IE INVESTIGATION REPORT NUMBERS
50-269/75-8
50-270/75-9
50-287/75-9

REGION II

Subject: Duke Power Company
Oconee 1, 2, 3

License Nos: DPR-38, 47, 55
Docket Nos: 50-269, 270, 287

Allegation: An investigation was conducted of statements transmitted to the USNRC Region II office alleging that (1) quality control functions at the Oconee Nuclear Station (ONS) related to instrumentation were hampered by the other organizations; (2) that the drawings for the ONS instrumentation were less than adequate and (3) that Duke Power Company (DPC) had procured inadequate equipment for ONS.

Period of Investigation: May 19, 1975
June 3, 4, 5,. 1975

Investigators: S. D. Ebneter, Reactor Inspector
Engineering Section
Facilities Construction Branch

F. Jape, Reactor Inspector
Facilities Section
Facilities Test and Startup Branch

R. C. Parker, Reactor Inspector
Nuclear Engineering Section
Facilities Test and Startup Branch

Principal Inspector: Frank Jape 7/16/75
F. Jape, Reactor Inspector Date
Facilities Section
Facilities Test and Startup Branch

Reviewed by: W. L. Lewis for 7/16/75
R. C. Lewis, Senior Reactor Inspector Date
Facilities Section
Facilities Test and Startup Branch

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Reason For Investigation

The Carolina Environmental Study Group (CESG) transmitted a letter to the Region II office suggesting that the Quality Control (QC) ONS was subordinate to Design Engineering. The CESG contacted a former employee of DPC and made arrangements for NRC investigators to interview him. The former employee provided the investigators with a signed statement of three allegations (Attachment 1). This investigation was conducted to determine the validity of the allegations.

Summary

During the period May 19 and June 3-5, 1975, an investigation was conducted to determine the validity of allegations made by a former employee of DPC pertaining to ONS. On June 3, 1975, the NRC investigators interviewed the former employee to obtain factual information that could be used as a basis for further investigation. Subsequent to this, the NRC investigators conducted an investigation of DPC Charlotte operations on June 4, 1975, and a site investigation of ONS Units 1, 2 and 3 on June 5, 1975.

The former employee had supplied the NRC with a written statement containing three allegations:

1. Quality functions at Oconee Nuclear Station were hampered by their being controlled by Technical Support.

2. Design Engineering produced a less than adequate set of drawings because of poor engineering practices, accuracy of drawings and usability of drawings.

3. Equipment, unsuitable for the application, has been used, and purchase of the equipment was based upon friendships and other factors unrelated to the requirements necessary for proper operation.

The alleger had difficulty in identifying specific documentation or hardware that could be investigated in depth and most of the equipment referred to was non-safety related. Each allegation was investigated to the extent possible and it was concluded that allegations 1 and 3 could not be substantiated. However, allegation 2 was partially substantiated. This led to the finding that contrary to 50.59(b) of 10 CFR 50, a written safety evaluation was not performed to determine the safety significance of making changes to safety related instrumentation systems without approval as required by paragraph 1B.5.2 of the FSAR, and not installing instrumentation systems in accordance with paragraph 1C.3.5c. of the FSAR. Specifically, the investigators found that the detailed drawings for two safety related instrumentation systems did not reflect the as-built status of the plant and the instrumentation was installed in a manner which differs from the detail drawings, without the approval of the Engineering Department.

Failure to perform a written safety evaluation is considered to be an infraction.

Prepared by: S. D. Ebneter — Date

S. D. Ebneter
Reactor Inspector
Engineering Section
Facilities Construction Branch

Dates of Investigation: June 3,4,5, 1975

Reviewed by: L. L. Beratan — 7/16/75 Date

L. L. Beratan
Senior Reactor Inspector
Engineering Section
Facilities Construction Branch

Details

Persons Contacted

Duke Power Company (DPC)

W. H. Owen - Vice President, Engineering
J. R. Wells - Corporate QA Manager
C. B. Aycock - Construction QA Manager
C. J. Wylie - Chief Engineer, Electrical
R. H. Waltman - Principal Engineer, Electrical
T. C. McMeekin - Design Engineer
W. E. O'Neal - Design Engineer
J. M. Curtis - Vendor QA Manager
R. J. Brackett - Assistant QA Engineer - ONS
J. E. Smith - Plant Superintendent - ONS
K. W. Schmidt - Associate QA Engineer, Construction
O. S. Bradham - Superintendent of Maintenance - ONS

Alleger

Former Employee of Duke Power Company

1. Investigation of Allegation 1

Allegation 1

The alleger, in a signed statement (Attachment 1) dated May 19, 1975, alleged that quality functions at ONS were hampered by their being "controlled" by Technical Support.

Interview with Alleger

The NRC investigators interviewed the alleger on May 19 and June 3, 1975, to obtain information and facts as a basis for further investigation. The alleger stated that he is a graduate electrical engineer and a registered professional engineer in the State of North Carolina. He does not have any work experience in quality assurance (QA) or quality control (QC) disciplines but has interfaced with QA and QC on various assignments. The alleger stated that he was not assigned to QA or QC at ONS but reported to Steam Production Department. He was not familiar with the QA requirements or organization structure as stated in the FSAR, Appendix 1B. He stated that the Construction Department did not permit him to use the FSAR. He also stated that he was not aware that a copy of the FSAR was available for his use at the public document room in the Walhalla County Library.

The alleger stated he felt QC was subservient to Design and Technical Support, and that QC had no teeth. This conclusion was based on his interfacing with QC at ONS and his observation that QC could request changes but could be overruled by Design. Upon interrogation, he stated that of the suggestions or requested changes, approximately 20 percent were related to problems and approximately 80 percent were "helpful" suggestions based on the individual requestor's experience. In reference to this, the alleger provided an apparent DPC internal document (Attachment 2) which specified the duties and responsibilities of QC inspectors dated, September 26, 1972. This document lists ten responsibilities for Electrical and Instrumentation QC Inspectors. The alleger stated that this was the first formal definition of QC functions and he felt that it was helpful.

The alleger related that numerous problems existed in the ONS instrumentation but could not specifically identify any system as being deficient. He stated that the process instrumentation sensing lines installation criteria such as line slopes and routings were not detailed on drawings. In general, when these deficiencies were detected and documented on Random Inspection Worksheets (RIW) and Variation Notices (VN), corrective action was initiated for that specific deficiency; but he stated that only those that were specifically documented were corrected. The investigators queried the alleger if established procedures for control of RIWs and VNs were followed to resolve problems. He responded that he didn't know about the RIWs and he supposed they did for VNs. He stated that there were no instrument standards at ONS until early 1973 and that inspection of the instrument installations were made only to

verify conformance to drawings which were limited in the amount of detail. The alleger provided additional DPC documentation to support his allegations. In one of the documents dated March 21, 1973, which was prepared by the alleger while employed by DPC, the alleger made reference to an "investigation." In response to questioning, the alleger stated that he was conducting an investigation of his own and compiling information based on confidential interviews with construction and QC personnel. He stated he was assigned to the Steam Production Department and that he had no charter to, nor had he been authorized to conduct any investigation; it was strictly on his own initiative.

Investigation and Interviews

The investigators met with DPC personnel representing Design Engineering and Quality Assurance at various Charlotte offices on June 4, 1975, and discussed various aspects of the allegations.

Appendix 1B of the FSAR describes the DPC approach to QA and QC at Oconee. The organizational structure as it existed at the time in question is shown on Figure 1B-4 of Appendix 1B and is further amplified by an organizational chart in NRC files titled "Oconee Nuclear Station Organization for Quality Control and Technical Support" dated August 17, 1972. In discussions with DPC QA personnel, it was stated that Technical Support and Quality Control were the same organization and had three areas of responsibility: QA, QC and technical support. The QC function was primarily accomplished by inspectors, the QA function by the discipline field engineer and technical support personnel. The technical support personnel primarily performed field engineering duties. This type of QA organizational structure was fairly common within the nuclear industry in the late 60's and early 70's. In fact, the FSAR distinctly describes this type of organization in paragraph 1B.2.2 which states that "Duke's quality assurance program conforms to . . . the proposed" Quality Assurance Criteria . . . with a single general exception. The proposed criteria sometimes suggests that quality assurance functions be performed by an organizational component separate and distinct from the organizational component having responsibility for an activity. Duke conforms to this suggestion with respect to activities performed by craftsmen . . . . In the area of professional engineering as applied in design, construction, testing and operation, Duke has intentionally assigned quality assurance responsibilities to the same organizational components responsible for professional engineering activity."

DPC personnel stated that considerable problems had been experienced with some inspection personnel bypassing supervision and making recommendations or seeking solutions to problems by contacting design engineers directly. This was remedied by limiting telephone access and defining the responsibilities of the QC inspectors. The latter definition of responsibilities apparently is the document the alleger and the CESG submitted to the NRC.

DPC personnel stated that there was no formal instrumentation installation criteria in the early 1970's but that standards were developed and implemented in 1973. Instrument installations were inspected to drawing requirements and the acceptance or rejection of an installation was based on the experience and judgement of the inspector. The FSAR was available in the Construction Department offices and was used by QC personnel. Discrepancies were documented on VNs or RIWs.

NRC Inspections

The NRC (formerly AEC) inspection reports of the ONS during the late 1960's and early 1970's were reviewed to determine if this subject had been covered. Report 50-269/69-8 noted the need for electrical installation procedures and 50-269/69-7 identified a requirement for greater depth of QA and QC in electrical areas. Report 50-269/71-8 specifically cited weaknesses in the construction QC due to transfers of key people, resignations and poor training. The identification of these deficiencies was followed by DPC corrective action which resulted in a continuously evolving QA and QC program.

Conclusion

The allegation that QC was subservient to and controlled by Technical Support is considered to be a result of misinformation. As noted above, the QC and technical support functions were integrated into a single organization. This was a fairly common and acceptable approach in the early 1970's. The alleger stated he was not familiar with the QA description in the FSAR. No evidence could be found that QC was subservient to Design Engineering. The DPC internal memo, dated September 26, 1972, (Attachment 2) which listed ten QC responsibilities was based on the existing organization structure and assigned functions. The memo content appears to be consistent with the FSAR description and the alleger felt it was helpful. The investigators noted that four of the responsibilities were written as negative statements rather than positive. The responsibilities as defined are those that are normally assigned to QC and inspection. It appears, based on statements from DPC and the alleger, that inspectors and others were exceeding their authority in interpretation of requirements and resolution of problems. In fact, the alleger stated he was conducting his own investigation which was not within his assigned duties.

The DPC approach to QA and QC at ONS was just one means of structuring a QA/QC organization. This particular approach has proven to be difficult to control and, at the present time, is not considered to be the best approach. As noted, the NRC inspections identified areas where the QA/QC program at ONS needed improvement early in the construction phase of ONS. These resulted in citations, where applicable, to DPC and subsequent corrective action. No further investigation into this item is planned.

An undesirable situation involving M occurred frequently. Suppose Construction has installed an instrument such that it operates improperly. Piping for the instrument may be sized improperly; it could require additional outlets for purging; the slope of the piping may be insufficient. Most important is the possibility that thick-walled piping, capable of withstanding elevated temperature and pressure in a highly radioactive environment, has been welded, radiographed, and considered complete. Regardless of the nature of an instrumentation problem, Construction often contacted M, who issued a VN to change any drawings in disagreement. Attached[1/] are copies of letters and memos relating numerous problems as viewed by key personnel responsible for management of Oconee during both construction and operational phases.

During my residency at Oconee I became acquainted with many persons throughout the system in capacities ranging from laborers to departmental supervisors. One such person was J who was employed in Quality Control as an inspector for a few years. In March, 1973 he resigned to accept other employment outside Duke's service area.

J related many incidents such as that described above involving M. Other incidents involved K, who was second in Command in Technical Support and reported to L. At the time Quality was actually controlled by Technical Support, regardless of contrary claims. Persons in Quality repeatedly requested a written list of their duties from K since his verbal comments were undescriptive and generally useless. Those same persons repeatedly asked for and were refused access to 10 CFR 50, PSAR, FSAR, and other documents by K.

In late summer, 1972 I contacted L and requested to view a copy of 10 CFR 50 and any document describing general duties, responsibilities, and authority of Quality related personnel. K, sharing the office space with L, immediately became indignant because anyone would make such a request, and suggested I view a copy available in the Steam Department. He emphasized those documents contain only "motherhood" statements and are so general (vague?) that little if any useful, specific information can be obtained from them. I concluded that J statements were correct, and K was totally unconcerned regarding the true intent of Quality Control.

G replaced K when the latter was promoted. On September 26, 1972, G issued a ten-item directive listing "the official interpretation of responsibilities for Electrical and Instrumentation QC Inspection." The enclosed copy[2/] shows that QC is rendered incapable of making a binding decision and is considered to function entirely subservient to outside groups. This implied that QC was exactly what had been suspected-a spineless, paper organization whose sole purpose was to answer AEC questions.

1/ The reference memos and letters were not provided to the NRC investigators.

2/ Attachment 2.

The alleger stated that an audit of drawing series 0-422 might verify his allegation.

Investigation and Interviews

On June 4, 1975, the NRC investigators discussed design criteria, design control and design changes with DPC Design Engineering and Quality Assurance personnel.

DPC personnel stated that all drawings are checked by a checker prior to release. The final release requires a three party signoff by representatives from the Mechanical Division, Civil Division and Electrical Division. Subsequent to release, no design or drawing changes can be made without prior approval of Design Engineering. The field has no authority to deviate from design drawings or standards without prior approval by Design Engineering. The Variation Notice is the means by which design changes were accomplished.

Instrumentation installations are specified on an instrument detail drawing which is a schematic representation of fittings, tubing, piping and valves. The actual installation is done by "controlled field routing" as specified in Appendix 1C.3.5 of the FSAR. DPC personnel stated that instrumentation standards were issued in February of 1973, but prior to that time no formal standards existed. Decisions were based on the experience of the field personnel.

On June 5, 1975, the NRC investigators inspected instrumentation related to the borated water storage tanks on Units 1 and 2 and the reactor building ventilation cooling water system for Unit 2. The installation was inspected to verify conformance with DPC instrumentation standards contained in Mechanical Instrumentation & Control, Instrument Standards, Installation Field Practices and the design drawings, series 0-422.

The borated water storage tank level instrumentation consists of two redundant channels and is detailed on instrument details 0-422-x-13 and 0-422-x-28. Variations between the detail drawings and the installed system were noted by the investigators. For example, Valve V17 is shown on drawing 0-422-x-13 but is not installed. An isolation valve is installed between the regulator and instrument KT6, and an isolation valve is installed in the return air line, but neither are shown on the detail. The detail shows the regulator and a local indicator to be installed outside the protective box but both are installed inside. Similar discrepancies were noted on the Unit 2 borated water storage tank level instruments and the reactor building ventilation cooling water system. DPC personnel accompanying the NRC investigators stated that all ONS instrumentation was installed to the same criteria and that all systems would exhibit similar discrepancies between the detail drawings and the installation. The actual installation facilitates maintenance and calibration activities; the system, if installed in accordance with the drawings, would not.

DPC personnel stated that instrumentation lines were field run and only the instrument locations were shown on drawings. Isolation valves, local pressure gages, air regulators and so forth were not shown on the detail drawings and hence any change of these items was not the subject of a VN. The investigators had no questions concerning the field run installation of sensing lines and the lack of detail showing ells, tees, and couplings for these lines. However, concern was expressed regarding the lack of detail showing the isolation valves, local pressure gages and installation of air regulators.

The investigators reviewed the grounding philosophy and criteria used at ONS. DPC personnel stated that there were three main grounding systems namely, station ground, instrument ground and computer ground. Some confusion existed in 1972 about ground terminology and DPC issued a memo on June 27, 1972, to clarify this. Standardizing grounds terminology and symbology is necessary to reduce the chance of improper interpretation of design drawings. DPC personnel stated that no major noise, interference or grounding problems had been experienced at ONS.

The investigators reviewed drawings OEE-15, 0-903, 0-1903 and other drawings related to the ground system at ONS. The ground system was inspected at selected points and compared to the drawings. Drawings 0-789-C, Revision 6; 0-1789-C, Revision 2; and 0-2789-C, Revision 1 applicable to Units 1, 2 and 3, respectively were reviewed. These latter three drawings are for transducer terminal cabinets and the latest revisions referred to SMR-217-D. The drawings had references either to OEE-15 or contained notes defining the ground terminology. The equipment installation was compared with the engineering drawings and the isolated ground traced from terminal blocks to the central bus. No discrepancies were noted SMR-217-D was a modification to add a 250 ohm resistor in series with PT 14P and power supply. The SMR appeared to be complete and the documentation, including the drawings, were in agreement with the installation.

SMR-060-S, a station modification to add an additional computer alarm as an aid for operators was reviewed and the investigators had no questions. SMR-130-S relating to the installation of Bailey Cabinet No. 15 in the control room was also reviewed and no discrepancies were noted.

Conclusion

The investigation conducted at ONS on June 5, 1975, appears to substantiate the allegation of the inadequacy of some drawings. The instrumentation installations are not, in all cases, in accordance with the design detail drawings. Since the instrumentation sensing lines are field run details for each tubing or piping fitting are not required. However, system components such as valves are required on detail drawings so that the true system configuration is available for reference at the site. Otherwise, in the event of an emergency, any analysis based on inaccurate instrumentation drawings, could be in error and could lead to more serious consequences.

The DPC quality assurance program description is contained in Appendix 1B of the FSAR. Paragraph 1B.5.2 states that ". . . all drawings and procedures for construction of the station prepared by Duke, consultants, or vendors are reviewed and approved by engineering prior to release to the Construction Department. Any changes to these must be approved by the Engineering Department . . ." This commitment appears to have not been fulfilled in that changes to the instrument design have not been documented and current drawings are not available. Also, paragraph 1C.3.5c of the FSAR states ". . . All field engineered lines are schematically shown either on a diagrammatic, an instrumentation detail or a piping drawing such that mistakes in valving, connection termination points and materials are virtually eliminated . . ." For the two safety related systems examined by the NRC investigators, this commitment appears to have not been followed. Also, the investigators did not find any evidence that a written safety evaluation was performed, as required by 50.59(b) of 10 CFR 50, to ensure that the installed changes from that described in the FSAR do not involve unreviewed safety questions. Failure to conduct a safety evaluation of the safety significance of these changes and to obtain approval of the changes as required by the FSAR is considered an item of noncompliance with 50.59(b) of 10 CFR 50.

3. Investigation of Allegation 3

Allegation 3

The alleger prepared a signed statement (Attachment 1), dated May 19, 1975, alleging that equipment, unsuitable for the application, has been used, and purchase of the equipment was based upon friendships and other factors unrelated to the requirements necessary for proper operation.

Interview with Alleger

The NRC investigators met with the alleger on May 19 and June 3, 1975, to discuss the allegation. The investigators attempted to identify specific equipment items that could be traced through DPC records as a basis to establish the validity of the allegation. Only the technical aspects of the allegation were investigated.

The alleger stated that DPC awarded contracts to suppliers with no previous nuclear experience. He referred to contracts awarded to Unit Electric Company, Orlando, Florida, for control room equipment and panels at the ONS. He stated that Unit Electric had no previous nuclear experience but could not identify any specific deviations or inadequacies related to this procurement, either contractually or equipment related. In response to questioning, the alleger said that he had not reviewed the procurement contract, had not been involved in the preparation of the procurement specification and had not reviewed the specification in depth. The alleger also stated that DPC had awarded a contract to some other firms, which he could not recall the names, to build panels and then had taken the contract away and gave it to Unit Electric Company.

The alleger stated that several hundred ITE Imperial J13P relays used in ONS control systems required replacement. His opinion was that these relays represented a new design and were purchased without any DPC testing. He stated that he had not reviewed or prepared the procurement specification or contracts. The alleger noted that considerable purchasing power resides at the principal engineer level for procurement of relays, switches and cabinets. In his statement, the alleger specifies that "grandfather clauses" effectively restrict the inclusion of new vendors onto approved vendor lists while assuring established vendors of virtual inclusion. He also noted that quality control procedures and requirements are supposed to be major areas of concern.

Investigation and Interviews

On June 4, 1975, the NRC investigators met with DPC personnel representing Design Engineering and Quality Assurance. The details of the procurement cycle were discussed and the specific procurements related to Unit Electric Company and ITE Imperial relays were reviewed. DPC Procedures EPR-1, EPR-2, and EPR-3 were reviewed as these were procedures in effect during the time period in question. EPR-3 titled, "Criteria for Qualifying Suppliers of Nuclear Safety Related Electrical Equipment and Materials," required pre-award and post-award evaluation of the supplier.

DPC records were made available for the Unit Electric Company (UEC) contract. A review of these records shows that DPC conducted a pre-award survey of UEC on October 2, 1970, which is documented on an Evaluation and Investigation of Proposed Bidder and Supplier Form. The survey noted that this was the first to perform nuclear work. DPC Specification OS-309-1 for emergency power switching logic panels contained basic QC requirements and test requirements. The records include documentation of subsequent surveillance inspection and witnessing of functional tests at UEC. The cabinets were seismically qualified by calculations in December of 1972, and subsequent seismic testing of cabinet and components by Wyle Laboratories qualified them by test.

DPC personnel stated that for ONS Unit 3, a competitive bidder was awarded a contract for control room panels and boards. However, the company did not meet schedules. The contract was cancelled and subsequently awarded to UEC, the second lowest bidder.

DPC Design Engineering personnel stated that the ITE Imperial relay J13P was selected by Design Engineering based on design criteria related to physical size, number of contracts and voltage. Previous experience with other manufacturer's relays proved to be disappointing and the design of the newly developed J13P appeared to meet DPC requirements. The relays were procured as a catalog item based on ITE supplied data.

DPC performed functional testing of the ITE relays including pickup time, voltage drop-out, and simulated circuit applications to facilitate testing of the emergency start circuit. A memo discussing the tests dated August 21, 1970, included a recommendation to use the relay in the start circuit.

The ITE records package was reviewed and extensive documentation was available as objective evidence of tests performed, audits conducted and action taken.

During functional testing of panels at UEC in October 1970, several of the relays failed or malfunctioned. DPC, in conjunction with ITE and Wabash Magnetics, conducted an in-depth failure analysis, test and relay modification program. DPC audited ITE and Wabash Magnetics facilities and programs. In June of 1971, DPC concluded from cyclical tests conducted in a dust environment at elevated temperature and humidity that the ITE relays were not acceptable for the intended application. Cutler Hammer type M relays were selected as a replacement and test items were subjected to cyclical operation under simulated environmental conditions. Based on the test results and additional Cutler Hammer data, DPC felt the Cutler Hammer relays were qualified for the intended application. All of the ITE Imperial J13P relays were replaced at the ONS and Keowee Station. The replacement was accomplished in accordance with a written procedure, was witnessed by a design engineer and QC inspectors, and is fully documented in QA folder OS-80B. The investigators reviewed the QA folder for adequacy. As a final step to preclude further problems, DPC issued a letter dated November 18, 1971, to remove ITE relays from stock. The investigators selected several pieces of equipment in which the original design incorporated the J13P relays for field inspection to verify that replacement had been accomplished. On June 5, 1975, the investigators inspected Keowee Emergency Start Channels A and B at ONS. Relays KB, SIB, and 8ESB in Channel B cabinet and relays KA, SIA, and 8ESA were Cutler Hammer relays and had been installed in accordance with DPC documentation and records.

NRC Inspections

NRC inspection reports were reviewed for pertinent information related to the J13P relay problem. Reports 50-269/70-12 and 50-269/71-1 discuss the relay failures. DPC reported the relay failure to NRC for investigation into its possible generic implications.

Conclusion

The investigators could find no evidence to substantiate the allegation that equipment unsuitable for the application had been used. Nor could any evidence be found to substantiate the charge that procurement contracts were awarded on factors unrelated to technical requirements other than those such as cost and schedule which are normally considered in the awarding of contracts. At the time DPC awarded UEC contracts, UEC had previous experience in providing electrical equipment for utility power

plants including Florida Power and Light, South Carolina Electric and Gas and Carolina Power and Light. In addition, UEC had manufactured equipment such as control panels for the National Aeronautics and Space Administration under stringent quality assurance requirements. It was felt that QC was commensurate with the size of the company and that DPC would have to provide assistance in interpretation of IEEE-279 and Class IE requirements. Several other suppliers with previous experience, bid for the work and considering all factors, DPC selected UEC.

Attachment 1

COPY

I, A voluntarily give the following statements to Frank Jape and Dick Parker, who have identified themselves to me as representatives of the U. S. Nuclear Regulatory Commission.

*Attached are twenty (20) sheets of related information substantiating the following:

1. Quality functions at Oconee Nuclear Station were hampered by their being "controlled" by Technical Support.

2. Design Engineering produced a less than adequate set of drawings because of poor engineering practices in accuracy, usability of drawings, training of personnel, and other reasons.

3. Equipment - unsuitable for the application - has been used; purchase of much equipment was based upon friendships, and other factors unrelated to the requirements necessary for proper operation.

Signed: A

May 19, 1975

*Original signed statement consisted of 20 handwritten and typed pages.

A

Supplementary Information

Duke Power Company entered the commercial nuclear power field with Oconee, a three-unit station. Many serious field problems occurred in Unit 1 from initial construction through the transition (systems turnover) to an operational phase. They ranged from schedule disruption to catastrophic equipment failures. The source of those problems was undefined. Was equipment being utilized improperly? Was this inherent in nuclear facilities? Could it be sabotaged? Those were some of the questions being asked. The steam Production Department requested assistance to locate the source, solve the problems, and prevent recurrence in later units. Design Engineering management volunteered personnel for the task assuming the fault originated elsewhere. Mr. B, Chief Electrical Engineer selected me to represent the Electrical Division in an onsite inspection requiring coordination between Engineering, Construction, and Steam Production.

Field experience demonstrated problems and errors were numerous and repetitive. A few thousand Unit 1 changes were formally documented; perhaps a similar quantity were never documented. Analysis indicated the majority were attributable to improper engineering practices in Design Engineering. Poor drawing practices including failure of personnel to properly implement changes, a casual attitude regarding the accuracy and checking of drawings, and indifference for the drawings' utility were among the more prominent causes. An additional problem beginning with Unit 2 was failure to implement changes on subsequent units. These problems were discussed with my superiors during visits to the Charlotte office. When they realized the magnitude of problems created by Design Engineering, they became reluctant to improve the situation. They insisted on meeting scheduled priorities in designing Unit 3 and other new fossil, hydro, and nuclear stations - forcing curtailment of Design manpower for Units 1 and 2.

Upon returning to Charlotte, I assumed the position of staff engineer for Mr. C, Principal Engineer in charge of Electrical Control and Instrumentation Design. One of my responsibilities was an overall inspection of Oconee drawings before issuance to alleviate past problems. Any changes I considered necessary were to be enacted if a maximum of one day's delay was observed in drawing issue and if no Design Group Supervisor raised an objection of a technical nature. Those Supervisors were under extreme pressure to release drawings for newer stations by a management that considered Oconee complete. Even though Mr. B had assured me the required authority accompanied the responsibility, Mr. C virtually ignored my repeated requests for assistance to offset an excessive workload and to avoid further delays. The Supervisors' resultant objections became purely arbitrary because of tight, unrealistic schedules established by management. Mr. C preferred to avoid intervening in disagreements between the Supervisors and myself. Instead, he followed Mr. B alleged insistance that drawings be issued regardless of their condition.

The combination of factors - adequately reviewing drawings, management's attitude, and other duties -- created very unsatisfactory working conditions during the next fourteen months. The situation of having been assigned responsibility without meaningful authority led to my seriously considering outside employment. However, I felt a responsibility to alleviate as many of the problems as possible within the guidelines established, realizing they would remain uncorrected otherwise.

On October 10, 1974, during my first work performance appraisal in approximately eighteen months, Mr. C requested my comments. The points listed above were given with the fact that had made a conscientious effort to improve employee capability, efficiency, and morale which would have resulted in better work performance -- both quantitatively and qualitatively. I requested treatment commensurate with my performance and qualifications. Because of unresolvable differences of opinion, he suggested I contact Mr. B. My earliest opportunity to see Mr. B was preceded by Mr. C's conversing with him. Mr. B was callous to my viewpoint, accused me of disloyalty (insubordination?), and frequently stated that only his opinion counted and mine was unimportant. The only possible question involving my loyalty is that of why I refused to blindly accept Mr. B directives and to "go along with the crowd, and keep my mouth shut." On October 11, I was fired by Mr. D, Vice President of Design Engineering following my refusal to resign.

Summarizing, my dismissal resulted from a personality conflict arising because I chose to expose poor engineering practices which were violating professional ethics in matters involving public safety. Management resented being asked to remedy those shortcomings, and resented my refusal to resign.

I have reason to believe that Duke Power Company may give misleading information regarding my work performance and/or subsequent dismissal. You may contact my other employers without restriction, but all information exchanged between you, Duke Power, and agents representing either organization must be written; no verbal exchanges are permissible. No unconditional release will be given concerning any Duke Power supplied information. I request that any decision concerning my employment be based upon accurate and complete information; therefore, I will be pleased to answer any questions arising from written information.

Dear E,

Enclosed are two copies each of:

1. Mr. F's letter of November 20, 1972, on flow instrumentation.

2. Mr. G's letter of September 26, 1972, on QC responsibilities.

3. Mr. H's letter of October 5, 1972, on instrument installation practices.

4. Mr. I's letter of November 20, 1972, on preliminary instrument standards.

5. Station Problem Report Number 94 of January 20, 1973, on poor installation of instrumentation.

6. Instrument Standards of February 8, 1973.

7. Mr. J's letter of February 9, 1973, listing questionable items of instrumentation.

QC was unable to obtain a clear definition of their responsibilities prior to item 2 above. This was issued shortly after Mr. G replaced Mr. K as Head of Tech-Support. Repeated requests of K from J produced no results. J repeatedly told me that QC was unable to look at the 10 CFR 50 or FSAR. That letter further illustrates the actions by tech-support to prevent proper functioning of QC. Soon after my first conversation with you approximately one month ago, I asked L to let me look at their copy of the two documents. Immediately K sharing an office with L became quite sensitive and defensive that anyone should want to see the documents. He quickly explained that one was a collection of "motherhood" statements, which would not provide me much information, and that the other book was available in operations. Nevertheless, both virtually refused to permit me to view their copies.

I feel that aforementioned parties in tech-support are deliberately trying to cover their asses and make it look as if there is a good QC program at Oconee, in fact, QC is being used as a front to make those efforts look legitimate to the AEC and anyone else concerned. QC's hands are presently tied because all QC work must meet approval of tech-support. I have been told by you and others in Charlotte that QC is not supposed to be limited by tech-support. In reality, the opposite is true. Further, J told me of repeated efforts via Random Inspection Work Sheets (RIW) to get instrumentation problems solved. Instead of correcting problems, M sent the request to construction - who said that installation was acceptable - and then M returned J's RIW's with answers that generally meet the criteria. "Construction says it is okay, and that is the end of it. It is none of your business to pursue the matter further, "or that M didn't give a damn about correcting the problem. If a discrepancy existed between the engineering prints and installation, then a variation notice followed to change the drawings,

but seldom were the installations changed. This attitude of poor or no quality efforts in installation is especially painful in the case of sensitive equipment, such as that which would be adversely affected by improper installation (ref letter of October 5, 1972).

Also, G, K's yes man - has told QC that no effort will be made at making the Instrument Standards retroactive. Instead, anything wrong will remain so until someone raises enough hell in the right places.

There are many areas of which I am totally ignorant which should also be ideal sources of information such as - but not limited to - construction departments.

Because of the above and other leads I have and/or am pursuing, I feel that a completely unannounced freeze of all variation notices, all RIW's (formally QC-53's), and a complete check by qualified people thoroughly familiar with correct instrumentation installation and all QC records on site would identify many problems of which I feel are not in the best interests of Duke. Further, confidential conversations with many individuals working on-site should identify many other problem areas which may not be documented. I must stress the importance that any information uncovered will probably be difficult to prove, and that heads of innocent workers in no way responsible for the decisions would certainly roll if persons involved even suspected such an investigation was being held. Please handle very confidentially all information you receive because of this.

J quit last Friday to work for another firm out-of-state. N formerly of tech-support, replaced him.

If I can be of further assistance, please do not hesitate to contact me.

Respectfully,

A

Signature
March 21, 1973

Y on April 21, 1975

I have reason to believe that, certain individuals in responsible positions of Duke Power Company Design Engineering Department and Mill Power Supply Company-Duke's purchasing agent-are acting in their own interests, to the detriment of both Duke Power and the public. Let me describe a bit of my experience while at Duke Power, prior to explaining the above statement.

I began working for Duke as an Engineer Associate in the Electrical Controls and Instrumentation group on May 11, 1970. Duties included the design of Keowee Hydro Station, Oconee Nuclear Station, and other plants as well as the occasional investigation of special problems.

O, another newcomer to Duke in early summer, 1970, and I worked under the direction P for several months, in design and checking drawings on Keowee, the emergency power source for Oconee. C began placing complete confidence in P decisions, and avoided trusting anyone else. If a difference of opinion occurred, P comments were those used by C. Knowledge and experience were discarded, a pattern used to the present time by C if P is remotely involved in a decision. P experience prior to joining Duke in late 1969 or 1970 was graduation from high school followed by a tour in the U. S. Navy aboard a submarine. I am uncertain, but it may have been a nuclear-powered ship.

Under O's direction, the complexity, equipment required, and attendant costs of Unit 2 were reduced by some fifty percent compared with P design of Keowee Unit 1 controls. I will not elaborate, but several other important comparisons can be cited showing the contrasts in these persons methods, that of brute force versus an overall view of objectives with sufficient ability to successfully manage a task or project.

I performed several engineering tasks in addition to Keowee design through summer 1971. Approximately May 1971, it was discovered that Oconee Unit 2 was not a mirror image of Unit 1 as Duke had told the AEC it would be in the PSAR, and later would be included in the FSAR. Civil was the least affected Engineering Division by this change, often called the "A & B swap", or "building roll". In contrast, the Mechanical Division was required to make a substantial number of changes, and the Electrical Division considerably more. Several persons were involved in the summer and fall, 1971 making those changes and checking them in Electrical.

Late in 1971 approximately six to eight persons-including myself-joined those already involved in a thorough recheck of Unit 2 drawings. The number of persons rapidly diminished until only three of four total were working on Oconee, two part or full time by midwinter. The others began working on Belews Creek and other projects. Many of the errors discovered during those checks were ultimately lost because a majority of the drawings marked with corrections were lost or destroyed. Most of the remaining marked drawings were lost when Design Engineering moved to its present location in the Charlotte Trade Mart in summer, 1972.

Ideally, Engineering designs a system, Construction installs and verifies that all equipment operates, motors and pumps rotate in the proper direction, instrumenation is operable, with liaison provided by Field Engineering to resolve problems, and finally a system is released or "turned over" to Steam (Operations) with a list of those items missing, broken, etc., required to complete the system. In practice, Oconee 1 systems were turned over to Steam in an incomplete, and otherwise unacceptable manner. Steam Department managers suspected many of the problems inherited were avoidable and should be reduced to an acceptable quantity. They requested the loan of one representative each from Mechanical and Electrical Divisions to work one year onsite to perform a special check primarily for the benefit of Steam. This consisted of identifying all the equipment in each system, verifying its installation, identifying missing and/or damaged equipment, and tabulating any such equipment or other discrepancies. Engineering would benefit from personal involvement in checkout and the experience gained. It should also provide a means for identifying good and bad features in their respective modus operandi.

Q was selected to represent Mechanical, and I to represent the Electrical Division. In late February, 1972 I arrived onsite, with Q coming one month later. I worked for R, Supervisor of the Instrumentation Department.

Generally speaking, Mechanical designs the process systems, and determines the controls necessary for operation, as well as instrumenation required for monitoring. Mechanical determines size, location, and type for each valve, pump, pipe, and instrument, as well as identifying each device. Note that any items supplied in a purchased system will be identified by systems manufacturer, such as that of a nuclear steam supply system and will thereby acquire duplicate identification. A third method of identification could and frequently did occur at Oconee when Steam attached its identification to a device. Virtually every such item at Oconee acquired either double or triple identification. After Mechanical has assigned its own set of identification to purchased systems and included only that identification on Mechanical drawings, the key for relating the two sets is discarded. Several months later Electrical must extract information to properly identify each device such that the electrical portion of the engineering package for a plant can be drawn. At this time the information desired by Steam must be included on the electrical drawings. I shall give credit where due with this point: Steam now agrees to use the identification attached to an item by Engineering, reducing confusion considerably. One can only hope this, or a similar problem, will not be reinvented through a lack of experience, or otherwise.

A nuclear unit has several hundred each of process, control, and instrumentation drawings with numerous ancillary drawings, tabulations, etc.

My three assistants-part time employees who were engineering students at Clemson University-and I catalogued the power sources, control equipment, instrumenation, and all interconnecting cables required for each system. An inspection team comprised of one person from Technical Support, one from our group, and a construction electrician verified installation of all equipment in each system as thoroughly as feasible using Engineering drawings for a guide. These inspections were expected to occur after systems were considered complete, but prior to actual turnover.

These types of errors were observed on installed equipment.

1. Incorrect field installation which disagreed with accurate Engineering drawings.

2. Installation per erroneous drawings.

3. Installation corrected by construction, but drawings remained uncorrected.

4. Electrical terminals unidentified by equipment manufacturer, accurate drawings, installation operative but different from drawings because a similar contact was used instead of that indicated on drawings.

5. Unacceptable installation practices upheld by person(s) responsible for their avoidance.

Solutions to the above problems varied, but usually followed this pattern, respectively:

1. The Construction electrician made minor corrections "on the spot." Large problems requiring coordination with other departments were tabulated, and appropriate personnel were provided a copy. Construction made modifications, and later inspections determined the remaining problems.

2. Technical Support contacted the design supervisor responsible for that system and verbally described the problem, proposed a solution, and received a verbal agreement to the solution; otherwise the supervisor suggested an alternate solution. Tech Support then initiated a variation notice (VN) to alert Engineering of the changes required and to permit Construction to make required changes without waiting for revised drawings.

The VN contained space to identify which units(s) were affected. If Technical Support failed to indicate all the affected units, or if Engineering failed to make the required changes on all affected units, it became necessary to solve the same problem repeatedly. The latter "if" occurred profusely because Engineering managers always stressed the intent to get drawings to the field for the unit considered most needed while choosing to ignore all other units until later when they also were in strong demand.

3. A VN should have been written to cover this situation since it involved deviating from Engineering drawings, even if it was required for proper systems operation.

   C, my Engineering supervisor, and I had several lengthy and sometimes heated discussions regarding this issue. He contended that any deviation should-and would-be covered via VN. C philosophy was that problems could not exist in the absence of a documented account from the field, therefore, do not attempt to make corrections unless the field complained loudly and frequently. My experience at Oconee led me to believe that many problems and resultant changes were concealed forever because of insufficient documenation. Many such losses resulted from someone's forgetting to notify those responsible for followup of problems, but I feel that a substantial quantity were deliberately overlooked because it would have required someone's time and effort to properly document the situation.

   Another explantion was that VN's and subsequent drawing changes were being processed, but were currently unavailable. This condition was acceptable and neigher caused nor resulted from the previous situation.

4. This type problem became less frequent than several others during Oconee's evolution because Engineering issued standards for identification of equipment terminals, cable color codes, etc. Nevertheless, several drawings were revised only because Construction installed equipment incorrectly, verified system operation, and lastly notified Engineering of the problem. Drawings were changed rather than argue over the problem.

5. Prior to Oconee, Duke installed little or none of the instrumentation required in its plants. An outside firm whose specialty was instrumentation provided those services. Oconee instrumentation was installed by persons professing similar experience. No Duke standards existed regarding proper installation until well into the construction phase of Unit 3. The installation at best reflected those principles learned on previous projects in a multitude of industries.

   M applied for employment as an instrumentation specialist in Technical Support at Oconee. He was refused employment onsite and contacted someone in Charlotte. That same someone instructed Technical Support to employ M immediately.

An undesirable situation involving M occurred frequently. Suppose Construction has installed an instrument such that it operates improperly. Piping for the instrument may be sized improperly; it could require additional outlets for purging; the slope of the piping may be insufficient. Most important is the possibility that thick-walled piping, capable of withstanding elevated temperature and pressure in a highly radioactive environment, has been welded, radiographed, and considered complete. Regardless of the nature of an instrumentation problem, Construction often contacted M, who issued a VN to change any drawings in disagreement. Attached[1/] are copies of letters and memos relating numerous problems as viewed by key personnel responsible for management of Oconee during both construction and operational phases.

During my residency at Oconee I became acquainted with many persons throughout the system in capacities ranging from laborers to departmental supervisors. One such person was J who was employed in Quality Control as an inspector for a few years. In March, 1973 he resigned to accept other employment outside Duke's service area.

J related many incidents such as that described above involving M. Other incidents involved K, who was second in Command in Technical Support and reported to L. At the time Quality was actually controlled by Technical Support, regardless of contrary claims. Persons in Quality repeatedly requested a written list of their duties from K since his verbal comments were undescriptive and generally useless. Those same persons repeatedly asked for and were refused access to 10 CFR 50, PSAR, FSAR, and other documents by K.

In late summer, 1972 I contacted L and requested to view a copy of 10 CFR 50 and any document describing general duties, responsibilities, and authority of Quality related personnel. K, sharing the office space with L, immediately became indignant because anyone would make such a request, and suggested I view a copy available in the Steam Department. He emphasized those documents contain only "motherhood" statements and are so general (vague?) that little if any useful, specific information can be obtained from them. I concluded that J statements were correct, and K was totally unconcerned regarding the true intent of Quality Control.

G replaced K when the latter was promoted. On September 26, 1972, G issued a ten-item directive listing "the official interpretation of responsibilities for Electrical and Instrumentation QC Inspection." The enclosed copy[2/] shows that QC is rendered incapable of making a binding decision and is considered to function entirely subservient to outside groups. This implied that QC was exactly what had been suspected-a spineless, paper organization whose sole purpose was to answer AEC questions.

1/ The reference memos and letters were not provided to the NRC investigators.

2/ Attachment 2.

Realizing the situation, I contacted E, the Director of Quality related functions in Design Engineering's Electrical Division. My letter of March 21, 1973, and all documents referenced therein were personally delivered to E. We also discussed my overall impression of the circumstances at Oconee. He suggested letting him pursue that matter further through channels and informing him of any further developments. I agreed, and contacted him later to determine the results of that information. He stated that the proper persons were working on it.

K is presently a Quality Manager in the Electrical Division, and reports to B, according to sources within Duke Power Company presently.

While working at Oconee, I maintained contact with my supervisor and B, head of the Electrical Division. It was emphasized repeatedly that many problems could be avoided by adequately checking drawings prior to reissue, rather than depending upon field personnel to find errors. I had carried marked copies of current drawings to C several times requesting his people transfer the information exactly as shown on the marked drawings. Rarely did that information return to the field correctly.

During one of his mid-summer visits to Oconee, B and I discussed my future role in the Electrical Division. I would be responsible for inspecting all electrical control and instrumentation drawings prior to their issue or reissue for field usage at Oconee. My asking "Does this mean I will have the authority to get things done, or only the responsibility?" was answered, "You will have both responsibility and authority for making any changes, improvements, or whatever".

Upon returning to the office September 3, 1973, I was given relatively free reign in inspecting and improving the drawings issued by the Electrical Controls and Instrumentation Design. I was instructed to avoid delaying any drawing more than one working day, and doing anything which could affect the safety and/or operation of the plant. For the first few months I was severely overloaded and requested assistance which never arrived except for two and one-hald man-days help on computer inputs.

I wrote B a letter in midsummer, 1973 containing 14 suggestions for assisting and improving the Electrical Division. C and I discussed that letter in October. During the discussion I volunteered a comment relating my feelings that it was rather obvious that at least one, perhaps several, persons were involved in an arrangement with a vendor, and I expressed my hope that he was not involved. I had no conclusive proof and readily acknowledged it. However, I refused to furnish names as he had requested, but I did compare the situation with Watergate with possible strings going toward the top of the Company. The subject was never again discussed between C and myself.

My employment with Duke Power ceased October 11, 1974 with C comments, B concurrence, and D giving me a choice of resigning or being fired. I refused to resign.

The following lists the individuals, firms, and other information describing the situation in which I suspect Duke Power Company's supervisors are involved much more than is acceptable in a legitmate business relationship:

Several hundred ITE Imperial series J13P industrial control relays used in Keowee and Oconee control systems required replacement in whole or in part three times. Those relays represented new design, and were purchased without any form of Duke testing, but with the encouragement of S, Principal Engineer supervisor of Electrical Control and Instrumentation Systems. I believe this was ITE's first attempt to produce such a relay. Consider the fact that virtually all the controls for Keowee and Oconee Unit 1 were installed and operative during the exchanges. It was common knowledge that ITE arranged fishing trips for the benefit of its customers. B definitely exercised undue influence and poor judgement in selecting this particular equipment, and possibly received other favors from ITE for their actions.

Approval for a purchase requisition varies depending upon the value, but it permits considerable purchasing power at the levels of Principal and Chief Engineer, especially if the purchase is piecemeal. Typical of this situation is the purchase of control relays, switches, and cabinets. Larger acquisitions are influenced by an Engineering evaluation of the bidders' facilities, quality control program, prices, and any other information considered necessary. One important criterion is how "closely" the vendor worked with Duke in past contracts. Grandfather clauses effectively restrict the inclusion of new vendors onto approved vendor lists while assuring established vendors of virtual inclusion. Quality Control procedures and requirements are supposed to be major areas of concern. Mill Power evaluates the package and awards the contract to the successfull bidder.

Unit Electric of Maitland, Florida has been the questionable recipient of several Duke contracts for building control panels, consoles, etc during the past three or four years. Unit's first nuclear experience was at Oconee with little or no changes made from their previous non-nuclear power plant designs. Unit can now claim extensive experience in nuclear designs without question. In my opinion S, B, C, and T and other Principal Electrical Engineer, with U of Mill Power are deeply involved.

The aforementioned individuals as well as other Engineering representatives were visiting Unit on a Thursday and Friday in May or June, 1973 for the purpose of inspecting control boards. S, B, C, and T were not inspecting equipment as alleged; rather, they were elsewhere. Deducing from their invitation which V declined to accept and other people's observations, they remained in Florida after Thursday for a combination fishing and/or boating excursion complete with feminine companions. I feel it would be reasonable to state that other "inspection" trips were equally ficticious.

W, a Unit representative located in Charlotte, hosts S, B, C, T and U to lunch at least once each week. Occasionally other persons have been invited when some of the above are absent. W conversations imply that the luncheon is usually non-business related.

I realize the above information is brief, but it is a collection of observations by myself and others. So far as we know there will be no written proof anywhere as all arrangements were surely handled in person or via telephone.

Notes of General Problems Observed While C Oconee

Problems observed at Oconee and discussed with B and/or C were numerous, frequent, and repetitive. Basically, Design Engineering personnel were careless in their checking of control drawings prior to reissuance to the field, or were completely ignoring the true meaning of "checking" a drawing. Another major problem was Design's attitude that "any coincidence between released drawings and their usefulness to field personnel was unintentional." Many times I have heard C and others in Design say the most important thing is to get drawings to the field, and concern ourselves with finding and correcting errors at some later date, i.e. drawing revision. Each time this was expressed, it was attributed to B initiation. In reality, the field (construction) personnel were the ones who found and corrected the tremendous quantity of errors on each unit. Variation notices were the method most often used by field personnel to notify Design of errors on problems which were solved or changed to facilitate usage, and required a drawing change to acknowledge those modifications. I contend that accurate drawings to not require complete and repetitive checks to assure their correctness. My frequent requests for improving accuracy and usefulness of drawings were essentially ignored by C and others.

Items with which I disagree in part or in whole with C - Summer 1974.

1. C's refusal to try to correct all grounding sketches on drgs, while being repeatedly cognizant of the problems in the field due to poor information and/or conflicting information issued via Design Engineering. (1) Verbal, (2) letter, (3) SMR O-60-D.

2. Despite an obvious and expressed need for full-time assistance, C has provided only one half week of it via X during the week prior to Christmas, 1973. It was expressed that computer and all other areas of string checks would be performed, yet only those relating directly to the computer were given any checks.

3. Regarding my letter of summer, 1973 to B defining some 14 areas that should be improved, C and I worked late one night in the early Fall discussing those items. Since then no other discussion has ensued, and it is quite obvious that many of the points mentioned are in no manner being actively improved on further stations.

Attachment 2

September 26, 1972

Effective immediately, the following is the official interpretation of the responsibilities for Electrical and Instrumentation QC Inspection.

1. The QC Inspection group is not directly responsible for the contents of 10CFR50 or the FSAR. All interpretations of these two documents shall be obtained from the Field Engineer.

2. The amount, cost, or time spent on rework is not the responsibility and shall not concern QC Inspection.

3. Unless noted on prints, the serviceability of equipment installed is not the responsibility of QC Inspection. Questions as to the serviceability or the removal of equipment for calibration or repair will be submitted by Operations to Design Engineering.

4. It is not the responsibility of QC Inspection to review or question the design of a system or instrument loop. The responsibility of QC INspection to the Construction Department is to see that the equipment is installed according to applicable prints. The design of a system is the responsibility of Design Engineering. If for any reason a system does not perform its intended function, Operations will submit a request to Design Engineering to have the design changed. No technical questions will be submitted to Construction Technical Support or any other department.

5. There will be no suggestions to field forces as to the best way to install any equipment. Discrepancies may be pointed out to field forces. If discrepancies are not corrected after being pointed out, a Random Inspection Worksheet should be written.

6. Obvious errors on prints, details, OM drawings, Variation Notices, or pertaining to the installation of equipment, will be written up on a RIW.

7. The use of the RIW will be limited as stated in paragraphs 5 and 6. No suggestions or requests will be noted on this form.

8. Any answers received from Technical Support or Design Engineering will be final and not questioned a second time.

9. Suggestions may be submitted through normal channels, but on either blank stationery or company stationery, and only pertaining to the QC program.