plates at the end of the span to transfer shear. Other types of fixes which have been used include adding of a steel beam, strut or an angle bracing.

Table 2 (attached) lists the 6 of 444 safety-related walls which currently exceed the SEB allowable stresses for the SSE load combination but met our project criteria and thus were not modified. All other walls which did not meet the project criteria were upgraded to meet the SEB criteria.

Also given in Table 2 are the available factors of safety which are calculated using the test results obtained for the Clinton Nuclear Station masonry walls (see Section 3.0 for applicability of the test results for LaSalle County Station).

Based on the Clinton test results, a modulus of rupture value of 250 psi was obtained for the horizontally spanning single wythe hollow block walls. For solid or grouted block walls, this value would be larger at least by the ratio ($= 112/75$) of the SEB allowable stresses for solid block walls to hollow block walls. Thus, a value of 370 psi has been used for solid or grouted block wall to determine the available factor of safety given in Table 2.

Allowable stresses for vertically spanning masonry walls are approximately one-half of the allowable stresses for horizontally spanning masonry walls. As such, the modulus of rupture for vertically spanning hollow masonry walls is assumed as one-half of the Clinton test value. Thus, the safety factors listed in Table 2 for vertically spanning hollow block walls are based on a modulus of rupture value of 125 psi. For vertically spanning solid block walls, a value of 185 ($= 370/2$) psi is used.

Table 3 gives the design status of all the 15 horizontally spanning and 3 vertically spanning masonry walls which were reported to have actual stresses exceeding SEB allowable stresses in CECO's submittal listed as Reference 1.

It is evident from Table 3 that only three horizontally spanning and three vertically spanning walls have actual stresses exceeding SEB allowable stress and these walls are the same walls which are listed in Table 2. The remaining 12 horizontally spanning hollow block walls were unnecessarily included in the report dated November 19, 1982. To determine whether a masonry wall exceeds the SEB allowable stress, the ratio of the actual stress to the project allowable stress was compared with the ratio of SEB allowable stress to the project allowable stress. For the 12 hollow block walls, the ratio for a hollow block wall was compared with the ratio for a solid block wall resulting in unnecessary conservatism. The ratio of the SEB allowable stress to the project allowable stress is 0.97 ($= 75/77$) for hollow block walls and 0.86 ($= 112/130$) for solid block walls.

3.0 Application of Clinton's Station Masonry Wall Test Data to LaSalle County Station Masonry Walls

The masonry walls at LaSalle County Station have been built with a) full mortar bedding of the units, b) running bond construction, c) continuous truss-type joint reinforcement every second course, d) masonry block units conforming to ASTM C-90 for hollow units and ASTM C140 for solid units, e) Type M mortar conforming to ASTM C270, and f) 3/8" thick mortar joints.

The masonry wall construction at LaSalle County Station and the Clinton masonry wall test panel construction are identical and the test panel results can be applied to the masonry wall design at LaSalle County Station.

4.0 Conclusions

Based on the information presented in this report and the report dated November 19, 1982, we believe that the masonry wall construction at LaSalle County has met the intent of 10 CFR50, Appendix B. The walls have also been evaluated to meet the requirements of IE Bulletin 80-11, and the actual

design stresses for all walls except the six walls of attached Table 2 are within the SEB allowable stresses. Where the actual stresses for the six walls exceed SEB allowable stresses, the factor of safety against SSE loads for these walls varies between 2.50 and 3.13 and is adequate for the structural integrity of the walls.

It is Commonwealth Edison Company's judgement that safety-related concrete masonry walls currently satisfy the requirements of IE Bulletin 80-11 and no further modifications are justified or warranted.

Reference 1: "Re-Evaluation of Safety-Related Concrete Masonry Walls at LaSalle County Station," dated November 19, 1982.

TABLE 1
SUMMARY OF SAFETY RELATED MASONRY WALLS (1)
WHICH WERE MODIFIED TO MEET IE BULLETIN 80-11

Type of Building	Unit Number	Total Number of Safety Related Masonry Walls	Total Number of Safety Related Masonry Walls Which Were Modified to Meet IE 80-11
Auxiliary Building	1	202	50
	2	74	27
	1 & 2	276	77
Reactor Building	1	69	16
	2	63	30
	1 & 2	132	46
Diesel Generator Building	1	32	9
	2	4	3
	1 & 2	36	12
Total All Buildings	1	303	75
	2	141	60
	1 & 2	444	135

(1) Fixes which have been provided for the walls include addition of one or more of the following:

- a) Steel columns to act as lateral supports for the masonry wall.
- b) Angles or plates at the end of wall span to act as shear supports.
- c) Steel beam or a strut or an angle bracing as required for additional wall support.

TABLE 2
SUMMARY OF SAFETY RELATED CONCRETE MASONRY WALLS WHICH EXCEED SEB ALLOWABLE STRESSES
FOR LASALLE COUNTY, UNITS 1 AND 2

Wall Number	Drawing Number	Location			Wall Properties							SSE Actual Stress	SEB Allowable Stress	SSE Actual Stress SEB Allowable Stress	Safety Factor
		Unit	Building	Elevation	Type	Thickness	Length	Height	Wythes	Design Span Direc.	Design Span Length				
R1-673-6	A-217	1	Reactor	673'-4"	Solid	12"	11'-6"	7'-0"	1	Horiz.	11.7'	137	112	1.22	2.70 ²
R1-710-5	A-225	1	Reactor	710'-6"	Hollow	12"	2'-0"	8'-8"	1	Vert.	8.7'	50	32	1.56	2.50 ³
R1-786-3	A-237	1	Reactor	786'-6"	Solid	16"	14'-0"	7'-0"	2	Vert.	7.0'	59	52	1.14	3.13 ³
R1-786-3A	A-238	1	Reactor	786'-6"	Solid	20"	30'-0"	7'-0"	3	Vert.	7.0'	59	52	1.14	3.13 ³
D1-736-5	A-277	1	Diesel	736'-6"	Hollow	12"	16'-6"	11'-0"	1	Horiz.	16.5'	100	75	1.33	2.50 ¹
R2-694-4	A-224	2	Reactor	694'-6"	Grouted	12"	10'-0"	14'-6"	1	Horiz.	10.0'	120	112	1.07	3.08 ²

¹Based on modulus of rupture value of 250 psi for hollow block walls established on the basis of Clinton test results.

²Based on modulus of rupture value of 370 psi for solid or grouted construction which is obtained by adjusting Clinton hollow block wall test value with a factor equal to ratio of SEB allowable stresses for solid or grouted to hollow block wall construction.

³Based on modulus of rupture value of 125 psi which is one-half of the Clinton test value and is assumed valid for vertically spanning hollow block walls because allowable stresses for vertically spanning walls are approximately one-half of the allowable stresses for horizontally spanning walls. For vertically spanning solid block walls, a value of 185 psi is used. This value is obtained by adjusting 125 psi with a factor equal to ratio of the SEB allowable stresses for solid or grouted to hollow block wall construction.

TABLE 3

SUMMARY OF SAFETY RELATED CONCRETE MASONRY WALLS WHICH WERE REPORTED IN NOVEMBER 19, 1982 REPORT
AS EXCEEDING THE SEB ALLOWABLE STRESSES FOR LASALLE COUNTY, UNITS 1 AND 2

Wall Number	Drawing Number	Location			Wall Properties							SSE Actual Stress	SEB Allowable Stress	SSE Actual Stress
		Unit	Building	Elevation	Type	Thickness	Length	Height	Wythes	Design Span Direction	Design Span Length			SEB Allowable Stress
A1-710-10	A-184	1	Auxiliary	710'-6"	Hollow	12"	18'-0"	17'-0"	1	Horizontal	18.0'	71	75	0.95
A1-710-41	A-184	1	Auxiliary	710'-6"	Hollow	12"	19'-9"	16'-4"	1	Horizontal	16.3'	54	75	0.72
A1-710-42	A-184	1	Auxiliary	710'-6"	Hollow	8"	14'-0"	19'-9"	1	Horizontal	13.0'	69	75	0.92
A1-731-2	A-186	1	Auxiliary	731'-0"	Hollow	12"	49'-6"	14'-0"	1	Horizontal	12.42'	59	75	0.79
A1-731-3	A-186	1	Auxiliary	731'-0"	Hollow	12"	52'-0"	14'-3"	1	Horizontal	11.0'	60	75	0.80
A1-731-7	A-186	1	Auxiliary	731'-0"	Hollow	12"	16'-0"	7'-4"	1	Horizontal	16.0'	69	75	0.92
A1-731-9	A-186	1	Auxiliary	731'-0"	Hollow	12"	16'-0"	7'-4"	1	Horizontal	16.0'	57	75	0.76
A1-768-4	A-190	1	Auxiliary	768'-0"	Hollow	8"	8'-4"	18'-0"	1	Horizontal	8.3'	73	75	0.97
A2-768-31	A-191	2	Auxiliary	768'-0"	Hollow	8"	13'-6"	16'-6"	1	Horizontal	13.5'	67	75	0.87
D1-736-4	A-277	1	Diesel	736'-6"	Hollow	8"	17'-6"	11'-0"	1	Horizontal	8.5'	59	75	0.79
D1-736-5	A-277	1	Diesel	736'-6"	Hollow	12"	16'-6"	11'-0"	1	Horizontal	16.5'	100	75	1.33 ¹
D1-736-9	A-277	1	Diesel	736'-6"	Hollow	12"	27'-0"	11'-0"	1	Horizontal	12.5'	55	75	0.73
R1-673-6	A-217	1	Reactor	673'-4"	Solid	12"	11'-8"	7'-0"	1	Horizontal	11.7'	137	112	1.22 ¹
R1-843-1	A-250	1	Reactor	843'-6"	Hollow	12"	21'-0"	16'-0"	1	Horizontal	13.3'	59	75	0.79
R2-694-4	A-224	2	Reactor	694'-6"	Grouted	12"	10'-0"	14'-6"	1	Horizontal	10.0'	120	112	1.07 ¹
R1-710-5	A-225	1	Reactor	710'-6"	Hollow	12"	2'-0"	8'-8"	1	Vertical	8.7'	50	32	1.56 ¹
R1-786-3	A-237	1	Reactor	786'-6"	Solid	16"	14'-0"	7'-0"	2	Vertical	7.0'	59	52	1.14 ¹
R1-786-3A	A-238	1	Reactor	786'-6"	Solid	20"	30'-0"	7'-0"	3	Vertical	7.0'	59	52	1.14 ¹

¹These walls for which actual stresses exceed SEB allowable stresses are the same walls which are listed in Table 2.