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MEMORANDUM FOR: C. E. Norelius, Director
Division of Engineering & Technical Programs, RIII

W. V. Johnston, Assistant Director
for Materials & Qualifications Engineering
Division of Engineering

L. R. Rubenstein, Assistant Director
for Core & Plant Systems
Division of Systems Integration

J. P. Knight, Assistant Director
for Components & Structures Engineering
Division of Engineering

FROM: Thomas M. Novak, Assistant Director
for Licensing
Division of Licensing

SUBJECT: DRAFT SER ON LASALLE HVAC INDEPENDENT REVIEW

The enclosed draft SER incorporates information related to the C. F. Braun HVAC review beyond that provided in an earlier draft. Specifically, additional information has been added describing staff involvement in reviewing the scope and processes of the review. Also included is a summary of the overall results of the C. F. Braun review beyond just the three findings cited earlier. We also modified information related to sampling following consultation with Region III personnel.

You are requested to review this draft SER and provide your comments to me by COB Monday, November 22, 1982. You should factor in as appropriate comments we have received from GAP (copy enclosed).

I am particularly interested in what you could add that more fully describes what your staff did in reviewing the thoroughness of the C. F. Braun review and the conclusions we support for removing the restriction on full power operation.

Original signed by:

XA Copy Has Been Sent to PDR

Thomas M. Novak, Assistant Director
for Licensing
Division of Licensing

Enclosure:
As stated

cc: D. G. Eisenhut
A. Schwencer
W. Haass
O. Parr
D. D. Liau
R. Bosnak
A. Bournia

*See attached for previous concurrences

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MEMORANDUM FOR: C. E. Norelius, Director
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Division of Engineering

L. R. Rubenstein, Assistant Director
for Core & Plant Systems Branch
Division of Systems Integration

J. P. Knight, Assistant Director
for Components & Structures Engineering
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FROM: T. M. Novak, Assistant Director
for Licensing
Division of Licensing

SUBJECT: DRAFT SER ON LA SALLE HVAC INDEPENDENT REVIEW

The attached draft SER incorporates information related to the C. F. Braun HVAC review beyond that provided in an earlier draft. Specifically, we have added more introductory information establishing staff involvement in reviewing the scope and processes of the review. We also included a summary of the overall results of the C. F. Braun review beyond just the three findings cited earlier. We also modified information related to sampling following consultation with Region III personnel.

You are requested to review this new draft SER and provide your comments to me by COB Monday, November 22, 1982.

I am particularly interested in any information you could add that more fully describes what your staff looked for, in addition to the final conclusions they reached as reflected in the attached report.

T. M. Novak, Assistant Director
for Licensing
Division of Licensing

Attachment:
As stated

cc: D. G. Eisenhut
A. Schwencer
W. Haass
O. Parr
B. D. Liaw
R. Bosnak

| OFFICE | | | DL:LB#2/PM | DL:LB#2/BC | DL:AD/L | | |
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SAFETY EVALUATION

LA SALLE COUNTY STATION, UNIT 1

DOCKET NO. 50-373

INTRODUCTION

License Condition 2.C(33)(b) of the La Salle County Station Unit 1 License No. NPF-11 states that:

> Prior to exceeding 50% power operation, the licensee shall submit the results of an independent review acceptable to the NRC staff of the HVAC system, including design changes, fabrication and installation. The review shall encompass all safety-related HVAC systems and the effect of non-safety-related HVAC system failures on safety systems.

This license condition was prescribed as a consequence of allegations made against the Zack Company (Zack), the installer of the heating, ventilating, and air conditioning (HVAC) system at La Salle, by former employees. As a result of this license condition, two meetings were held with the Commonwealth Edison Company (CECo or licensee) and the intended independent reviewer, the C. F. Braun & Company (C. F. Braun) on August 11, 1982 and August 24, 1982. At the first meeting C. F. Braun presented its qualifications and preliminary indication of the scope of its program to perform this independent review. At the second meeting, a more detailed description of the program was provided with qualifications of personnel to be involved in the review. The NRC staff requested the licensee to document its selection of the independent HVAC review contractor and the HVAC review program description for review by the staff. By letters dated August 24 and 27, 1982, CECo responded, providing its selection of C. F. Braun as the independent reviewer, giving CECo's requirement to C. F. Braun for this review and forwarding C. F. Braun's Technical Program to CECo to perform this review. The NRC staff reviewed these submittals and, by letter dated September 8, 1982, notified CECo that the selection of C. F. Braun as the independent HVAC reviewer was acceptable to the NRC staff subject to the following comments relative to the Technical Program:

- When comparing the Zack installation drawings to the Sargent & Lundy Company (S&L) design documents, C. F. Braun should verify that any differences have been properly corrected. A specific concern that should be investigated is that in those cases where Zack did not buy materials in accordance with the S&L specifications, it should be verified that the materials installed are of comparable quality.
- When examining the CECo's disposition of non-conformance reports, C. F. Braun should determine on a selective basis that the technical justification is correct. If C. F. Braun's review determines safety concerns involving significant as-built design changes, then they should evaluate these changes against the design documents.
- All observations that the C. F. Braun site review committee submits to CECo for disposition should be acknowledged in the C. F. Braun final report.
- All observations that the C. F. Braun internal review committee determines are safety concerns should be discussed in the C. F. Braun final report.
- In CECo's requirements, a request was made that the final report be simultaneously submitted to CECo and the NRC, however, in the C. F. Braun proposal, it was stated that the final report would be sent to CECo for distributing the unedited report to the NRC staff. We asked that the report be submitted simultaneously to CECo and NRC.
- In CECo's requirements, a request was made that CECo be notified immediately when an item is sent to the second level review committee. In the C. F. Braun proposal, it is stated that the item first be sent to the second level review committee for disposition before notifying CECo. We asked that CECo be immediately notified for any item required for disposition by the second level review committee.

The NRC staff, based on its receipt and review of the final report, finds that CECo's contractor, C. F. Braun, satisfactorily accommodated the above concerns

CECo obtained the services of the C. F. Braun for this independent review. This review included all La Salle Unit 1 safety-related HVAC systems including those common to Unit 2 and those non-safety-related HVAC systems which are seismically supported. There were three such systems. These non-safety-related systems are required to retain their structural integrity during a seismic event so as not to prevent the operation of any safety-related structures, systems, or components. As a result of this review, a final report dated October 27, 1982 by C. F. Braun entitled, "Independent HVAC Review Final Report," Project 6356-N was submitted. As stated in the report, the primary objective of the design review was to provide verification and increased assurance that the HVAC installation by Zack was in accordance with the design of S&L, the architect/engineer for La Salle. However, because the S&L design was not in question for this effort, the scope of the independent program did not include a review of the S&L design.

PROGRAM

The program for the independent review performed by C. F. Braun consisted of:

1. Material installed by reviewing results of CECo and NRC conducted material tests;
2. Inspection of field and shop welding supports and ductwork including welding procedures and welder qualifications;
3. Operability of associated mechanical equipment by reviewing the leakage tests, the balance tests and preoperational tests;
4. Design changes as a result of site noncomformances were reviewed by C. F. Braun for their disposition and procedures followed in dispositioning;
5. Field testing by Zack Company, including construction testing performed by Zack Company and its subcontractors.

Observations, which are confirmed discrepancies, during the review were documented and reviewed by two teams of C. F. Braun personnel - one onsite and one offsite at C. F. Braun's main office. The review teams verified the accuracy of each observation and determined its potential for a safety concern. The C. F. Braun work was conducted by qualified personnel in accordance with documented procedures and instructions.

RESULTS OF C. F. BRAUN PROGRAM

The C. F. Braun inspectors conducted inspections on 335 hangers, duct sections, and pieces of equipment. From these inspections, discrepancies were found on 117 items. Discrepancy in the final report was defined as a departure of the actual installation from the specified design requirements as noted by inspection activities or engineering review. Of these, 32 were determined to be acceptable by the site review committee, 80 were "observations", 3 were "findings", and 2 were voided. Observations in the final report were defined as confirmed discrepancies requiring CECo disposition and a verification of corrective action by the site review committee. Findings were defined as observations which have been identified as potential safety concerns. Sargent & Lundy responded to the observations and dispositioned 34 as having no discrepancies. Repairs were required for 46 observations, all of which were minor in nature and did not jeopardize the safety of the system. Of these 46, 32 were Zack discrepancies, 9 were design drawing discrepancies, 4 were for weld coatings, and 1 was the result of a stud being removed after completion of Zack's work. Twenty-four (24) of the 83 observations and findings will result in Sargent & Lundy drawing revisions. Three inspections resulted in findings, these being QC-2-50, QC-2-88, and QC-2-89. Further discussions relative to these findings are discussed in the Mechanical Engineering section below.

In addition, C. F. Braun's analysis of the results on the material tests conducted by the NRC and CECo verified that the material met the design requirements. C. F. Braun concluded that the quantity and variety of samples encompassed the representation of material used to fabricate and erect the entire HVAC systems; and therefore, additional sampling was not required. Additional C. F. Braun conclusions were as follows:

1. Although isolated welds were observed to be defective or undersized, C. F. Braun determined that the welding on the supports and ductwork is of good quality and no safety concerns exist on the HVAC systems.
2. All of the mechanical HVAC equipment examined by C. F. Braun was determined to be operable and in accordance with design requirements.
3. Inspection of non-conformance reports by C. F. Braun indicated that design changes have been documented and approved by S&L.
4. Leak tests, balance tests and preoperational tests were found to be acceptable, even though in the balance tests some flows were lower than design but were found not to compromise the safety of the design.

Finally, C. F. Braun recognized the allegations made about the Zack quality assurance; however, this investigation performed by them resulted in assurance that the quality of the hardware and craftsmanship that went into actual installation was not adversely affected by the Zack quality assurance program. C. F. Braun concluded that the installed HVAC systems and associated supports were in conformance with the requirements of the S&L design.

ASSESSMENT BY THE NRC STAFF

The NRC staff review of the C. F. Braun report was broken into four areas: Quality Assurance, Mechanical Engineering, Material Engineering and Functional Adequacy of HVAC Systems. These areas are addressed below.

Quality Assurance

The C. F. Braun review and followup work was performed in accordance with its topical report on quality assurance, Topical Report 21A, "Nuclear Quality Assurance Manual Volume I." This Topical Report was originally found acceptable (i.e., meeting the requirements of Appendix B to 10 CFR Part 50) by the NRC in July 1975 with Amendment 5a (C. F. Braun's latest submittal) found acceptable by the NRC in July 1980. Although the entire quality assurance program was applicable to the independent HVAC review, the quality assurance controls under Appendix B Criteria I-Organization, II-Quality Assurance Program (including personnel training and qualification), V-Document Control, X-Inspection, XVI-Corrective Action, XVII-Quality Assurance Records, and XVIII-Audits did apply to this work.

C. F. Braun had a project quality assurance engineer at the site while the independent HVAC review was being performed. The quality assurance engineer was responsible for implementation of all quality assurance procedures on the program. Appendix B, "Project and Quality Assurance Instructions", of the C. F. Braun final report are instructions used by the C. F. Braun personnel to perform the independent HVAC review. The staff has scanned the Appendix B of this report and concludes that the instructions appear to reasonably reflect the requirements of Appendix B to 10 CFR Part 50 for applicability to this work.

As part of C. F. Braun's quality assurance program, a qualified auditor from the C. F. Braun home office in California, who had no direct responsibility for implementing the program, audited the program while it was being implemented onsite. The report of the audit is included as Appendix K of this report. Based on our cursory review of the audit report, we conclude that the audit scope and depth appear to be appropriate. Appendix K indicates the audit resulted in several comments and recommendations. In Appendix K, responses shown from the onsite team to the home office auditor appear to acceptably close out any open item.

The staff concludes that the C. F. Braun's independent review of the HVAC systems was performed by qualified personnel in accordance with quality assurance controls adequate to provide credance to the results of the review.

Mechanical Engineering

As was stated above, the scope of work did not include a review of S&L design because the S&L design was not in question. From a mechanical design standpoint, the primary concern would be if significant changes from the design drawings to the installed "as-built" configuration were found. The final report stated that if the C. F. Braun review resulted in safety concerns involving these significant "as-built" design changes, then the "as-built" changes would be evaluated against the S&L design documents.

The NRC staff reviewed the final report and noted that three findings (QC-2-50, QC-2-88, and QC-2-89) involved significant deviations from the design documents and required a review of the design documents to resolve the potential safety concerns. The staff focused its review on the adequacy of the resolution of these findings.

In QC-2-50, the finding indicated that the installed HVAC duct hanger S-1382 on drawing M-1538-42 Rev. E was missing two vertical structural members as shown in the design drawing. The discrepancy was resolved in a letter from D. C Haan (S&L) to B. R. Shelton (CECo) dated October 5, 1982 which found that the error was in the drawing and not in the installation. S&L had previously performed a calculation per a field change request which was based on the support design without the two vertical members. The field change request was approved but because of a misinterpretation by the draftsman, the design drawing was not changed. The drawing was subsequently revised to properly indicate the installed configuration. The staff believes that from a design standpoint this finding has been properly resolved and does not affect the safety of the plant.

The two findings, QC-2-88 and QC-2-89 also involved a discrepancy between the installed condition and the design drawings for an HVAC support. The C. F. Braun site review team discovered two supports (S-2065 and S-2049) which had specified a 4 x 4 x 1/4 TS member (tubular steel with 1/4 inch thickness required). The installed members were found to be 3/16 inch thick. Thus, C. F. Braun believed that this condition should be considered a generic problem

and the structural adequacy of all 4 x 4 TS members should be verified. The internal review committee concurred with the finding and felt that it was a significant deviation from the design documents. S&L responded to the finding and subsequently reviewed all La Salle HVAC hangers using 4 x 4 x 1/4 TS members. The maximum stress was recalculated using 4 x 4 x 3/16 TS for the 4 x 4 TS hanger with the largest loading. It was determined that the maximum stress was 14,267 psi which is less than the S&L design allowable stress value of 18,000 psi. For tubular steel sizes of 4 x 4, thicknesses greater than 1/4 inch are not specified for HVAC duct supports. C. F. Braun stated in the final report that they concurred with S&L's justification and, thus, the finding was considered resolved. The staff concludes that from a design standpoint, this finding has been properly resolved and does not affect the safety of the plant.

The staff also reviewed, on a sampling basis, the 117 observations identified in the report. We noted that many of the observations were related to weld deficiencies, missing duct attachment clips, and undersized support members. CECo's response to the observations indicated that many of these discrepancies had been previously evaluated in field change requests and in "as-built" configuration reviews. In some cases, actual repairs or drawing revisions were made to correct the discrepancy. Based on our sampling review of the observations and CECo's responses to the observations, the staff concludes that except for the three findings discussed above, the observations appear to be minor in nature from a design standpoint and do not result in significant safety concerns.

Materials Engineering

There have been questions raised that materials specified by S&L had not been properly procured by Zack. There were instances of materials furnished to commercial standards rather than to the ASTM Specifications required by S&L. Evidence was also provided that material was ordered by Zack to commercial standards rather than to the S&L specifications and was furnished as ordered. However, it should be noted that the materials specified for ductwork and hangers are the same as those used in typical commercial and industrial application. The possible impact of the HVAC material control of Zack is not as severe as a similar loss of control would be in other systems because of the specified materials used in the fabrication of the HVAC systems are of such low strength that even materials not purchased to a required specification would be adequate. The maximum design stress level is conservatively 18,000 psi as stated above. The strength level of the lowest grade of galvanized sheet metal and structural shapes available exceeds this value without exception. Indeed, some of the specifications (e.g., ASTM-A 527 and A 575) have no mechanical property requirements. Some of the specifications (e.g., ASTM-A 575) that are called out by S&L are for "merchant quality" which is about as low grade material available on a specification.

Generally speaking, the yield strength of a hot rolled mild steel is about 35,000 psi. Substitution of steel at lower carbon content (such as using ASTM-A 575 grades 1015 or 1010 for ASTM-A 36) will provide a material with a yield strength in the range of 30,000 to 35,000 psi. Data available from material tested by a Zack vendor show that the yield strength of Grade M 1008 is only as low as 34,000 psi. It would be rare indeed to obtain material with a yield strength of less than 30,000 psi. Similarly, the use of low carbon cold rolled bar for fastener materials for those specifications requiring higher carbon hot rolled material provides adequate properties.

To verify the grade of material installed by Zack, both CECo and the NRC staff conducted material tests. CECo's test compared the carbon content with the allowables per the ASTM specifications. Of those found unacceptable on the first test, a second test was conducted by CECo and the material was found to be acceptable based on the retests. Otherwise, all samples were confirmed as being of the proper type of material.

The NRC staff initially had chemical tests conducted on samples removed from ductwork, hangers, duct stiffeners, companion flanges and nuts and bolts. Subsequently, hardness tests were performed to obtain inferred tensile strength since the samples were not large enough to perform the tensile strength tests. C. F. Braun requested for the chemical tests from the staff, and the staff submitted the requested information. At the time of this request, data from 48* samples were submitted to C. F. Braun. C. F. Braun concluded from the quantity and variety of the samples tested provided a representative sample of the material used to fabricate and erect the entire HVAC system. The results of these tests were analyzed by C. F. Braun's structural engineer and the material specialist. The evaluation by C. F. Braun of these tests indicated that:

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*Subsequently, additional samples were taken by the staff. See Appendix A in this report for the staff evaluation.

1. Several samples did not conform to the chemical requirements for heat analysis but were found acceptable.
2. Although the carbon content for the A 563 nut was questionable, as it seemed unreasonably low for a carbon steel nut with a proof load strength of 97,000 psi, C. F. Braun found it acceptable.
3. Samples analyzed for the NRC staff were found out of tolerance; however, ASTM specification A29, General Requirements for Steel Bars, Carbon and Alloy, Hot-Wrought and Cold-Finished contains the following statement, "4.3.1 Merchant quality carbon bar steel is not subject to rejection for product analysis unless misapplication of a heat is clearly indicated." Based on the above statement, these samples were acceptable.
4. All of these samples for which tensile strengths were obtained indicated tensile strengths that exceeded the minimum requirements.

C. F. Braun concluded that the materials utilized in the fabrication and installation of the La Salle HVAC system, are in general conformance with applicable codes and standards and that they satisfy the intent of the design documents.

Evidence presented indicates that the materials specified by S&L in the HVAC design have been substituted by materials of differing composition. However, it appears that this has been done at little sacrifice in strength. Because the classes of materials specified are those requiring relatively low control and inspection, there appears that there is little loss in overall quality. Indeed, in many cases, the difference between the specified material and the ordered material is a test report or certificate which would have cost extra. C. F. Braun, however, did not acknowledge in their discussion the effect on stress corrosion behavior of the indicated high tensile strength for the A 307 bolt tabulated in Appendix L "Results of Sample Analysis" received from NRC 10/07/82. The low potential for stress corrosion failure for a bolt of this strength level was probably not considered to be a valid concern.

Based on the staff's review of this final report, the staff concludes that C. F. Braun has satisfactorily evaluated the substitution of commercial material by Zack for those specified by S&L. Further, the evaluation of the material issue for the class of material involved is sufficient since most of the material is tough and ductile. The staff concludes that the high tensile strength of A 307 bolt does not present a high potential for stress corrosion failure. The staff also believes that C. F. Braun exercised reasonable judgement in resolving potential safety concerns identified in their observations.

Functional Adequacy of HVAC System

We reviewed those portions of the C. F. Braun final report that deal specifically with reviews to verify the functional adequacy of the HVAC system. These reviews included inspections of leak rate, air balance and preoperating test results and component operability verifications. We also performed an audit review of the inspection reports as they pertain to observations/findings as defined in this report, relative to HVAC system function and component operability.

C. F. Braun's review of leak rate and air balance test results performed by Fluid Engineering Services, a subcontractor to Zack, against the S&L design documents concluded that leakage and air flow was within acceptable limits for the various HVAC subsystems with some exceptions. C. F. Braun concluded that the subcontractor utilized an acceptable means of determining leakage for the system duct sections based on an allowable design leakage of 1% of total system air flow. Leakage was found to be within engineering limits specified for each HVAC subsystem. In addition, during the performance of the secondary leak rate test of the reactor building by CECo startup personnel, it was determined that an

acceptable leakage rate was obtained for the required supply and exhaust portions of the reactor building vent system as the standby gas treatment system was able to maintain a proper negative pressure within the secondary containment. The air balance test results identified flow rates which were not within design limits for certain plant areas. These showed lower than design air flows for fans in the control room HVAC system, auxiliary electric equipment room HVAC system, and switchgear heat removal ventilation system. However, C. F. Braun's investigation of the nonconformance reports written against the low flow rates indicated satisfactory resolution, and system design changes had been provided by S&L for the affected systems which permitted acceptance of the flow without compromising the system's safety function. Air balance test results for the diesel generator ventilation system and cubicle coolers for the diesel generator building pump room, residual heat removal pump room, high pressure core spray pump room, and low pressure core spray pump room indicated that these systems operate as designed.

C. F. Braun's survey of the preoperational tests for the control room HVAC system and auxiliary electric equipment room HVAC system, performed by CECo to verify proper system operation in its various design modes, indicated that discrepancies had been identified but were properly handled by CECo. CECo established a procedure for identifying, tracking, and resolving deficiencies noted prior to releasing the systems for testing and adding those encountered during performance of the testing. Major deficiencies discovered were satisfactorily resolved by CECo QA and operating groups. Certain minor deficiencies were still unresolved but were deferred by CECo for future resolution, thus allowing the system to be released to operating control. These items do not affect the Zack scope of work. C. F. Braun determined that the preoperational tests verified that the systems would function satisfactorily subject to the CECo agreed upon qualifications. The preoperational testing of the refrigerant piping system was also reviewed and satisfactory results were confirmed by C. F. Braun.

C. F. Braun also inspected HVAC system components and verified acceptable equipment operation. C. F. Braun's inspections uncovered no observations/findings of a potential safety concern involving the functional capability of the HVAC system. Based on these inspections and the satisfactory conclusions from the review of the leak rate, air balance, and preoperational testing, C. F. Braun determined that no further HVAC system testing was necessary. We concur with this recommendation based on our review of the C. F. Braun final report.

## CONCLUSIONS

Based on our review of the independent HVAC review final report, the NRC staff concludes that an extensive review was performed by C. F. Braun to verify that the HVAC installation was in accordance with the specified design documents. The staff also believes that C. F. Braun exercised reasonable judgement in resolving potential safety concerns identified in their findings. The staff further concludes that C. F. Braun has satisfied their commitments to evaluate significant "as-built" design changes that had the potential to result in safety concerns, against the design documents.

Finally, our review with those aspects concerning verification of proper functional capability indicates that the independent review has provided reasonable assurance that the HVAC system is capable of performing its intended safety functions in accordance with the original design and is, therefore, acceptable. Hence, the staff concludes that the independent design review provides assurance that the La Salle HVAC systems are installed in accordance with the specified design requirements, and consequently there is no justification for restricting the power level of the facility to less than full power.

GOVERNMENT ACCOUNTABILITY PROJECT
Institute for Policy Studies
1901 Que Street, N.W., Washington, D.C. 20009 (202) 234-9382

November 19, 1982

Mr. Harold P. Denton
Office of Nuclear Reactor Regulation
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Re: C. F. Braun Independent Audit
LaSalle Nuclear Power Plant

Dear Mr. Denton:

On November 9, 1982, we received a four-volume report of the C. F. Braun Company's independent analysis of the heating, ventilation, air conditioning system (HVAC system) at the LaSalle Nuclear Power Station in Illinois.

Although we are submitting a report to your office today, we must point out that it is an interim report. We have detailed our concerns, and in some cases provided some detailed justification for those concerns. We were not able to get back to the two Zack witnesses, Mr. Terry Howard and Ms. Sharon Marello, whose input into this analysis is critical.

Our final report will contain those comments, a review of the Commonwealth Edison Company's (CECo) failures to identify the HVAC quality assurance violations, and a more detailed justification of the items highlighted in this report.

Within the context of this interim report by the Government Accountability Project (GAP) is a request for further specific information not included or discovered within the C. F. Braun four-volume report.

It is imperative for our consultants and staff to have this additional information in order to draw final conclusions about the reliability of this audit and the implications of the findings affecting the safety of the public and of the site employees.

Our interim findings follow.

The C.F. Braun independent review of the safety-related and seismic supported non-safety related systems at LaSalle comes to the conclusion that the "installation by the Zack Company is in accordance with the Sargent and Lundy design and the workmanship to be of adequate quality."

The Government Accountability Project takes general and specific exception to this conclusion. We urge the Nuclear Regulatory Commission Office of Nuclear Reactor Regulation to take a number of specific actions in response to this audit:

1) Require Commonwealth Edison to recall C.F. Braun; modify the terms of Brawn's contract, and continue with the probe at the La Salle facility. The scope of their work simply must include a more comprehensive view of the safety systems at the facility.

2) Restrict the La Salle license to 48% power until there is further work done to identify the Zack errors that need to be repaired, replaced, or reworked, and that required repairs are completed.

3) Request Region III to consider enforcement action against Commonwealth Edison for failing to adequately supervise subcontractor in their procurement and supply of materials to be used in the plant.

4) Assign a Region IV vendor inspector to audit/review these conclusions in the light of specific C.F. Braun statements which disregard 10 CFR 50, Appendix B.

5) To consider this letter as an interim report, prepared for your immediate consideration. A more detailed analysis of the specific Zack allegations, as well as review by Zack Nuclear witnesses will follow this report by a few days.

As you are aware we are specifically engaged in both the Midland and the Zimmer plants--both of which are in intensely active stages of NRC involvement. At the William H. Zimmer plant in Ohio, GAP Legal Director Tom Devine is working with officers of the Federal Bureau of Investigations to review the massive amounts of evidence and talk to nuclear witnesses. His comprehensive knowledge of the Zimmer plant is irreplacable and therefore he has been delayed from finishing the significant portions of his analysis.

Bille Garde, Director of GAPs Citizens Clinic has been equally as involved in the investigation of the Midland Nuclear Plant in Midland, Michigan. The GAP investigation on the Midland site has become a full scale probe, and as you are aware this is a particularly critical time period at Midland.

Further, those experts and analysts who have made their services available to GAP have had only a very short time period to deal with an incredible amount of almost totally unorganized raw data.

The first opportunity that was provided for us to review this four-volume report came last Tuesday, after GAP had contacted the NRC to receive a copy of the C.F. Braun study. We understand that there was a September 5th interim report provided to the NRC, of which we did not receive a copy; and that other individuals in the press and Illinois received copies as much as ten days prior to our receipt of the final copy. This oversight unfortunately has caused unnecessary delay and expense for all parties.

However, the most significant delay in finishing our analysis has come from the shocking conclusions reached by the C.F. Braun audit team. It has left us no option but to go back into the raw data of the report --almost item by item -- to scrutinize each conclusion reached by Braun. The NRR staff can expect our final analysis no later than Tuesday, November 23, 1982.

Critique of C.F. Braun Summary

The following comments summarize the major flaws that GAP analysts have found to date in the C. F. Braun audit of Zack's work at the LaSalle Nuclear Power Station near LaSalle, Illinois. Further development of each item will follow in our expanded response to the C. F. Braun assessment.

1. The methodology employed by C. F. Braun in selecting the hangers, ducts, and other pieces of equipment invalidate the conclusions.

During the August 24, 1982 Region III meeting, and in his September 4, 1982 letter, GAP warned that the criteria to select items for the audit could prejudice the project. Unfortunately, our concerns were realized.

In our opinion, it is clear that the study's conclusions were biased by the sample. Expert industrial quality control analysts contacted by GAP reiterate that for any sample to validly reflect the entire population (in this case total number of hardware items), that sample must be randomly selected from the entire range of possibilities. C. F. Braun did not employ this basic industry quality assurance standard. The "Summary of Work" is clear; the selection process is subjective:

> These selections for inspection were made based on their own engineering knowledge and experience in conjunction with some basic guidelines as follows.

If Braun intended to limit its review to less than a 100% inspection effort, it should have employed a random selection process for all pieces of equipment reviewed -- not for just a few systems.

The consequences of Braun's risk are extremely serious. The NRC and the public are left with only two options:

1) Reject the Braun report because of a basic generic flaw in its methodology; or

2) Accept the Braun report, pretend that it was a valid assessment and do an analysis of the conclusions based on the mythical assumption.

After several consultations with nuclear power analysts, statisticians, and industrial quality control professionals, it became clear that the only option available to the NRC is to reject this report's general conclusions. In fact, it was the unanimous opinion of the analysts we contacted that without a random sample the conclusions are meaningless. As one person put it: "Virtually all of the techniques used to analyze data require that this data be obtained in accordance with well-specified rules of random sampling."

Although it would have been reasonable to conclude our review with a rejection of the Braun assessment purely on the grounds of a flawed methodology, we nevertheless proceeded with our own assessment. Our review, however, should not imply that we accept the 335 selected pieces of HVAC equipment as a valid sample.

Despite the conclusions, the substance of the Braun report confirms Mr. Howard's and Ms. Morello's concerns. It demonstrates that GAP's initial reservations about the weaknesses of the audit were well-founded. In fact, each unresolved concern raised by GAP in the series of meetings and correspondence surrounding the beginning of Braun's work has proved to be a forewarning.

2. Of the 335 pieces of equipment reviewed, Braun concluded that 34% (117 items) had discrepancies of varying significance.

The extrapolation of a 34% error rate to the entire HVAC system at the LaSalle plant is frightening. What remains even more frightening is the significance that this error rate has for the rest of the HVAC system. If the Braun sample truly is representative, clearly one-third of the HVAC system at LaSalle is in a discrepant condition.

One NRC inspector estimated that there are 45,000 potential pieces of HVAC equipment (safety and non-safety) on the LaSalle site. Because it has been impossible to turn up more realistic data, that number is offered merely to illustrate the significance of Braun's audit findings. A 100% review of the 45,000 pieces could

predictably produce 900 "findings," 30,600 observations, and only 12,150 non-discrepant conditions. Given that the 335 pieces actually used reflected a biased sample, it is probable that the actual review would produce even worse results.

In order to produce a more accurate assessment, GAP analysts need significant additional information missing from the current version of the report --

1) The total number of pieces of HVAC equipment on the LaSalle site, broken down by safety or non-safety related functions;

2) The total number of pieces in each system, rather than just the percentage of hangers in the system that were reviewed;

3) The total number of possible "finding" if all potential safety-related defects were actualized; and

4) In each instance, the variance for acceptable limits of error as specified by the approved design.

The most dramatic example of C. F. Braun's disrespect for NRC regulations is evident in the study's conclusions on welder qualifications:

> The Zack welding performance qualification records (PQR) were reviewed. Although some PQRs are incomplete, Braun does not feel that this degrades the welding program since Zack was not required to conform to a specific code or standard. It has been determined that the weld quality is consistent on all supports regardless of who performed the welding.

Clearly, the Nuclear Regulatory Commission cannot accept Zack's willingness to waive nuclear safety laws. First, Braun's observation that "Zack was not required to conform to a specific code or standard" is simply wrong. The Atomic Energy Act requires welders to be qualified. Regardless of Braun's conclusion that "all is well" despite an inability to prove welder qualifications, 10 C.F.R. 50, Appendix B, Criterion II is clear that personnel participating in a quality assurance program must be properly trained and qualified. The only way to avoid this requirement would be to remove safety-related HVAC welding from QA coverage -- an illegal loophole that Braun tacitly accepts.

At Zimmer the problem of welders whose qualifications could not be verified has led to severe enforcement action, including a massive recertification program. Continuing doubts about proof of welder qualifications played a major role in the

Commission's November 12, 1982 shutdown of the facility.

In the documentation provided in the Braun report there is little room for doubt about the qualification of Zack's welders.

In the September 14, 1982 review, of the 111 welders tested 42 failed the test; in the second round of tests given in early October, 24 of 123 failed to qualify. Even in the final qualification review on October 26, 1982, there were 12 unqualified welders from the 52 tested.

Braun's "feeling" that the lack of qualification for Zack's welders does not degrade the welding program casts serious doubt on all of Braun's assessments. It should not be necessary to debate that weld quality has a significant relationship to the verifiable qualifications of individual welders.

Other examples of major flaws that we have discovered within the Braun assessment are highlighted below:

1) It is apparent that numerous design changes, designer justifications, and changes in the drawings resulted from the errors found.

It is not clear that the initially approved NRC design was significantly changed as a result of hundreds of changes, revisions, and resolutions. Further, in most cases, Braun did not analyze the Sargent & Lundy justification; Braun merely accepted at face value whatever S&L concluded.

2) A review of the Inspection Report log reveals that out of 335 alleged system inspections 7 pieces that were covered by the sample did not receive full inspections.

The comment, "Hanger could not be inspected due to location," was noted for S-978, S-964, S-987, S-986, S-973, S-1327 and S-1332. So even the number 335 is not an accurate reflection of what was inspected.

3) There are numerous examples of Braun conclusions based on CECo's regularly scheduled tests or start-up tests.

As we had feared, the Braun audit appears to amount to little more than an industry rubber stamp.

4) It is not clear how many findings were reported to the Braun Internal Review Committee and Commonwealth Edison Company from the site team.

We do know that eventually three were reported to the NRC; however, since there were two levels of review prior to NRC notification, it is impossible to determine whether more of the observations were being considered as findings.

5) On page 23 of the summary there is an interesting but significant typographical error.

The second paragraph has obviously been "doctored." It is unclear by whom the changes were made. The [illegible] of the doctoring appears to be to remove certain statements [illegible] the Zack non-conformance reporting system. We would like [illegible] st that the NRC review the initial page 23 -- prior to de[illegible] and make a determination of what was removed, why an[illegible] this unfortunate slip-up reveals last-minute company [illegible] the Braun report and undermines the credibility which [illegible] supposed to guarantee.

The substance of Braun's comments suggests that the numerous Zack nonconformance reports should have been Quality Control Inspection Reports. Our experience with duplicate NR forms leads us to strongly disagree with this Braun conclusion. (At Zimmer, there was a similar change made to undermine the NR procedure. This replacement procedure contributed significantly to the plant's condition being "indeterminate.")

6) Other observations that our staff has made that will be further developed in our final report are listed below:

-- The lack of organizational independence of C.F. Braun from CECo.

-- The lack of informational independence of C.F. Braun from CECo.

-- The failure of C.F. Braun to make independent evaluations of CECo and S&L judgement.

-- The failure of C.F. Braun to extend the size of the sample after discovering critical problems.

-- The failure of C.F. Braun to follow through with disposition of their findings.

-- The failure to cite relevant professional code requirements to justify their procedures.

-- The failure to justify their conclusions with relevant professiona code requirements.

-- The absence of hardware tests.

-- The non-specific quantification of the numbers reviewed.

-- The reliance of C.F. Braun on Zack, S&L, and CECo tests and analysis.

FAILURE TO ADDRESS SPECIFIC ISSUES RAISED BY THE WHISTLEBLOWERS

The extraordinary remedy that created Braun's review is the direct result of whistleblowing disclosures from Mr. Howard, Ms. Marello, Mr. Ronald Perry and other former employees of the Zack Corporation. If subjective assessments are to replace standard statistical sampling techniques, no opinions come with better credentials than theirs. Unfortunately, Braun chose not to even attempt token communication with the whistleblowers, despite their announced eagerness to assist. As a result, Braun's report does not even report to address the specific concerns targeted by those responsible for the probe.

To illustrate, the report failed to --

1) guarantee that all relevant Nonconformance Reports ("NCR") were reviewed. Although the report discussed a review of 1756 NCR's; fewer than Mr. Howard and Ms. Marello estimated were included in the scope of their equivalent effort, and fewer than the 2200 figure that Braun concedes it received.

2) review and establish current HVAC site specifications at Lasalle, which were unknown to Zack when certain materials were originally purchased.

3) items never reached by the still-incomplete Zack internal document review.

4) target items covered in the suspect February 1982 CECo audit which Mr. Perry challenged.

5) all site records generated after January 1982, when Sargent and Lundy ceased indpendent reviews of Zack site documentation.

6) purchase orders from unapproved vendors, either because they never qualified for or were removed from the Approved Vendors List.

7) purchase orders where there is evidence of questionable records alteration or forgery.

CONCLUSION

To some extent the explanation for the flaws in the Braun

report is that the NRC exercised only token oversight. While CECo audited the "independent" reviewers, NRC site supervision was limited to one visit by one inspector. While staff priorities are understandable, the net result is that this third party report cannot legitimately serve as the basis for any final regulatory decision on Lasalle. The necessary facts will not be in until the staff releases its own reports.

If anything, the substance of the Braun findings are both ominous and understated in the extreme. Despite its mandate, Braun produced a paperwork review of a paperwork breakdown. It relied extensively on factfinding from the targets of the inquiry. It accepted at face value the suspect design changes approved without question by Sargent and Lundy, which rewrote the design requirements as needed to "legalize" Zack's violations. To approve full power for Lasalle on the basis of this report would represent a regulatory decision in spite of the facts.

Sincerely,

Thomas Devine
Legal Director

Billie Garde
Citizens Clinic Director

cc: Mr. Thomas Novak

TD:BG/my