

November 30, 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 behalf of our clients, Mr. Albert T. Howard and Ms. Sharon Mareello, the Government Accountability Project ("GAP") submits the following report to the Office of Nuclear Reactor Regulation ("NRR"). This report supplements our November 19, 1982 submission. We recommend that you refrain from issuing a full-power license to the LaSalle Nuclear Power Station (Unit I) in LaSalle County, Illinois on the basis of the October 27 report submitted by C.F. Braun and Company ("Braun report"). Instead, we urge that you additionally consider other more specific recommendations in the body of this report.

GAP is a non-profit, non-partisan public interest organization that assists federal and corporate employees who report illegal, wasteful, or improper activities by their agencies or organizations. GAP also monitors governmental reforms, offers its expertise about personnel issues to Executive Branch officials and agencies, responds to Congressional requests for analysis of issues related to accountable government and disseminates significant information about problems to appropriate offices within the government.

Our requests and recommendations are based on a detailed staff analysis of the C.F. Braun report, the review and analysis of the Zack witnesses who first exposed this problem to the NRC and the public, and statistical analytical review by several expert consultants. We have incorporated their comments into the body of this report.

Our review of the recently issued C.F. Braun assessment of the Heating, Ventilating, and Air Conditioning System at the LaSalle Nuclear Power Station indicates that their assessment was neither statistically valid, nor judgementally sound. Further, that the conclusions reached by Braun largely do not correspond to the facts presented in the raw data, and that the raw data itself has large credibility gaps. In short, the Braun

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report as it stands does not even succeed as a paperwork answer to a paperwork problem. Quite simply, it fails to offer a response to our client's challenge that is sufficient to resolve the concerns that previously led to postponement of full power authorization. In short, the Braun report fails to answer the safety-related questions raised by Mr. Howard and Ms. Mareello. Unless the NRC plans to modify the Commission's previous licensing conditions, this report fails to provide the grounds for full power authorization.

I. ZACK ALLEGATIONS

Background

In the fall of 1981 the Chicago based Zack Company, a Heating, Ventilating and Air Conditioning ("HVAC") contractor, hired Ms. Mareello, Mr. Howard, and a number of other individuals to establish a Quality Assurance Documentation Control office. Their assignment was to insure that the Zack Company had a Documentation Department that complied with 10 C.F.R. 50, Appendix B, the American National Standards Institute ("ANSI") codes, and the contract specifications of their various clients in nuclear business. Their specific assignment was to control the documentation -- purchase orders ("P.O.'s"), material certifications ("certs"), material traceability records ("M.T.R."), and certificates of conformance ("C.C."). This involved the monitoring of over 3000 purchase order "packages." Each package represented the proof of quality for up to thousands of items used to construct the Clinton, LaSalle or Midland nuclear power stations.

Mr. Howard was hired as the Documentation Control Room Supervisor in the fall of 1981. Ms. Mareello was a clerk. They, and the three or four other Documentation Control Room employees were allowed -- in fact assigned -- to investigate documents contained in Zack's files. Their task was to verify the accuracy, or identify the inaccuracies to the purchase order packages. This task gave them free access to the Zack files, and also placed them in a good position to observe the "paperwork trail" of Zack's nuclear documents.

From approximately November 1981 to April 1982, Ms. Mareello and Mr. Howard discovered and challenged a quality assurance breakdown that left reliability of HVAC systems, and the overall QA programs at three nuclear plant sites in serious question. Their experience reflected a contractor operating for years without regard for the Atomic Energy Act, and consequently the public health and safety.

In their employment with the Zack Company they discovered documentation that had altered specifications, some with "white out," missing certifications, purchase orders with no ASTM specifications, purchase orders changed to reflect correct quality assurance approval, and adhesive stickers with questionable authenticity, used to modify documentation and reflect the correct standards. They also uncovered top-level Zack management attempts to convince vendors -- with some success -- to provide inaccurate quality and traceability certifications after-the-fact.

Both Mr. Howard and Ms. Mareello worked in the Document Control Room at the Zack headquarters. Although they received no formalized Quality Assurance training, they, and the rest of the QA department, did become familiar with the various codes, contract specifications, and regulations that allegedly governed their work.

Subsequent to their challenge of the QA breakdown Mr. Howard and his staff suffered a pattern of harassment and intimidation. As Zack strove unsuccessfully to meet unrealistic time demands imposed by Commonwealth Edison ("Com Ed"), the pressure increased. Unfortunately the pressure and subcontractor "rush job" has caused more time delays.

In August 1981, Zack had notified the utilities of a potential non-conforming condition under 10 C.F.R. §50.55(e), due to inadequate and inaccurate quality and identification records on vendor purchases. They also attached a Corrective Action Report ("CAR") plan which outlined Zack's intention to identify, analyze and correct all the paperwork problems at the company headquarters. This CAR also outlined the proposed steps Zack would take to insure that the proper individuals responsible for this were appropriately disciplined.

As pressure mounted in early spring of 1982 to have the LaSalle nuclear plant load fuel, the QA department at Zack fell under greater pressure to close out nonconformance reports ("NCRs") that detailed the Zack QA documentation deficiencies at LaSalle. Mr. Howard refused to provide a final report to Com Ed. On March 1, Zack submitted 99 remaining NCRs to Com Ed. Zack warned it was unlikely that necessary documentation to correct deficiencies could be obtained. This frank admission did not deter the utility and NRC rush to begin operations at LaSalle. In April 1982 Com Ed received permission to load fuel.

On April 13 and 15, 1982 Mr. Howard, acting as a spokesman for the entire Zack Quality Assurance department, contacted an individual in the Consumers Power Company's Midland Project Quality Assurance department. This individual had represented to Mr. Howard and other members of the department that they should feel free to bring any allegations or problems at Zack to Midland's internal grievance system. He also guaranteed them confidentiality and protection from losing their jobs.

On April 18, 19 and 20, an audit team from Consumers and the Bechtel Corporation arrived in the Chicago office. The QA department anticipated a complete investigation and professional support for its effort. However, on April 30 the entire department was dismissed.

On May 3, 1982, the first working day following the purge, Mr. Howard began a series of contacts with Region III. He provided specific allegations about LaSalle and to a lesser extent Midland and Clinton, evidence and his offer of full cooperation with an NRC investigation. However, nothing happened. After 2½ months, when Mr. Howard and the others realized the NRC was not going to respond to their allegations, which had cost them their jobs, they took their information to the press and then to GAP.

On July 19, 1982 at a public meeting between the NRC, Com Ed, the Illinois Attorney General's office, and representatives of the public including

GAP Mr. James Keppler, Region III Administrator, acknowledged that the Zack allegations had not been pursued in the special investigation ongoing at LaSalle. Yet, Region III also reported prior to even reviewing the complete Zack allegations -- that "...it is our conclusion that no reason exists to preclude the LaSalle Unit 1 from going beyond zero power."

One week later, the NRC Commissioners overrode Mr. Keppler's recommendation. Following receipt of Mr. and Howard and Ms. Mareello's July 26, 1982 whistleblowing disclosure which included three affidavits, numerous memoranda, and attachments -- the Commission delayed licensing the LaSalle plant until the NRC staff had a more accurate assessment of the Zack allegations and their safety implications.

- In a July 26, 1982 cover letter to NRC Chairman Nunzio Palladino, GAP described the efforts of the Zack witnesses, the Quality Assurance breakdown at Zack, and the evidence supplied by the former Zack employees. GAP also outlined the inadequate NRC oversight that severely compounded the HVAC problems on all three sites. Finally, GAP presented three specific requests to the NRC Commissioners"

(1) Require the NRC to conduct a full investigation of the whistleblowers' evidence before permitting full power operations at the facility.

(2) Require the Office of Investigations ("OI") to replace Region III in its ongoing investigation.

(3) Require the Office of Inspector and Auditor ("OIA") to investigate the performance of Region III's Office of Inspection and Enforcement.

Unfortunately, the recommendations we identified for immediate action were not followed. The Commission conditioned license approval on a positive evaluation of investigations into Mr. Howard and Ms. Mareello's disclosure that led to the Braun report. But the NRC staff has pursued a "hands off" policy in monitoring the third party effort. In light of the C.F. Braun audit this may have proven to be a mistake.

Further, although OI has not yet completed its work, we are skeptical of the framework for its investigation. The Region III OI investigator, Mr. James Foster, conducting the Zack investigation is one of the same former IE inspectors who failed to take any action when Mr. Howard presented his initial complaint in May. Although the acronyms are different, Mr. Foster still is providing a second opinion to his own previous exoneration of Zack at LaSalle.

Finally, we are unaware of any OIA investigation into Region III IE's failure to pursue serious health and safety allegations.

On August 11, 1982 GAP representatives, Mr. Howard and Ms. Mareello, inter alia, participated in a Region III meeting in which Com Ed proposed C.F. Braun and Company ("Braun") to conduct the independent investigation and corrective action program on design implications from the Zack whistleblowing disclosure.

In an August 13, 1982 letter we presented our comments on the proposed Braun audit of LaSalle. After a second meeting on August 24, 1982, we submitted further comments in a September 4, 1982 letter. Our concerns of August and September about the flaws in the proposed Braun assessment obviously were well-justified.

On November 9, 1982 we received a four volume report of the C.F. Braun Company's independent analysis of the HVAC system at La Salle.

A November 19, 1982 GAP Interim Report summarized, and in some cases provides detailed justification, for our concerns. In our November 19, 1982 letter we urged the Nuclear Regulatory Commission Office of Nuclear Reactor Regulation ("NRR") to take a number of specific actions in response to the Braun report as submitted:

- (1) Require CECO to recall C.F. Braun to continue with the LaSalle HVAC review.
- (2) Restrict the LaSalle license to 48% power.
- (3) Request Region III to consider enforcement action against CECO for failing to supervise subcontractor work.
- (4) Assign a Region IV vendor inspector to audit/review Braun's conclusions in light of specific C.F. Braun statements which disregard 10 C.F.R. 50, Appendix B.

We reinforce those requests in this report. In particular, we take serious exception to any consideration of allowing LaSalle to go to full power prior to a complete resolution of the safety concerns at LaSalle. Our current analysis follows.

II. SUMMARY OF BRAUN FINDINGS

Although the Braun report found that Zack's alleged quality assurance ("QA") breakdown did not have a significant hardware effect, that conclusion does not match the detailed findings in the body of the report. Overall, Braun stated that it found discrepancies in 117 out of 335 inspections, a 34% rate. CECO agreed to repair 46 items, and twenty-four Sargent and Lundy ("S&L") drawings had to be revised to match the as-built condition. The report also noted that five welds out of 65 failed visual tests on September 1, 1982. The report noted "some" incomplete welding qualification record deficiencies. (Report, at 7, 18.)

These overall statistics are misleading. They understate the extent and rate of identified deficiencies. Initially, our review of Braun QC-1 inspection reports found that 28 out of the 335 inspections were voided or cancelled completely. In another 61 instances the inspections were only partially completed because of inaccessibility, due to location or high

radiation levels. Further, the 117 inspection reports that cited design violations involved 193 individual discrepancies.

Sixty three of the discrepancies involved missing or defective welds. The inspection reports generally did not provide specific quantification for the number of welds in each violation. But if each example of faulty "welds" only involved two, we can conservatively estimate that 98 welds were missing or deficient.

The body of the report concludes that seven Zack welding procedures were acceptable. But the correspondence in Appendix C indicates that two of the seven procedures were not qualified for all the positions in which they were used.

Appendix C quantifies what Braun meant by "some" missing welder qualification records. The statistical compilation attached to an October 5, 1982 memorandum in Appendix C shows 23 cases out of 113 where the welder performance qualification tests are not acceptable. The statistical attachment to an October 26, 1982 memorandum in Appendix C on 16 additional welders demonstrates that 12 position qualifications were unacceptable out of 52 reviewed. Most significantly, only seven of the 16 welders had acceptable qualification records for all the positions which they had previously been approved to perform.

As a result, a more accurate summary is that Braun found 193 discrepancies in 117 out of 307 relevant inspections, a 38% rate. Two welder procedures out of seven did not qualify unconditionally. In 35 cases out of 165, the records failed to prove the welders were qualified for relevant procedures, a 21% rate.

We have still understated the significance of what Braun found. For example, Braun switched its reporting system in the middle and stopped reporting violations for uncoated welds and missing welder identification for specific hardware. To illustrate the scope of these discrepancies that were defined -- out of the conclusions, we found 16 cases where there was no welder identification available for the material covered in the 335 originally-scheduled inspections, or about a 5% rate where the welds cannot be traced back to a particular craftsman. Braun conceded that it could not determine how much the as-built condition varied from the original approved design, because so many of the earlier revisions to drawings are missing. (Report, at 24.)

To say that these findings are not significant strains credulity. To illustrate the significance of Braun's inability to confirm the qualifications of craftsmen on 23% of the welding procedures, a similar case occurred at the Zimmer plant with 20% of the welders. At an October 28, 1982 public meeting Commissioner Gilinsky asked Region III official Dorwin Hunter if that failure rate was "highly unusual." Mr. Hunter replied, "It would be absolutely unusual." At Zimmer the finding sparked NRC action to

require a massive remedial program. Braun, by contrast, dismissed the entire concept of unverified welder qualifications as insignificant.

What is particularly unfortunate at LaSalle is that it is not even possible to draw reliable conclusions on the work performed by suspect welders, since some 5% of the weld inspections could not be traced to identifiable craftsmen. Significantly, ten of the 15 actual inspections that involved unidentified welders also led to findings of welding violations.

A survey of examples in the Braun report appendices removes any doubts as to the seriousness of HVAC hardware flaws at LaSalle. Examples where the as-built condition failed to match the design included-- items that were of insufficient thickness (QC1-78, 245); a hanger three feet away from the location on the available drawing (QC1-219); missing nuts, washers, door plugs and plates (QC1-88, 224, 238, 318, 335); and improper bolt spacing and projection (QC1-120); as well as numerous instances where the work was done in the wrong location or the drawings were not current.

Welding hardware problems included-- missing welds (QC1-29); partial welds and burn holes (QC1-177); cracked welds (QC1-25, 65); and welds with corrosion and porosity defects (QC1-117). To illustrate the conservative nature of our statistical summary to quantify the number of bad welds, the QC1 report disclosed that "most" welds in particular inspections had excessive corrosion (QC1-25) or porosity defects (QC1-117). One inspection report that did specify numbers identified ten cases of cracked or poor quality welds, with at least one and possibly two leaks (QC1-295).

The discrepancies were not limited to welding and inaccurate design problems. To illustrate, Braun found air leaks, including one around a valve (QC1-190); a hole in a duct (QC1-228); and eight holes in one inspection that had been "repaired" with tape (QC1-38).

It is particularly important that CECO's QA program had missed all of these discrepancies. Yet it was ready to vouch for the quality of the HVAC system as well as to recommend operating LaSalle at full power.

While Braun and the utility denigrate the significance of these findings, in our opinion they evidence violations of six out of 18 quality assurance criteria in 10 CFR 50, Appendix B-- II (personnel qualifications); III (design control); VI (Document control); XVI (corrective action); XVII (quality assurance records); and XVIII (audits). In short, to deny the significance of the discrepancies Braun identified is to deny the significance of 10 CFR 50, Appendix B. Braun's empirical findings (if not its conclusions) strongly support our call for NRC enforcement action against CECO.

III. FLAWS IN BRAUN REPORT

The findings summarized above are too serious to permit full power operation without further investigation. There is no question, however, that the report conclusions are flawed to the point that it severely underestimates both the scope and safety significance of the hardware defects. We have organized our critique into six areas-- 1) lack of informational independence; 2) lack of institutional independence; 3) faulty methodology for the scope and nature of fact-finding; 4) incomplete disclosure of results; 5) suspect subjective evaluations instead of conclusions supported by authoritative citations; and 6) failure to verify all necessary corrective actions. Our specific analysis follows.

A. Lack of informational independence.

In our September 4, 1982 comments on Braun's proposed program, we emphasized,

The point of this proposal is to provide a "fresh" look at the facts -- not to publish CECO's inspection and test results under Braun's signature. We do not contend that NRC-sponsored laboratory tests should be duplicated. But the results of previous CECO self-inspections should have no more than background significance.

Our emphasis on the necessity for Braun to provide a "fresh look" at Zack's work was consistent with Mr. Keppler's remarks at the August 24, 1982 public meeting to which the September 4 comments were addressed. Mr. Keppler further indicated that all of Zack's work should be considered suspect. Obviously that precaution applied to the Zack paperwork, whose reliability is the reason for the Braun project.

Unfortunately, Braun trampled on this suggested premise. The "independent" review in many cases was no more than a resummery of CECO and Zack's previous factfinding reports and tests. In fact, CECO overruled Braun's own factfinding on the basis of reinspections conducted by the utility's own construction department. In reality, the Braun report's conclusions do not even provide an independent factual record. A more accurate characterization of the report is that it contains the factual conclusions of Braun as accepted by CECO. Braun's own factfinding was preliminary at best, and subject to veto by the utility.

1) Braun relied entirely on the NRC and CECO for material tests of the HVAC ductwork and supports. When materials failed one CECO test, the utility tried again and passed the materials without exception. (Report, at 7, 14.) As a result, the "independent" organization did not conduct any material tests, or even the retests. The necessity of the third-party independent hardware tests is due to CECO's own previous inability to maintain adequate quality records.

Braun defaulted on this basic foundation of the program and turned it over to the utility.

2) Similarly, Braun did not conduct independent verification of CECO's pre-operational test results. The third party was satisfied with a paperwork review of CECO's records. There is no reference to any relevant field inspections to doublecheck the results on paper. (Report, at 22.)

3) Braun even relied upon tests conducted by Zack and its own subcontractors, again limiting itself to a paperwork review. For instance, Braun's investigation into leak rate and air flow balance was limited to restudying the tests conducted by Zack's own subcontractor. (Id., at 5-6, 20-21.) In other instances, Braun used Zack's measuring equipment or CECO's personnel to actually conduct the inspections and tests. (See QC2-88, 89.)

4) Braun apparently did not even collect its own records, or doublecheck to see if Zack truly provided all that was requested. As a result, the third party was content to report that six welding procedure specifications and 91 welder qualification records were "purported" to be all applicable documents. (Id., Appendix C.) In fact, the summary of the Braun report refers to seven welding procedure specifications. (Report, at 7.) In the end, Braun did not confirm that its review even covered all the relevant Zack records or whether any were missing -- apparently because Braun didn't check.

5) CECO's control of the final factfinding conclusions is illustrated by the disposition of Braun inspection reports. The utility rejected Braun discrepancies that had been supported by attached drawings, by referring to other drawings which CECO failed to include in the report. (See, e.g., QC2-64 and CECO response.) This means that the utility not only dominated the final factual conclusions, but left its empirical vetoes unverifiable.

6) In a number of instances CECO did not even turn to its own QA department to overrule Braun factfinders. The utility turned the job over to its own construction department, whose factual vetoes again were accepted as final without including the relevant reinspection records. (See, e.g., QC2-27, 55, and 75.)

7) In the most crude example, CECO even relied on Zack's previous damage reports to reverse Braun's inspectors on the extent of Zack's damage. CECO rejected one Braun observation, because Zack's records showed that reinforcement bars were only nicked, not severed, and nicking will not affect the strength.* In this instance, the lack of independence

*/This, of course, dilutes the standard used this July to assess the structural effects of nicked reinforcement bars outside the HVAC system, in response to charges leveled by the Illinois Attorney General and GAP. In that instance, Sargent and Lundy assumed that nicked rebars were severed, for its calculations in the absence of new tests to confirm the facts.

made the full cycle. Zack's records were used as the final answer to safety questions raised due to the questionable accuracy of Zack's records.

B. Lack of institutional independence.

CECo's organizational domination of Braun compromised the independence of the review as much as its informational domination. In our September 4, 1982 comments, we urged that as an HVAC design firm Braun should exercise independent judgment with respect to S&L design decisions. We also warned that Braun's role could be limited to that of an organizational research assistant if CECO totally controlled the technical evaluations of Braun's findings.

That is just what occurred, especially for the Braun quality control ("QC") inspectors who actually conducted the primary factfinding work. They were subject to an illegal gag order not to reveal what they learned. CECO added further pressure on the third party by auditing Braun during the course of the review. In the 34 cases where Braun observations were overruled by S&L design changes or CECO factual rejection, Braun accepted the vetoes without question. In short, the final conclusions represent the judgments of CECO and S&L, not Braun.

1) Initially, the groundrules for the project violated the independence of the personnel who conducted the review. Braun personnel assigned to the Zack project signed an agreement to "treat all information revealed" during their work as "confidential" and not to disclose it to anyone "except as directed by the Project Manager." (Report, Appendix H.) This means that Braun employees have agreed not to reveal illegalities or significant findings that may have been deleted from the final report -- even to the NRC. To the extent that information suppressed by this gag order could lead to an NRC investigation, its enforcement would be illegal. Disciplinary action against any employee who asserted his or her legal independence under the Atomic Energy Act could lead to severe sanctions, including fines or even license revocation. See 42 U.S.C. § 5851 and 47 Fed. Reg. 30452 (July 14, 1982).

2) CECO violated the basic groundrules of the project by auditing Braun during the review. CECO's action was an undisguised attempt at organizational bullying, and gave the utility premature access to raw Braun data before the results were in. As Braun stated,

At the meeting on August 17, it was clearly established that the C F Braun site program would not be subject to audit by the CECO Site Quality Assurance Group. This was agreed upon so that the C F Braun independence would not be compromised.

(Report, at 27.) Nevertheless, on September 10 CECO conducted what Braun has described as an "informal" audit for conformance with technical program requirements. Somehow Braun simultaneously concluded that

the audit did not cover "the Braun project and QA program." (Id.) That assertion is unverifiable since none of the CECO audit documents are included in the report. This organizational interference is inexcusable. If CECO had legitimate concerns, it should have gone to the NRC rather than taking matters into its own hands. At a minimum, the NRC should require CECO to explain its action, to disclose the results and Braun's response, and to produce all relevant records from the audit.

3) Braun chose not to question any instance where S&L responded to discrepancies by changing the design requirements. For instance, on October 18 in one sweep S&L eliminated 14 Braun observations about clips - in the wrong locations with a design change that allowed the clips to be located almost anywhere on the relevant item. Braun did not comment. (Report, at 7.) Similarly, when Braun found a generic deficiency where certain tubing was 25% too thin (3/16" instead of the required 1/4"), Sargent and Lundy responded with a generic design change allowing all the tubing to be as thin as it was in fact. Although it had originally deemed the discrepancy as significant for LaSalle's safety, Braun again concurred without comment. (Id., at 8.)

Braun's decision to sacrifice its independent judgment to that of Sargent and Lundy is particularly inappropriate, based on S&L's record at Zimmer. At that plant its engineering judgments endorsing the status quo have been overruled repeatedly by the American Society of Mechanical Engineers ("ASME") and the NRC. The judgment flaws were so severe that last November NRC Region III called for a generic evaluation of S&L's work by the NRC's vendor inspection team. (See IE Report 50-358/81-13.) At an October 26, 1982 enforcement conference, S&L representatives repeatedly disagreed with angry NRC inspectors who reported that S&L was designing the plant after the fact on the basis of "trial and error" to justify the existing construction deviations.

4) Braun also sacrificed its independent organizational judgment to CECO, again without question. Examples where CECO overruled Braun's judgment without challenge include observations against-- two welds with cracks and porosity (QC2-06); a bolt that is over 25% shorter than called for on the drawing (3" instead of 3-13/16"), on the basis of a previous nonconformance report (QC2-24); a hanger that CECO reported was stronger because the welder was in a difficult location than called for in S&L's original drawing, raising more questions about S&L's initial design judgments (QC2-31); missing welds (QC2-80, 85); horizontal members that are 3" long instead of 4" (QC2-91); members that are 3/16" thick instead of the required 1/4" (QC2-109); and a duct overhang that was off location by 3'5" (QC2-113).

In light of CECO's organizational domination of the judgments, as well as its control of the factfinding conclusions, there is almost no basis to conclude that Braun's report is an independent review. In fact, Braun was no more than a subcontractor, whose report is being publicly released. The reality of Braun's project simply did not match its mission to provide an independent structural check on the QA breakdown for Zack's HVAC work at LaSalle.

C. Faulty methodology for the scope and nature of factfinding.

Regardless of independence, a sound methodology is the necessary premise to have confidence that Braun's work could verify the safety of Zack's HVAC system. In our August 13, 1982 public comments, we urged that Braun disclose the selection criteria for its proposed methodology, and cite to relevant authorities to support its proposed QC inspection plan. We also urged that Braun consult with the whistleblowers to target items that are particularly suspect and may require hardware tests.

- Braun chose not to accept these suggestions, so our November 19 interim report severely criticized the methodology for lack of either a true random or an intelligently-targeted review of items whose quality is in question. Additionally, we are concerned that Braun chose not to increase the size of its inspection sample after finding a significant number of initial discrepancies. On balance, Braun's methodology was too limited and superficial to make conclusions about quality for a system where the paperwork fails to answer serious questions about the quality of materials and workmanship.

1) Initially, the Braun findings are compromised by definitions either nonexistent or so vague that they neutralize the significance of the report's conclusions on safety. For example, Braun limited its work on nonconformance reports to a review of whether the disposition was complete, and of "technical justification." Unfortunately, the report does not define what constitutes "technical justification." Most significant, to qualify as a potential safety concern, a design discrepancy had to qualify first as a confirmed "observation" and then as a "finding." Unfortunately, the definition of "finding" is circular-- "An observation which has been identified as a potential safety concern." The only additional criteria for the definition are that the observation requires "extensive repair" or is a "significant deviation" from the design. (Report, Appendix B-3.) In other words, there is no definition of what constitutes a safety concern. The safety conclusions in the Braun report are nearly totally subjective.

2) An analogous flaw is the failure to cite any authority for the QC inspection procedures used in the review. This omission undercuts the legitimacy of all Braun's conclusions. It is also in contrast to Braun's qualifications standards and audit procedures, which are referenced to 10 CFR 50, Appendix B and relevant professional standards. (Id., Appendix A.)

3) It should be no surprise that Braun failed to cite authority for its inspection procedures: the project was basically limited to visual inspections, which are too superficial to meet the difficult challenge of confirming quality for Zack's suspect work, or even as the sole technique in a normal QC inspection program. Braun failed to conduct or require any additional chemical or pull tests. It only

used Nondestructive Testing in rare instances, and did not take any radiographs.

These steps are essential to establish qualify when work has been performed by unidentified welders whose qualifications are erratic; or when material traceability can never be established due to records never generated or lost over time. In addition, visual inspections often uncover problems that require more intensive tests. (See, e.g., AC2-103, involving ducts which visual inspection found were distorted and discolored.) Finally, ASME § III requires either radiographs, penetrant tests or magnetic particle tests for all Class I materials. Mr. Howard informs us that his and Ms. Mareello's whistleblowing disclosure covered items for which the technical specifications used ASME Class I QA requirements. In sum, Braun's QC program diluted Zack's inspection standards in order to evaluate Zack's work.

4) Braun was also unable to verify that its methodology in fact matched the requirements of its own QC inspection procedures. In an October 4, 1982 audit report, Braun's J. S. Fiedler disclosed, "The improper use of the wrong revision number to inspection form QC-1 is very evident. It has been determined that we are not utilizing the instructions in the manner in which they are intended." (Report, Appendix K.) (See, e.g., QC1-325 for a questionable inspection which did not verify torque for anchor bolts.)

5) The flaws in the nature of Braun's methodology were matched by its scope. Initially, the criteria for selecting the sample remain a mystery in key instances. Braun failed to explain how it selected three HVAC systems for detailed review or why it picked that number, despite NRC questions on that topic at the August public meetings. Similarly, Braun explained that it would inspect for correctly-implemented disposition for 20% of nonconformance reports and FCR design modifications deemed "critical to safety." Unfortunately, there is no explanation of the standard to meet that criteria. (Report, at 10.) As a result, in some instances the selection criteria for the sample are as subjective and undefined as the evaluation standards.

6) There are grounds to doubt the adequacy of whatever criteria Braun chose to select its review sample, because it skipped significant background research necessary for effective targeting of suspect equipment. This flaw is in part due to Braun's failure to meet with Mr. Howard and Ms. Mareello to help select the sample, as we previously urged. It is verified by examining the scope of documents Braun used in its review. (Report, Appendix A.) The list fails to include the following documents, which Mr. Howard explains are necessary both for an informed selection of items, and a reliable evaluation of discrepancies-- a) the July 26, 1982 Howard-Mareello whistleblowing disclosure and all attachments; b) the technical specifications for Zack's HVAC contract; c) copies of the original material test reports originally used to verify quality; copies

of the Zack shop nonconformance reports, as opposed to just the field NCR's; applicable HVAC Purchase Orders; and relevant portions of Zack's contract for the HVAC system. As a result, Braun's methodology for scope and evaluation was too uninformed to be reliable, particularly in the absence of a truly random sample measured against normal evaluation standards.

7) One of the most basic flaws in Braun's methodology was the failure to expand the scope of its sample after identifying significant numbers of discrepancies. For example, when Braun was unable to prove the qualifications for more than 20% of welders, it should have inspected all the work of the suspect craftsmen. When NRC tests led to findings that from seven to ten material samples tested did not conform to chemical requirements or were of questionable tolerance, it should have expanded the sample. (Report, at 14.) Expanding the scope of review may have uncovered more generic deficiencies, such as the tubes in the drywell that were undersized and led to two "findings." (Report, at 28.) As a result, Braun's conclusions are only preliminary at best. The full extent of problems identified in the report remains unknown.

8) In at least one key instance even the scope of Braun's "sample" is not quantified. Braun dismissed the problem of welder qualifications as irrelevant with the following comment:

Braun has inspected approximately 250 welded hangers. Since each hanger consists of many members, Braun has inspected thousands of welds associated with these supports. Some by welders whose qualifications are complete and some with incomplete qualifications. Based on these inspections Braun has determined that the weld quality is consistent on all supports regardless of who performed the welding.

(Report, at 29.) Unfortunately, the passage did not cite to any particular appendix or referenced findings to support its somewhat incredible assessment. This is one of the most sensitive conclusions in the report, but the passage does not provide any specific empirical basis. As a result, Braun's conclusion has all the scientific reliability of a hunch.

9) Even where the size of the sample was known theoretically, Braun could not confirm that all the necessary inspections took place. As the checklist to an October 5, 1982 audit disclosed, "There is no way of checking to see if all inspections requested by HVAC have been performed." (Report, Appendix K.) Braun should be required to confirm if and how the inspections have been confirmed.

D. Incomplete disclosure of results.

The above analysis criticized CECO for rejecting Braun observations and findings without providing commensurate supporting documents to those it rejected. The problem of incomplete disclosure of necessary data and

evidence permeates the report. The result is misleading or unverifiable conclusions. The significance is to further illustrate why the Braun report, as released publicly, cannot support full power authorization for LaSalle. The conclusions cannot stand on their own.

1) The most common misleading tactic was to substitute loaded adjectives for objective data. For instance, the report refers to "isolated" cases of bad welds, "some" deficient welder qualification records, "some" bolts without necessary identification, and "most" nonconformance reports as only involving minor problems. (Report, at 7, 19, and 26.) Braun should have included the relevant statistics in the text or listed examples, and left the reader sufficiently informed to challenge Braun's adjectives.

2) In other instances, Braun failed to adequately describe the documents it did reference. For instance, Appendix A refers to Zack's NCR (nonconformance report) log as one of the documents reviewed. Mr. Howard explains, however, that Zack had two NCR logs, one for shop NCR's and another for those written in the field. This ambiguity explains his query whether Braun conducted the necessary review for both sets of Zack NCR's. (Supra, at 14.)

3) In other cases the report does not provide the specifics for impressive, but vague references. Braun dismissed the significance of 7 material samples that failed to conform to chemical requirements out of 48 tested by the NRC, because of "permissible variations for product analysis." (Report, at 14.) But the report fails to specify the permissible variations necessary to check the exoneration.

E. Suspect subjective evaluations, instead of conclusions supported by authoritative citations.

Previous sections of this report have criticized the Braun report's conclusions for lack of independence and failure to fully provide referenced documents. Whether Braun, CECO or S&L, however, in many instances the conclusions are totally unexplained, subjective evaluations. In other cases the judgments contradict 10 CFR 50, Appendix B or professional standards. In still other examples, the evaluations in the Braun report are internally inconsistent or contradictory. The errors involve such fundamental issues -- i.e., evaluation of chemical material tests, or the relevance of welder qualification records -- that they invalidate the report's blanket reassurances. In our August 13 comments we urged that Braun reference its evaluations to relevant professional codes. Its failure to do so fatally damaged the credibility of the conclusions.

1) As seen above, on the most casual of empirical studies Braun rejected the relevance of a widespread inability to verify welder qualifications. The QA basis for the conclusion is that both Zack

and S&L told Braun at a September 21, 1982 meeting that there was "no particular code or design specification" required for the HVAC welds. (Report, Appendix C.) This assertion literally defined-out 10 CFR 50, Appendix B, Criterion IX for the LaSalle HVAC system. It casts doubt upon Braun's judgment and independence that the third party apparently accepted the statement without challenge.

Further, Zack and S&L appear to have misinformed Braun. To illustrate, the notes to an August 18, 1980 CECO Surveillance Report (Attachment 1) cite repeated violations by Zack for failure to sufficiently review welder qualifications. Mr. Howard points out that his document review team at Zack examined welder qualification records, and notes that if the issue were irrelevant Zack would not have issued an August 2, 1982 potential 10 CFR 21 Report on weld records. In short, the Braun report offers the first evaluation that HVAC welding quality in general, and welder qualifications in particular, are exempt from normal QA standards.

2) Despite unsatisfactory chemical test results on 11 samples out of 48, Braun gave its seal of approval to all HVAC materials based on permissible variations. That conclusion was premature, however, under the ASTM standards to which Zack had been held by technical specifications prior to the Braun report. His enclosed analysis is based on research of the relevant ASTM standards. (Attachment 2.) It demonstrates that due to gaps in the scope of the reported test data (i.e., missing yield, mechanical and elongation data), only 27% of the material samples can be confirmed as acceptable.

3) Braun also based its material evaluations on misapplied standards. The report states that--

...materials specified for ductwork and hangers are the same as those used in typical commercial and industrial use. The maximum design stress level is conservatively 18 KSi. The lowest grade of galvanized sheet metal and structural shapes available exceeds this value without exception.

(Report, at 14.) Based on the standards used at Zack, however, Mr. Howard reports that Braun's evaluation is only accurate for ductwork, not hanger materials. The hangers were required to meet ASTM A36 standards, which specify minimums of 58 KSi for tensile strengths and 36,000 KSi for yield strength. Again, Braun either applied the wrong evaluation criteria or significantly diluted even Zack's standards.

4) In at least one instance Braun's evaluation is suspect because of unexplained shifts in judgment. To illustrate, a September 14, 1982 Braun memorandum stated that welding procedure WPS P-5 CS is not qualified for short arc welding. An October 6 Braun memorandum found the procedure acceptable, however, without explaining the change. (Report, Appendix C.)

5) In another case Braun's conclusion is not credible, because the appendices contradict the exoneration in the text. Braun concluded in the text that "i/n each case it was concluded that these procedures are acceptable." (Report, at 7.) The appendices, however, refer to at least two procedures that either were not qualified or of only limited acceptability. The flaws for one procedure, WPS P-6 CS, Rev. 7, illustrate the inaccuracies of Braun's conclusion:

Eleven of 14 tensile tests failed at less than the 50,000 psi minimum tensile strength required for the RCuSi-A filler metal (AWS 5.7). The two lowest tensile strengths reported were 30,200 and 35,800 psi. The base materials are not identified but the three specimens that broke in the parent metal failed at tensile strengths exceeding 50,000 psi.

(Report, Attachment C.)

6) Braun's Site Review Team ("SRT") had the responsibility to review all discrepancies uncovered by QC inspectors. The trend of suspect, unreferenced subjective evaluations was most severe at this level. The significance is that the SRT defined-out the safety significance of the inspectors' findings. A particularly common occurrence was to overrule without explanation the discrepancies found by inspectors. The evaluations need some explanation, since they overruled discrepancies such as welds that were 2.5" instead of the specified 5.5" (QC2-96) or accepted concave washers and oversized holes that admittedly represented "poor workmanship." (QC2-104.) In other cases the unexplained evaluations were inconsistent. (Compare QC2-70, 71 with QC2-73 for evaluation of missing bolts.) (See also QC1-03 and 18 for examples where the inspection supervisors overruled the inspector without explanation.)

7) In other cases the SRT's explanations are insufficient to justify the conclusions. For instance, in one example the inspector found that most of the welds were defective due to porosity. The SRT rejected the discrepancy with the explanation that there are more welds than necessary. (QC 2-54) But it failed to explain how many extra welds there are, or what the acceptable error rate is.

8) In numerous instances the SRT offered explanations of obvious credibility, in the absence of further information or authority. In one case the SRT decided that eight holes could be repaired with tape, because of where the leakage would flow. (QC 2--60) This explanation casts doubt on the necessity for any repairs in the first place. (See also QC 2-104, 107.) As with unexplained rejections, Braun's supervisors also offered weak explanations that confirm our earlier criticisms. For example, the Braun supervisor resolved one discrepancy with references to Zack documents that involved the "buyoff" of missing and faulty welds.

9) CECO's judgment, of course, was decisive. It was even more sketchy than Braun's SRT. For example, the utility rejected an observation on a duct with a 3'5" excessive overhang, without explanation. (QC 2-113) In numerous instances the utility dismissed Braun observations solely based upon the following versatile, if nonauthoritative explanation -- "as built analysis" -- another undefined evaluation standard.

10) Sargent and Lundy's evaluations underly many of the CECO responses, which were generally too sketchy to specify the S&L role. S&L's analysis was exposed in two of Braun's potentially significant safety "findings," however. Braun found a generic deficiency of tubes that are undersized by 25% (3/16" versus 1/4"). S&L's review rejected the finding, explaining that the maximum stress would be only 14,267 psi, or less than S&L's design stress of 18,000 psi. (QC 2-88, 89) S&L failed to delineate the effect of undersized tubes on the acceptable pressure that could be sustained by the design, even if the design only called for commercial standards. (Supra at 16.) This unexplained assumption casts doubt on S&L's dismissal of two key safety findings.

F. Failure to verify all necessary corrective actions.

In our September 4 comments we recommended that Braun verify the corrective action on its findings. This is always the necessary last step for an effective QA program. It is particularly necessary when the program represents the final hurdle for full power operation of a nuclear plant. Unfortunately, as with other crucial stages of the project, Braun either skipped discrepancies or ceded the task of following through to CECO. As a result, the report itself cannot stand as sufficient basis for final judgment of Lasalle's HVAC system. Even if Braun's analysis were comprehensive and sound, CECO still must bear the burden of proving it has honored all its commitments to the third party. In many cases that may be impossible once the plant is operating at full power.

1) Perhaps the easiest way not to verify corrective action is to lose track of the original discrepancy. Our review of QC #1 and QC #2 reports revealed numerous cases where discrepancies originally uncovered by the QC inspector disappeared without any specific written rejection. See, e.g. QC 2-69 (SRT failure to discuss three welds reported as warped and/or rusting; CECO failure to discuss two of three other welds the SRT observed were defective); QC 2-72 (anchor bolts cutoff and large amounts of debris); QC 2-76 (a missing bolt and a missing nut); and QC 2-78 (SRT and CECO failure to discuss reported discrepancy that hanger horizontal and vertical members are butt-welded, contrary to the drawings).

2) Braun explicitly defaulted on verification of CECO QA commitments, instead entrusting that duty to CECO itself. (Report, Appendix L.) Fortunately, in some cases Braun's QC 2 reports verify that CECO repairs have been completed. Unfortunately, Braun also signed off on the QC 2 reports when corrective action remained unverified. (See, e.g., QC 2-46,

74 and 79.) One unresolved issue with broad application involves CECo's commitment to develop a program "to correct the omission of painting, galvanizing, fireproofing and insulation as requested by the Site Review Team. QC 2-53) This program must be implemented and verified before full power operations are authorized, or else it may never be implemented at all.

3) There can not be any debate that the Braun report demonstrates S&L's drawings are neither current nor complete for the HVAC system. Even for the small sample covered, however, the report does not verify that the inaccuracies have been corrected. In some cases when CECo chose not to implement corrective action on a Braun observation, it at least promised to upgrade the drawings. In other unexplained instances, CECo did not mention correcting the outdated drawings when it rejected the substance of Braun's disclosure of design deviations. (See, e.g., QC 2-65, 85 and 96.) The NRC should inquire as to whether those drawings will remain outdated, and if so, why.

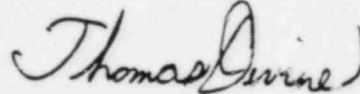
CONCLUSION

In our opinion, the flaws in the Braun report disqualify it from playing a decisive role in this NRC licensing decision. Our criticisms represent more than analytical challenges. Braun ruled out four NRC QA criteria under 10 C.F.R. 50, Appendix B, from relevance for its sample selection -- Criterion VII (vendor quality assurance); Criterion VII (vendor quality assurance); Criterion VIII (material traceability); and Criterion IX (special process controls); and Criterion XV (disposition of non-conforming conditions). Further, in our opinion the conduct of the Braun review itself is inconsistent with five other criteria of 10 C.F.R. 50, Appendix B -- Criterion I (independence for QA personnel); Criterion V (appropriate acceptance criteria for instructions and procedures); Criterion X (proper procedures and performance of tests and inspections necessary to assure quality); Criterion XII (control of testing equipment); and Criterion XVI (verifying corrective action, including the cause of significant conditions).

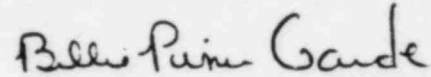
The weaknesses in the report support our recommendations that the Vendor Inspection Branch review Braun's findings, and that after that review Braun should return to the LaSalle site to complete its mission properly. Unfortunately the Braun report has demonstrated that Mr. Howard's and Ms. Mareello's fears of last spring were well-grounded in fact. Meaningful conclusions about the quality of Zack's work and the HVAC system at LaSalle can still not be drawn. In fact, the only conclusion that can be drawn is that Braun's preliminary findings demonstrate the necessity for nondestructive examinations, hardware testing to resolve nontraceability problems or unreliable Zack paperwork, and a significantly expanded sample size.

The Braun report confirms that the Zack Quality Assurance Breakdown was not a paperwork problem. Further it confirms that the solution does not lie in more visual tests and paperwork reviews. A final resolution can come only after Braun performs a truly independent assessment and comprehensive audit of the HVAC system. The NRC "hands off" policy with regards to this problem has failed; it must now assume a much more involved role in protecting the public from an increasingly anxious utility.

Sincerely,



Thomas Devine
Legal Director



Billie Pirner Garde
Citizens Clinic Director

Attachments

my:td