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PRELIMINARY
DRAFT

QUALIFICATION AND CERTIFICATION OF QA/QC PERSONNEL

Subtask D

Preliminary Draft Report on Site Visit "A".

This preliminary draft report has been prepared for comment and use by members of the site visit team only. It must not be circulated further until it has been fully revised by, and received clearance from, ORNL.

ENCLOSURE 3

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Introduction

This report contains the observations and conclusions concerning QA/QC certification and qualification that were made by a team of investigators during a fact-finding visit to a nearly completed nuclear power plant. The visit was conducted by ORNL on behalf of the NRC under Fin No. A9077. The research team consisted of five ORNL staff members, the NRC technical project monitor and a consultant QC engineer from EG&G Idaho. This is a much larger team than it is anticipated will take part in subsequent site visits connected with this project, but it was considered important that all project staff should share a baseline field experience to facilitate future exchange of information and comparisons concerning other sites.

The principal field visit lasted five days, including an introductory and a closing meeting with corporate QA management at the licensee's headquarters. This was preceded by a one day tour of the plant for the two principal investigators and one other ORNL staff member. As it was only possibly to interview construction personnel during the principal site visit, three members of the ORNL staff also returned to the plant for a full day follow-up visit to operations staff during the week following the principal site visit.

The total number of individuals interviewed was _____. The interviewers were divided into three interview teams. Two of the teams primarily directed their interviews at broad vertical slices of the licensee's QA and QC organizations in both Divisions of Construction and Operations. One of these teams worked from the higher managerial echelons of each organization towards the lower level inspectors/auditors who actually perform QC/QA functions. The other

team started out by interviewing every worker whose work is subject to QC inspection and whose records of work performed, along with inspection records, are subject to QA audit. This division of research effort was adopted in order to avoid the problems of the research team adopting an exclusively management viewpoint on the issues, which is an ~~interest~~ danger in adopting a unidirectional approach to formal organizations.

The third interview team adopted a different role which principally involved tracking the Construction PQ paperwork through the document control system and investigating the procedures and practices by which the licensee ensures that the QC/QA personnel performing inspections or audits are properly qualified and certified to perform that particular function. In addition to tracking the paperwork, this team also interviewed the personnel responsible for operating the control system - the Records Review Group - and the staff of the Procedures and Training Unit which is responsible for administering certification examinations and ~~version~~ updates, as well as reporting the results to the Records Review Group.

The QA/QC Program

The plant selected for the site visit is nearing completion. At the time of the site visit, one senior official estimated that 75% of the current work is nuclear-safety related work requiring inspections. The research team was therefore concerned with the structure and functioning of two QA/QC programs; one pertaining to construction, the other to maintenance of those parts of the plant that have been transferred to the licensee's Division of Nuclear Power Operations.

The case chosen for study is somewhat atypical in that the licensee operates its own construction organization. Both construction and operations are therefore subject to the direct scrutiny and audit of the licensee's corporate QA organization, which has auditors permanently assigned to either the construction or operations side of the house; but reporting off-site to the licensee's QA management.

Despite this organizational linkage, the execution of QA responsibilities and functions varied noticeably between the construction and operations divisions, although the qualification requirements and certification process were substantially the same. In the field of quality control, however, the programmatic contrast between construction and operations was much more distinct, and was reflected in wholly different qualification requirements and certification processes. Whereas construction QC inspectors are certified to a limited number of site-specific procedures, operations QC inspectors are certified to a much wider range of inspection skills. This contrast reflects the fact that, unlike QA, QC is entirely the responsibility of the respective divisions within the licensee organization.

In addition to QA and QC functions, both the construction and the operations divisions have formally designated quality engineering (QE) units. Although this function is not recognized in the statement of work, it clearly falls within the intended range of the study.

The exact role of the QE personnel was not easy to distinguish from that of the QA staff, in that both review records of work performed (audits), and both make real-time checks on the performance of QC personnel (surveillance). However, there are three major differences that can be discerned between QA and QE at this site.

First, quality engineers are conceived as fulfilling line functions. In contrast to QA personnel, they report directly to the quality managers for construction and operations respectively. The quality manager, in each case, also oversees his organization's QC staff.

The second distinction hinges around the quality engineers' responsibilities for writing site-specific construction or maintenance procedures and QC inspection procedures based on generic (upper-tier) documents, generated off-site by the licensee's Engineering and Design Office or the corporate Office of Quality Assurance.

Third, QE personnel have the added responsibility for reviewing the effectiveness of the overall quality program of their division at the site. Although this was a function that the investigators had expected to be allocated to the corporate QA personnel, this was not the case with this licensee.

As their job title suggests, quality engineers are part of the engineering units within their respective divisions. Their job-descriptions require qualifications that reflect this fact. All hold a minimum qualification of a two-year associate engineering degree, while most have

four-year bachelor's degrees in engineering. In addition to those qualifications, the quality engineers at this site also hold various certification in QA/QC skills.

Outlined in the following table are the responsibilities and functions allocated to personnel as they were observed within the licensee's Divisions of Construction and Operations respectively. The brief summaries of qualifications and certifications in the right-hand columns will be treated more fully in the following sections of this report which is dedicated to the topic.

TABLE I

Function	Responsibilities	Report to	Prerequisite Qualifications	Training or Certifications
Division of Construction				
QC	Real-time inspection	on-site quality manager	high-school 2 yr. Assoc. degree	licensee certifies to process
QE	Develop/review procedures	on-site quality manager	2yr. Assoc. 4yr. bachelor	licensee certifies to skills
QA	Audit/surveillance	off-site QA	?	licensee certifies to skills
Division of Operations				
QC	Real-time inspection	on-site quality manager	high-school 2 yr Assoc.	licensee certifies to skills
QE	Develop/review procedures Audit/surveillance program evaluation	on-site quality manager	~~2 yr. Assoc.~~ 4 yr. bachelor	licensee certifies to skills
QA	Audit/surveillance	off-site QA	?	licensee certifies to skills

The licensee's Division of Construction also operates two training schools which are presently located at this site; one is a welding school, the other gives instruction in NDE procedures. Although the activities of those schools are relevant to the topic of qualification and certification of QA/QC/QE personnel, the schools do not represent a usual function of construction and operation of nuclear power plants. Discussion of the schools is therefore confined to their role in certifying NDE personnel, training details are omitted.

The licensee's corporate Office of Quality Assurance has expressed the philosophy that quality must be built-in to a plant, it cannot be documented-in after the fact. The licensee therefore operates a weekly quality-training program for craft workers. Discussion of this program will be confined to an appendix to this report because the statement of work specifically requires that the research concentrate on the qualification and certification of dedicated QA/QC personnel.

Hiring Practices for QC Inspectors

On the basis of the interviews conducted by members of the project team, it appears that relatively little attention is paid to specific areas of expertise in hiring personnel. Generally, the licensee looks at broad areas of academic training and experience, e.g. electrical, mechanical, or nuclear engineering. If QA/QC specialization is required, this capability is developed in-house.

The corporate personnel division has established categories of entry levels, both for job performance and equivalent salary levels. The usual procedure is for a line organization to submit a request for a job position to the corporate Personnel Division. Personnel screens applicants and sends the names of four to six applicants to the line organization for interview and evaluation. On occasions where a position may arise for which there is no specific match in the personnel categories, negotiation is carried out between the line organization and the Personnel Division.

The basic minimum prerequisite for a trainee QC inspector, whether for visual or NDE inspection, is a high-school diploma (or equivalent). Prior craft experience is not required, indeed, opinion was divided among those interviewed as to whether craft experience constituted either a desirable, or even practicable, prerequisite. It was generally felt that persons with craft skills would derive greater ~~pecuniary~~ pecuniary and status benefits from practicing those skills, than they would from inspecting the work of others. This viewpoint was embodied in the largely erroneous belief (carried surprisingly high up the management chain) that the crafts are significantly better paid than those who inspect their work.

Although high-school graduation is considered to be a minimum requirement for an inspector position, most inspector supervisors expressed a preference for two-year associate degreed candidates, and a large proportion of those inspectors interviewed did indeed have such a qualification.

The advantages of technical school education were seen to include higher ability in mathematics, including trigonometry, experience with correct use of measuring instruments, as well as training in reading and interpretation of drawings and blue prints.

Among the inspectors interviewed, opinions about the utility of these prerequisite qualifications varied. At one interview it was stated that a practical disposition, evidenced by an interest in, and aptitude for, weekend car maintenance is sufficient indicator of a candidate's trainability as a QC inspector. At the other extreme, one inspection group leader argued that a four-year engineering degree and some non-nuclear quality control experience should be the minimum requirements for trainee inspectors.

Training and Certification of Construction QC Inspectors

The individual line organizations, cooperating through the Personnel Division, are responsible for establishing the prerequisite qualifications to meet the job criteria. The line organizations are then responsible for establishing training and certification programs through which an individual becomes fully qualified to perform his job.

Non-NDT Inspector Certifications

Although the licensee is committed to follow Regulatory Guide 1.58 (which references ANSI Standard N45.2.6-1978) in the construction of this plant, the certification levels for testing and examination personnel do not conform to the three levels established in the ANSI Standard N45.2.6. Training, Qualification, and Certification of Construction QC Inspectors, in all but NDE and visual welding inspection, is carried out on a procedure-by-procedure basis, rather than on the basis of demonstrated inspection skills. The NRC has approved this arrangement since it is considered to create one level of certification roughly equivalent to the Level II inspection-skills certification described in ANSI N45.2.6.

Certification and Training To Procedures

In order to describe this practice of certification to procedures, it is necessary to give a short account of the process by which the procedures are generated for all construction QC inspections at the plant, except for weld inspections.

The plant design, originating with the licensee's Engineering and Design Division, specifies performance of certain QC inspections, but does not necessarily specify which engineering codes and standards apply. In these circumstances, the Construction Division's quality engineers will

supplement the design specifications contained in the FSAR Code of Records. In addition, the quality engineers (who have line reporting responsibilities) help to prepare inspection procedures in collaboration with the site's Procedures and Training Unit (which reports to the same individual as the inspectors - the Quality Manager for Construction).

Each inspection, test, or examination procedure is allocated a unique identification number. Subsequent revisions on updates to each procedure are also numerically designated. The process of developing or revising a procedure includes the preparation of a training module by the Procedures and Training Unit. Before he is able to perform a valid inspection, a trainee inspector must be trained by his own inspection unit in accordance with the appropriate training module. When the trainee's supervisor considers that he is both qualified to the necessary level of technical knowledge, and has acquired the experience on the job that is required by the training module for that inspection, the trainee sits for a written examination administered by the Procedures and Training Unit. If the candidate is successful, the Procedures and Training Unit informs both his supervisor and the Records Section which enters the procedure number on the inspector's computerized certification record. When a candidate is unsuccessful, Procedures and Training informs his supervisor that further training is required. The pass mark is 70% and the first-time pass rate is around 95%.

The licensee maintains up-to-date printouts of these certification records at the site to enable the Records Section to check that every inspection is carried out by a properly certified inspector. The Record Vault on site contains an official certification file for each inspector, in which the Procedures and Training Unit logs all certifications.

Periodic recertification, which is required at least every three years, and updating of existing certifications to procedural revisions follow substantially the same pattern as original certifications. The only difference is that the examination is usually waived for updating, in favor of a supervisor's confirmation that the revision training module has been studied by the inspector. Only about 5% of revisions are determined by Procedures and Training to require full recertification.

Certification Records

A review of sample inspection records from the site ~~were~~ was examined in the vault. Although there is considerable variation in the appearance of the forms used by the various inspection disciplines they all identify the inspection procedure number and revision number, along with the inspector's name and date. One of the functions of the Records Review Group is to verify that for each and every safety-related inspection, the inspector who performed it was properly certified to the latest version of the appropriate procedure that was in force at the time the inspection was performed. If there is a discrepancy, the paperwork is returned the originating engineer and a copy is sent to the Non-Conformance Review Section. Only when Records Review is satisfied that the inspector was properly certified, and that all non-conformance work has been redone, do they insert the work package in the permanent files.

Two points already need to be made clear concerning this process. First, the Procedures and Training Unit does not train inspectors. It devises procedures in consultation with quality engineers, it devises training modules, it administers exams, and it confers certification

status on candidates. Second, when a revision to a procedure is promulgated inspectors are required to update their certifications before they are permitted to perform that inspection. The requirement for updating comes into effect from the moment the revision and its accompanying training module are issued by Procedures and Training.

The training program has a 90 day minimum period which must be met before a new recruit may be certified in non NDE procedures. This requirement is to allow a candidate's on-the-job performance to be evaluated by his peers and his supervision, and to provide a measure of confidence that the candidate is ready for certification. Acceleration of certification can be done in less than 90 days if the candidate's qualification circumstances warrant and the process is approved by management.

Self-Study

The training process itself consists of two parts; self-study of the written procedures, and on-the-job training (OJT) in interpretation of the procedures and proper execution of inspection techniques. In self-study of procedures, trainees are required to familiarize themselves with individual inspection procedures and discuss them with their immediate supervisor who must satisfy himself that the trainee understands and interprets them correctly. In most cases, supervisors at this level are ex-inspectors with a detailed knowledge of the inspection procedures. However, this is not always the case. At least one QC unit supervisor had no prior QC experience and was neither trained nor certified to any of the licensee's inspection procedures.

On-The-Job Training

On-the-job training in a procedure consists of assignment of the trainee to a certified inspector who is well-versed and experienced in that procedure. When the inspector feels that the candidate is competent to be relied upon to perform the inspection correctly according to procedures he advises the supervisor who must arrange with Training and Procedures for the trainee to sit for the certification examination.

The length of on-the-job training for any procedure may vary from one week to several months, depending on the complexity of the procedure, the frequency with which the inspection needs to be performed during the training period, the prior experience and ability of the individual, and the number of procedures to which he is being trained at any one time. Some supervisors indicated that they would push a candidate through the examanination as soon as they felt that he could pass, but before they felt fully confident that he could reliably perform inspections on his own. This usually happened when supervisors wanted to train new recruits to as many as twenty procedures in as short a time as one year. In these cases, however, the supervisors concerned insisted that they did not allow such newly-qualified inspectors to work without supervision until such time as they proved themselves fully competent. In effect, on-the-job training periods may actually, therefore, be more extensive than is suggested by merely measuring the time from appointment to trainee status until certification. In any case, no trainee who does not have prior QA experience is eligible for certification during the first ninety days employment.

Examinations

A number of certification examination papers were scrutinized by members of the study team. They were found to consist of very specific questions which require precise knowledge of the relevant procedure. The papers generally consist of multiple-choice and true-or-false questions. In some instances, there are several versions of an examination for a specific procedure, although there was not a great deal of difference in the questions asked between those papers. In some cases questions were merely rephrased or reordered.

Examinations are graded immediately the candidate has finished and the pass/fail result is communicated to his supervisor as described above. Pass results are also communicated to the Records Section for updating of certification records, usually before close of business on the day the examination is taken. Once certification records have been brought up to date, the candidates' answer paper is destroyed.

As examinations are usually scheduled on a weekly basis, a failed candidate may, at his supervisor's discretion, resit for his certification. The Procedures and Training Unit does not, as a matter of course, inform a failed candidate or his supervisor of the reason for his failure. However, some supervisors said that they persisted in obtaining such information from Procedures and Training as is necessary to direct a trainee's study in the area of his weakness.

Welding Inspection and NDT Certification

Weld inspection and NDE certification is conducted quite differently from all other construction QC certifications at the site. Both training and

certification in these functional areas is carried out independently of the QC performing organization by an NDE school which also trains and certifies Nuclear Operations Division personnel as well as weld inspectors from the licensee's coal and hydro units. Certification in the functional areas of NDE and weld inspection is conducted on a procedure-by-procedure basis, similar to the non-NDE inspectors described above. To this end, one procedure is specified by the licensee for each of the NDE methods taught - magnetic particle, liquid penetrant, ultrasonic, vacuum-box leak testing, and radiography - as well as for visual weld inspection. Certifications based on these procedures are awarded in NDE at level I and level II, corresponding to the recommended practice specified in SNT-TC-IA.

Instruction in each of the NDE techniques is given in the NDE school. The instructors are themselves certified to ASNT level II. The lead instructor is also a member of the American Welding Society (AWS) and the American Society for Nondestructive Testing (ASNT). The same instructor also serves on the ASNT National Committees on penetrant testing, vacuum-box testing and radiography. He sees his own participation in his professional organizations as being important to staying current in his field. There are no ASNT level III instructors in the school. When the services of a level III person are required, for example, to approve level II certifications, an appropriately qualified individual is called in from the licensees corporate offices.

The process of NDE certification to procedures differs importantly from certification practice in other functional QC areas in that NDE certification requires practical examinations to demonstrate capability, in addition to the written test paper to demonstrate knowledge of the procedures.

Training and Certification of Operations QC Inspectors

QC inspectors in the Licensee's Division of Nuclear Power Operations are not certified to procedures but to inspection disciplines as laid out in The American National Standards Institute recommended practice ANSI/ASME N45.2.6. As is the case with Construction QC inspection, the minimum requirement for hiring is a high-school diploma. Most of the licensee's Operations QC inspectors, however, do hold two-year associate degrees from technical schools. Furthermore, as many operations QC inspectors were recruited away from the Construction QC organization on the basis of their good performance records in Construction, a large proportion of the Operations QC inspectors interviewed had previous inspection experience, some in NDE.

Training School

The qualification process for Operations QC inspectors is more exacting than is the case with construction inspectors. Whereas construction trainees can pick up certifications more or less at their own pace on the job, operations trainees have to undergo a nine month training course at an off-site training center run by the licensee. This formal training period lasts nine months, during which the trainee studies no fewer than nine inspection disciplines to which he is eventually to be certified in accordance with ANSI, ASME, and ASNT Codes.

On-The-Job-Training

Upon completion of these training courses, the candidate inspector is assigned to a plant QC group for a minimum of three months on-the-job training with three different experienced inspectors. During this period, the trainee is introduced to various inspection procedures which he learns how to perform under close supervision. Upon completion of

this period, the trainee will continue on-the-job training until he feels confident of being able to perform these inspections on his own. He is then subjected to an oral examination by a special in-house examining board which must concur that he is fully qualified to receive certification by the licensee in the disciplines studied.

Apprenticeship

Thus a variety of classroom and practical training, each with specific holdpoints, is deemed necessary before the new inspector is permitted to carry out his first solo inspection. This system is very close to being a traditional apprenticeship.

An inspector may add further disciplines to his repertoire as he gains experience. All have to be periodically recertified in accordance with the appropriate code every three years. The Operations QC supervisors are responsible for tracking the certification of their own personnel and sending them for recertification. Although this places a greater burden on the supervisor than the system used in Construction, where the Records Review group will draw supervisor's attention to expired certifications, none of the interviewees could recall a single case of an audit revealing that an inspection had been performed by improperly certified personnel.

Certification Checks

There is indeed less external monitoring of inspectors and inspection certifications in Operations than in Construction. Once paperwork has been signed-off by a Operations QC inspector, it passes through the

craft foreman to the craft supervisor. The inspectors' certifications are, of course, subjected to scrutiny if this paperwork is selected for QA audit by the independent Office of Quality Assurance, but for routine review, the only monitoring would seem to be that of the Division's Quality Engineers.

Most Operations QC inspectors interviewed were happy with the system and felt that it equipped them well to do their job. There were some, however, who felt that instead of being trained and expected to work across a wide range of disciplines, it would be preferable to concentrate on just one or two for each inspector who would then be the acknowledged authority in that area.

Training and Qualification of Quality Engineers

The general functions of quality engineers in both Construction and Operations have already been outlined in the description of the QA/QC Program above. Their responsibilities include performance of audits for the line organization, surveillance activities for the line organization, writing site-specific maintenance or construction procedures, and reviewing QC inspection procedures to assure conformance with upper-tier QC/QA documents, issuance of non-conformance reports, and reviewing the effectiveness of the overall quality program within their respective divisions.

Hiring Practices

The licensee's Qualification Program for Engineering Functions specifies only that a candidate should be physically capable of performing the work and that he meets the specific qualification requirements for his specific assignments. Hiring prerequisites are almost wholly determined by preparation of the job-description of the actual post for which the candidate is applying. In practice, the minimum requirement in Construction QE is a two-year associate degree for a quality engineering aide, and a four-year bachelor's degree for a quality engineers. The Operations QE group has only fully qualified engineers, all of whom possess a four-year degree. In addition, all of the QE personnel interviewed on the Operations side had some prior experience in either welding, NDE, or other QA/QC work, such as procurement or auditing.

The quality engineers interviewed were unanimous that general hiring prerequisites should not be made more specific. Many felt that personal qualities and background experience are more important than technical

education (except for the highly specialized area of eddy-current testing). Self-motivation, initiative, and communications kills with crafts were the most frequently cited qualities. More specific prerequisites could only be based on a task analysis of actual job description.

Certification

Most QE training consists of self-study and informal on-the-job acquisition of appropriate knowledge and skills. However, the individual engineers have all attended various courses in a variety of disciplines at the licensee's training schools. These courses lead to an examination-based certification by the licensee in such areas as concrete, protective coatings, auditing, NDE, welding visual inspection, etc. The pace of this training and the number of disciplines studied at any one time is at the discretion of the candidate in consultation with his supervisor.

Certification Monitoring

Since the functions of quality engineers are not mandated by 10 CFR 50 Appendix B, their own qualifications and certifications are not monitored externally, nor are they subject to mandatory QA audit since they perform line functions and do not, therefore, report through independent QA or QC channels.

Training and Certification of OQA Personnel

It is the policy of the Office of Quality Assurance (OQA) that each person who determines or specifies quality or quality assurance requirements, or who verifies conformance of activities and work results to quality or quality assurance requirements, shall be certified to perofrm the assigned work in accordance with applicable codes and standards. This certification is supported by appropriate measures such as education, training, testing, evaluation, and peridic review to assure continiued proficiency.

This procedure applies to the certification of personnel within OQA who directly supervise, perform, witness, or evaluate the results of quality assurance actions incuding surveillance, inspection, examination, tests, and audits. This procedure is also utilized for the certification of other personnel within TVA who will be used by OQA to perform quality assurance audits.

Responsibilities for implementing the certification procedure are distributed as follows. The Training and Certification section supervisor assigns responsibility for developing and maintaining the certification process, and ensures implementation. He also reports on progress and recommends changes to the Manager of Quality Assurance.

The Certification Unit Supervisor establishes methods of certifing personnel. Individual certification of personnel is carried out by supervisors within OQA who are responsible for assuring that personnel under their cognizance who require certification are appropriately qualified. There are two special exceptions to this general rule, which apply to the positions we are most interested in. Lead auditors and auditors, are certified by a specially designated Quality Assurance Auditors Examiner. Similarly, the corporate NDE Level III Exmainer certifies NDE

examiners.

Certification of personnel is based on objective evidence that an individual meets the job position or job task qualification requirements and can adequately perform the assigned function.

Certification of OQA Personnel Other than Lead Auditors

The certification procedure for all OQA personnel, other than lead auditors is as follows. The Certification Unit Supervisor develops and maintains a listing of all job positions~~/tasks~~ within OQA that require certification, as well as TVA personnel outside OQA that require certification by OQA as auditors, for example Quality Engineers. He also develops a listing of individuals who require certification, and develops an overall plan and schedule for obtaining necessary certification, furnishing copies of qualification requirements to supervisors of personnel requiring certification. Other supervisory personnel within OQA distribute qualification requirements to members of OQA under their cognizance who hold job positions or perform tasks requiring certification.

The candidate evaluates his own personal knowledge, skills, and abilities in terms of experience, training, and education against job position qualification requirements and discusses these with his supervisor to obtain concurrence. He then applies for and completes any necessary training prior to examination.

The Certification Unit Supervisor collects and validates documentation of the candidate's qualifications from Personnel Development Records and supervisor's evalutions as applicable. He then coordinates the deve-

lopment, administration, and analysis of required examinations, and provides supervisory personnel within OQA responsible for the certification of individuals with the documentation of qualifications and examination results as applicable.

Supervisory personnel within OQA, responsible for the certificaton of personnel under their cognizance, review the documentation of qualifications and examination results as necessary and complete the certification documentation as applicable. They must then forward the approved certification documentation, or certification rejection and justification information to the Certification Unit Supervisor who enters the documentation into the individual's certification file and informs the responsible supervisor and candidate of certification status.

Certification of Lead Auditors

The certification of lead auditors proceeds slightly differently. The Supervisor, Certification Unit collects and validates documentation of qualifications, coordinates the development and administration of lead-auditor examinations to ensure the requirements of ANSI/ASME N45.2.23-1978 are satisfied, and, finally, provides the responsibsle Auditor Examiner with documentation of qualifications and examinations results. The Auditor Examiner must then evaluate the documentation of qualifications and examination results to ensure that the requirements are satisfied before he records the results on the Certification of Auditor's Qualification Form. The examiner signs the Certification of Auditor's Qualifications Form, or completes written justification for certification rejection, and forwards it to the Certification Unit Supervisor.

The final stage in the process is the responsibility of the Certification Unit Supervisor. He enters the signed Certification of Auditor's Qualification Form into the individual's certification file, and informs the employee and his supervisor of certfication status. The employee's copy of the Certification of Auditor's Qualification Form is forwarded to the supervisor of the employee upon successful completion of certification. The Certification Unit Supervisor then provides the Supervisor of Planning and Support Services for each branch with a listing of all certified lead auditors and date of expiration of their certifications.

Recertification

The sequence for recertification of personnel other than lead auditors follows the same process as original certification with the addition that evaluation of performance instructions are sent to supervisory personnel within OQA responsible for the certification.

The sequence for recertification of lead auditors is in accordance with the requirements of ANSI/ASME N45.2.23-1978. The Certification Unit Supervisor issues a notice to the responsible supervisor and the lead auditor that recertification is required, at least five weeks prior to the expiration date of the current certification. The Certification Unit Supervisor is also responsible for coordinating the upgrading of individual personnel qualifications, when necessary, with auditors, their supervisors, auditor examiners, and the chief of the branch/staff.

The Auditor Examiner for recertification of lead auditors ensures that the requirements for recertification are satisfied as required in ANSI/ASME N45.2.23 and completes the required documentation. He then

forwards the Certification of Auditor's Qualification Form to the Certification Unit Supervisor. The Certification Unit Supervisor enters the signed Certification of Auditor's Qualification Form into the individual's certification file and informs the employee and his supervisor of certification status. He also forwards a copy of the Certificate of Auditor's Qualification Form to the supervisor of the employee, and provides the supervisor of each branch with an updated listing of all OQA certified lead auditors and date of expiration of their certifications.

Audit Participation Records

Similar procedures are adopted to track auditor's participation in audits as required to keep their certification current according the ANSI/ASME N45.2.23.

Observations

Three important observations emerged from interviews with auditors, particularly those working in the construction side of the house.

First, in reviewing the backgrounds of QA personnel at the project, it was clear that most started their careers in some field other than quality assurance, such as engineering or construction. Thus, these people tended to be technically oriented when first assigned to QA jobs. They were well prepared to address technical issues but perhaps, not so well prepared to address QA (management systems) issues. This is quite understandable in that schools offering curriculum in quality assurance are not great in number. Many people who are presently in the QA profession, have received their education through less formal means such as on-the-job training, self-study, seminars, and where available, college level courses. Many have entered the profession through circumstance

rather than by design.

Second, the American National Standards Institute (ANSI) standard which deals with auditor qualification does not address nor highlight the ability of a candidate to evaluate management or quality system effectivenss as a necessary requirement. Rather, the standard is toned towards auditors being qualified to assess compliance issues. QA personnel at this site, have, in the past, been qualified to the requirements of this standard, but it is now being recognized that this is not sufficient for what management hopes to accomplish through their audit program.

Finally, the corporate QA management now views ANSI N45.2.23 as the minimum qualification that must be met on an industry wide basis. They are of the opinion their auditors need to be much more qualified than the ANSI standard requires and they must be experts in the areas they will be required to audit. Corporate QA management is now establishing a six-tiered qualification program which requires the candidate to meet ANSI N45.2.23 before he can move to the second tier. The follow-on tiers, which encompass additional training, testing, and hands-on experience, are designed to heighten the evaluative powers of the auditor so he can make assessments of program effectiveness.

III Employee Viewpoints on QA/QC Qualification and Certification

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no underlining

Certification to Procedures Versus Certification to Disciplines

The only QA/QC personnel at this site who are certified to procedures are the construction QC inspectors. In this respect their certification is consistent with the licensee's approach to craft certification in the Construction Division. Operations QC, as well as both Construction and Operations quality engineers, and Office of Quality Assurance personnel scrutinizing both divisions, are all certified to disciplines.

An overwhelming majority of Construction QC inspectors liked the system of certification to procedures. This partly may be due to a preference for what is familiar. However, only one who was acquainted with the certification to disciplines alternative expressed a preference for such a system. That preference was based on his feeling that having only one level of inspector certification was a disincentive for inspectors to improve the performance and range of their skills. Those who favored certification to procedures felt that it gave then confidence in their judgements. If the procedures are good then inspectors who are trained and certified to them should be more uniform and effective.

The principal disadvantages of certification to procedures were said to be twofold. One is that it requires a large number of inspectors as there are several hundred inspection procedures that would have to be memorized. This requirement may partly account for why Operations QC, which has far fewer personnel at the plant, prefers to certify to disciplines. Second, certification to procedures is not transferable from plant to plant. Some interviewees thought that standardization of procedures across the licensee's nuclear plant could be greatly improved, but certification to disciplines would still be easier to transfer.

The advantages of certification to procedures were said to include the ability certify less-able people to just a few procedures when there is a need to perform a large number of visual inspections in a relatively short space of time. Also, it is possible for a new recruit to become certified to at least a few procedures quite early in his employment. The training program for certification to disciplines does not permit the new employee to perform any solo inspections for at least one year.

According to a senior level manager, who was responsible for training programs and certification, a corporate wide-evaluation is taking place. He suspected that the results will show heavy emphasis on skills in some areas and heavy emphasis on procedures in others. He did not believe that there was a unified approach to training and certification across the organization and it will take sometime before it is sorted out. Training is not a top priority in the corporate organization now. Not many people are being hired, and in some areas overstaffing exists. New people are being hired only in the lower levels of the organization.

Third-Party Certification of QA/QC Personnel

Third-party certification is not used by this licensee. In any case, there was consensus among all personnel interviewed that third party certification of QA/QC personnel would be of marginal benefit for both Nondestructive Examination (NDE) and non-NDE areas. Any benefits would be primarily to the individual, in the form of status recognition and enhancement of job mobility. Benefits to the hiring company were thought to be perhaps quite small or non-existent.

All individuals stated that while paper qualifications may form a basis for initial hiring actions, it was still primarily a company responsibility (since they owned the liability) to verify the individual's qualifications through a combination of appropriate training, testing, and on-the-job evaluation. Quality control supervisory personnel were especially doubtful of the effectiveness of such a practice.

First, they related, it would be almost impossible to have a third party issue certifications for the specific non-NDE procedures that their inspectors are required to use. The training and qualification process used in these areas are specific to the needs of this one project and cannot readily be transferred to other nuclear projects, even within the same utility. Some merit was seen in the area of NDE skills certification (as opposed to procedure certification). Third-party certification of skills would give the employer a measure of confidence that the candidate did have the basic hands-on knowledge to perform the NDE technique when he was hired. They cautioned, however, that skills certification was not sufficient to be an efficient inspector at a nuclear project. Other factors such as a detailed procedure knowledge, a mature judgement honed by on-the-job experience, and an in-depth familiarity with paperwork requirements, organization interfaces, and job-safety requirements were also necessary. Verification of these qualifications could only be administered practically at the licensee level. (Especially at this licensee, where inspectors are required to recertify to any major procedure changes).

One QC supervisor stated that he thought any third party certification would be a dangerous practice. He related a case where job-shop employees had been hired to do radiography. These employees were

supposedly qualified to ASNT recommended practices through their parent company, an independent testing agency. However, project QC personnel, who interpreted the results reported problems with these individuals using poor techniques, which resulted in wrong film densities and improper pentrameter placements on the radiographs. In another case, an individual was hired, who appeared to be an expert in liquid penetrant, magnetic particle, and ultrasonic testing. After the individual was found having difficulty passing a UT qualification examination, it was determined that the individual had been certified by his former employer. However, his interpretive skills had deteriorated since he had not used the method for approximately a year. (The supervisor also stated that deterioration of interpretive skills occurs among radiographers).

Certification Versus Qualification

The licensee was judged to have a comprehensive certification qualification program for QC personnel. It included the verification of personnel skills for both NDE and non-NDE, as well as verification of procedure knowledge, even when procedures were revised. Perceptions of inspector qualification by engineering, managerial, and staff-level personnel were related to be quite good. However, crafts people and their supervision were critical of inspector qualifications. ~~(as related by other study team members).~~ Some of the criticism seems based upon jealousy. The crafts generally have decades of of experience and resent an individual with an associate degree (or less) and a few months training judging the adequacy of craft work. Other criticism was rooted in the inexperience of the inspectors. Inspectors, who do not have much experience, are not fully aware of the craft processes, terminology, nor have they had a chance to hone their judgement. This

unfamiliarity is perceived by the crafts as a lack of qualification. Problems in this area were recognized not only by the crafts people but also the QC inspectors and supervisors.

The experience factor plays a major role in fully qualifying other personnel as well. The corporate training and certification manager ~~supervisor~~ pointed out that development of judgement is what ultimately makes an individual fully qualified. A candidate may study, take written exams, pass practical exams, and ultimately be certified that he has passed the qualification requirements for a certain job. However, he may not be considered fully qualified for some years by his immediate supervisor. Specifically, he mentioned reactor operators. They may be qualified and certified through a formal training program but their supervisor would not immediately trust them to act on their own, or independently handle all jobs within the plant for which they were certified, until maybe four to six years after certification. The upgrading of the auditor qualification program and the informal apprenticeship program used for engineering personnel are other examples.

One inspection supervisor expressed the opinion that it is possible for someone to pass the certification examination (other than NDE) but not be fully qualified to do the inspection, while a QA auditor expressed the opinion that the certification examination was a memorization process and did not really test an individual's inspection capability. He felt that a capability test that put the candidate in a real-life situation would be more meaningful.

Thus, it appears that formal qualification/certification programs tend to be primarily rites of passage. The certification only verifies that an individual possesses the preprequisite knowledge and base level

experience for entry-level effectiveness. Full qualification and total effectiveness of an individual does not occur until sometime later.

The informal on-the-job training apprenticeship of new QC inspectors was seen to be a valuable aid in establishing baseline qualifications for inspectors. The apprenticeship, however, went beyond the individual's point of certification. As stated by many interviewees, an individual does not become fully qualified until perhaps years have passed. The question that arises now is how much experience and on-the-job training must an individual have before becoming fully qualified, recognizing that the value added by experience follows a law of diminishing returns? At one extreme, it may be advanced that an individual is sufficiently qualified if he knows the tools of the trade and can perform the job adequately or recognize when he should seek a superior's guidance. At the other extreme, he would be in the expert category. An individual who is looked upon as knowing all. The answer lies somewhere along this spectrum.

Regulatory Guides and Industry Standards

Most individuals, when questioned about the adequacy of the Regulatory Guides and Industry Standards, did not have any real problems with the way they were written. All pretty well related that the standards contained common-sense approaches and that the level of detail is appropriate. However, little benefit was seen in the establishment of level qualifications for non-NDE inspectors (in fact, this project does not use them).

One senior-level manager was of the opinion that, perhaps, levels should be established for auditors. One level would encompass those who

were qualified to do compliance type audits and another level for those qualified to do systems evaluative or quality of management audits.

The audit supervisor related problems with the flexibility of phrases that exist in many standards such as "as required", "as applicable", and "as necessary". These phrases are open to widely varying interpretation by the industry and the NRC. Does "as applicable" mean that an individual's judgement can be used in determining the extent of implementing the requirement, if at all? Or does it mean a requirement must be imposed in its entirety if a case exists where the requirement applies? (This is the same type of problem that existed with "shall", "may", and "should" before their meaning was clarified.)

One inspector for the NRC held a completely different opinion of the Regulatory Guides. He stated if they were really any good, industry would not be taking so many exceptions. However, there seems to be an overall awareness now that the Regulatory Guides and standards are practical, and the corporate organization is now committing to more of them for their future operations. Commitment in the early days was not extensive. There also seems to be an understanding that the Guides and Standards may contain only the minimal requirements for good quality control.

Quality Functions Versus Line Engineerng and Crafts

Several interviewees, particularly those in quality engineering, said that working in the quality field is not widely seen to be a career-enhancing path among the engineering disciplines; if only because line organizations can be seen to directly enhance output, while quality evaluation usually delays it. This reputation obviously acts as a disincentive to first-class individuals to enter the quality field. One

suggestion to counter this difficulty was to rotate engineering staff through quality engineering and quality assurance organizations. It was felt by supporters of this idea that this would also promote better understanding of the pressures and problems that quality and performing organizations each have to face. Opponents of the idea, however, felt that such a program would compromise inspector objectivity for just that reason. Another argument was that the quality organizations would lose the ability to accummulate and retain the full knowledge of inspection procedures and the disciplinary skills that are the hallmark of the best quality engineers, inspectors, and auditors.

Despite this sense of low status, many craft workers expressed respect for inspectors, particularly those who had shown themselves to be thorough, patient, and ready to learn from the crafts. The inspectors who were not popular were generally less experienced know-it-all types whose manner might cause offence to older, experienced craftsmen. These may be the individuals who give credibility to the probable bias among craftsmen and managers (up through the Assistant General Construction Manager - five levels above the craft workers) that colors their views of inspector competence.

For instance, it was said many times that inspectors are short-term, non-committed, and are not well enough trained for their jobs. When pressed for details, however, there were few examples and most would admit that there are some good inspectors. The worst of these stories are probably circulated preferentially in this willing audience. Perhaps this resentment results from the felt competiton and threats from outsiders who are seen as having inferior qualifications to their own, and who are not part of the union.

This predisposition to believe the worst about inspectors also results in the widespread erroneous belief (up to fairly high management levels) that inspectors are paid much less than crafts. The construction manager (also craft background) says, on the contrary, that most inspectors do a good job and that at least some of the many complaints from crafts about inspectors are (craft) cover-ups.

There is a view, strongly held by some crafts interviewees, that inspectors should be required to have a crafts background. However, this was not seen to be necessary or practicable by most inspectors, auditors, quality engineers, or their managers and supervisors.

SECTION III RECOMMENDATIONS FOR FUTURE STUDIES

Future visits would benefit from closer focus on the objective of the sub-task - i.e., to characterize QA/QC personnel qualification and certification practices in the nuclear industry. Meeting this objective requires, as a minimum, baselining the practices at the site by identifying the various groupings or types of QA/QC positions, and investigating what the education and experience requirements, and qualification and certification methods are for these groupings. The rationale for using these methods should also be pursued. To this end the following items should pursued:

1. What experience levels should candidates for certification have? At what point does development of their judgement from on-the-job experience make them adequately qualified?
2. Would recognition of a mangement level auditor versus a compliance auditor be beneficial?
3. Establishment of utility attitudes towards QA as an organization and a philosophy. (Incorrect attitudes will make a QA organization ineffective regardless of personnel qualifications.)
4. Skills qualification versus procedure qualification should be investigated more fully.
5. What are the qualifications of individuals holding QA positions? What kind of formal training do they have? How did they pick-up on QA as a career? Do they hold any professional licenses or certifications?
6. How decisive are QC personnel in rendering acceptance/rejection decisions? Can newly qualified personnel address nearly all questionable areas or do they frequently seek help?

7. Are interpretation disputes between crafts and QA/QC organizations on acceptance/rejection criteria really based on the criteria, or ~~is it~~ are they due to a hold over of fossil attitudes?

8. Compare the qualifications of QA/QC personnel during the mid-70's when nuclear construction was at its peak with what exists now in a particular utility. Also, include NRC resident inspectors.

9. How uniform are interpretations of the Regulatory Guides and standards dealing with personnel qualifications between the utilities to be visited? What exceptions are being taken and for what reasons?

10. Do individuals feel qualification (certification) is important and why?

11. What opinions are held on the importance of prior education and experience?

12. Perceptions on how well the methods used work, how these methods differ from those seen in past experience and is that significant?

13. Individuals' ideas for doing things differently if they could. Any suggestions for changing regulatory requirements.

14. Can third party certification work and why or why not?

15. Perceptions of how important the methods would be if there were no regulatory requirements.

Courtesy Copy for Ms. Melinda Maloy Rec'd 5/21/84

EG&G Idaho, Inc.
P.O. BOX 1625, IDAHO FALLS, IDAHO 83415

May 16, 1984

Dr. S. F. Rayner
Martin Marietta Energy Systems Inc.
Nuclear Division
P. O. Box X
Mail Stop G22
Oakridge, TN 37830

REVIEW OF PRELIMINARY DRAFT - SITE VISIT "A" - LDK-18-84

Ref: Preliminary Draft Report on Site Visit "A" - Qualification and Certification of QA/QC Personnel

Dear Dr. Rayner:

Attached are my comments from review of the above document as you requested by phone on May 3. As the report is the first draft, no effort was expended on typographical errors, grammar, syntax, or material organization. Review efforts were concentrated primarily on the accuracy and proper perspective of the information gathered.

Respectfully,

L. D. Kubicek, Manager
Quality Standards & Systems Branch

sj

Attachment:
As Stated

cc: J. O. Zane, EG&G Idaho

ENCLOSURE 4

COMMENTS ON FIELD STUDY "A" - A PRELIMINARY DRAFT REPORT

QUALIFICATION AND CERTIFICATION OF QA/QC PERSONNEL

1. Page 1, line 6.

   Change "consultant QC engineer" to "QA consultant."

2. Page 4 through 7.

   I would suggest eliminating or at least greatly reducing the differentiation that is developed between quality assurance (QA) and quality engineering (QE) personnel. The terms are used almost synonymously in the industry, i.e., quality engineers generally fill the professional staff positions in a formal QA organizations.

3. Page 7.

   Check the accuracy of the second sentence which states that "welding and NDE schools do not represent an usual function in the construction and operation of nuclear power plants." Utilities will more than likely directly perform these training functions.

4. Page 8.

   The first sentence sets a strong negative tone for this section (". . . relatively little attention is paid . . . . . in hiring personnel." This section could start quite nicely with the second sentence and have things put in better perspective.

5. Page 10.

   The last paragraph states the licensee's Engineering and Design Division specifies certain QC inspections but does not necessarily specify which engineering codes and standards apply. Some other meaning must be intended than what the words state. (It sounds like Engineering and Design are not doing their job but leaving specification requirements to inspectors). Clarification is needed.

6. Page 10.

   Note that this paragraph states inspector certification is not on the basis of demonstrated inspection skills. The subsequent pages, however, state a candidate must have on-the-job experience before he may be submitted for testing. Also I recall the supervisor or his designee verified that the candidate had satisfactorily demonstrated his skills as a trainee. If the rest of the paragraph on page 10 starting with "rather. . . ." were dropped, some confusion would be eliminated. If the informality of non-NDE capability demonstration needs to be highlighted, it might be done as in the last paragraph on page 16.

7. Same comment as in (2) above. (Deemphasis of distinction between QEs and QA professionals).

8. General Comment.

The report, after incorporation of everyone's comments, will greatly benefit from a thorough going over by a technical writer. Presently, there are problem areas of redundancy and noticeable differences in writing style, as well as data organization which prevent the report from flowing together nicely. We should also, perhaps, use more caution with respect to our personal opinions and statements of conjecture (ours, as well as theirs) in the final draft.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

Docket No. 50-529

OCT 0 1 1985

CORRECTED COPY

MEMORANDUM FOR: Dennis M. Crutchfield, Assistant Director
for Safety Assessment
Division of Licensing
Office of Nuclear Reactor Regulation

FROM: Brian K. Grimes, Director
Division of Quality Assurance, Vendor,
and Technical Training Center Programs
Office of Inspection and Enforcement

SUBJECT: PROOF AND REVIEW OF THE PALO VERDE UNIT 2
TECHNICAL SPECIFICATIONS

Per your request of August 9, 1985, we have proofed and reviewed the Palo Verde Unit 2 Technical Specifications within the area of QAB review responsibility. The specific section we reviewed was Section 6.0, "Administrative Controls," relative to quality assurance. Our comments are as follows:

1. Section 6.5.2.3 of the technical specifications addresses reviews of proposed modifications. Section 6.5.2.3 states that each modification shall be reviewed by an individual/group other than the individual/group which designed the modification.... We recommend that this statement (if retained) be revised to indicate that modifications shall be reviewed by a qualified individual/group.... Such a change is consistent with the applicant's commitment to Regulatory Guide 1.64 and wording in other parts of Section 6.5.2 concerning use of qualified individuals.

2. Section 6.5.2.3, as presently written, may be construed to permit design reviews associated with proposed modifications to be performed by the supervisor of the individual/group who designed the modification. However, there are restrictions placed on such supervisory reviews through applicant QA program commitments found in Chapter 17 of the SAR. Qualified supervisory personnel may perform design verification only under exceptional circumstances. These circumstances must be documented and approved by the next level of supervision.

The applicant, through its commitments to Regulatory Guide 1.33 and 1.64, is committed to technical review and controls which, in some instances, may be more restrictive than those addressed in Section 6.5.2. We would like assurance that Section 6.5.2 does not reduce those previous commitments.

8510030238

ENCLOSURE 1

As the commitments in Chapter 17 of the SAR are an adequate basis for inspections, and this paragraph does not generally appear in other recently issued technical specifications, the alternative of deleting paragraph 6.5.2.3 should be considered.

Should there be any questions concerning our review, please contact Bill Belke of my staff on 492-4512.

Brian K. Grimes, Director
Division of Quality Assurance, Vendor,
and Technical Training Center Programs
Office of Inspection and Enforcement

RECORDS

6.5.1.8 The PRB shall maintain written minutes of each PRB meeting that, at a minimum, document the results of all PRB activities performed under the responsibility and authority provisions of these Technical Specifications. Copies shall be provided to the PVNGS Plant Manager and NSG.

6.5.2 TECHNICAL REVIEW AND CONTROL

ACTIVITIES

6.5.2.1 The PVNGS Plant Manager shall assure that each procedure and program required by Specification 6.8 and other procedures which affect nuclear safety, and changes thereto, is prepared by a qualified individual/organization. Each such procedure, and changes thereto, shall be reviewed by an individual/group other than the individual/group which prepared the procedure, or changes thereto, but who may be from the same organization as the individual/group which prepared the procedure, or changes thereto.

6.5.2.2 Phase I - IV tests described in the FSAR that are performed by the plant operations staff shall be approved by the Manager of Technical Support or the Manager of Engineering as previously designated by the PVNGS Plant Manager. Test results shall be approved by the PVNGS Plant Manager or the Manager Technical Support.

6.5.2.3 Proposed modifications to unit nuclear safety-related structures, systems and components shall be designed by a qualified individual/organization. Each such modification shall be reviewed by an individual/group other than the individual/group which designed the modification, but who may be from the same organization as the individual/group which designed the modification. Proposed modifications to nuclear safety-related structures, systems and components shall be approved prior to implementation by the PVNGS Plant Manager; or by the Manager Technical Support as previously designated by the PVNGS Plant Manager.

6.5.2.4 Individuals responsible for reviews performed in accordance with 6.5.2.1, 6.5.2.2, and 6.5.2.3 shall be members of the station supervisory staff, previously designated by the PVNGS Plant Manager to perform such reviews. Each such review shall include a determination of whether or not additional, cross-disciplinary, review is necessary. If deemed necessary, such review shall be performed by the appropriate designated review personnel.

6.5.2.5 Proposed tests and experiments which affect station nuclear safety and are not addressed in the FSAR or Technical Specifications shall be reviewed by the PVNGS Plant Manager, the Manager Technical Support, the Manager Operations, or the Manager Maintenance.

6.5.2.6 The station security program and implementing procedures shall be reviewed. Recommended changes shall be approved by the PVNGS Plant Manager and transmitted to the Vice President-Nuclear Production and to the NSG.

6.5.2.7 The station emergency plan and implementing procedures shall be reviewed. Recommended changes shall be approved by the PVNGS Plant Manager and transmitted to the Vice President-Nuclear Operations and to the NSG.

6.5.2.8 The PVNGS Plant Manager shall assure the performance of a review by a qualified individual/organization of every unplanned onsite release of radioactive material to the environs including the preparation and forwarding of reports covering the evaluation, recommendations and disposition of the corrective action to prevent recurrence.