



UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D. C. 20555

September 10, 1985

MEMORANDUM FOR: Mr. D. Ward, Chairman, ACRS
FROM: J. MacEvoy, ACRS Fellow *J. MacEvoy*
SUBJECT: SUMMARY OF COMANCHE PEAK SUPPLEMENTAL SER

On 7/14/84 the NRC issued the Comanche Peak 1 & 2 SER followed by 6 supplements. ~~In May, 1985~~ they issued supplements 7 through 11, summarized in this memo. *Between January, 1985 and*

Numbers in parentheses at the beginning of paragraphs in this summary are references to the page numbers of the SSER.

These supplemental SERs deal with the NRC's efforts to evaluate and resolve the technical concerns and allegations raised by various parties and individuals regarding construction practices at Comanche Peak.

(J-3) NRC Region II sent a surprise special review team to evaluate management control of the construction, test, and inspection program. This information provided the basis for a management plan for resolution of all outstanding licensing actions. Comanche Peak passed the evaluation and was allowed to complete construction while the NRC completed its review. A Technical Review Team (TRT) then interviewed Texas Utilities Electric Company (TUEC) personnel and "allegators", reviewed plant records, and followed up where possible on all allegations to determine their validity. TUEC submitted a program plan in late '84 for resolving deficiencies found by the TRT.

The allegations were broken down into the general areas of:

- Electrical and I&C Test Program Concerns
- Startup Test Program Concerns
- Civil and Structural Group Concerns
- Miscellaneous Concerns
- Concerns About Coatings (paint)
- Mechanical and Piping Concerns
- QA/QC Group Concerns
- Integrated Assessment of the QA/QC Program

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In general, most of the 900 allegations were unfounded, could not be substantiated, or were already found by the licensee and corrected. This report lists a summary of those allegations and concerns by area, the TRT's findings regarding the allegations, and the corrective actions required before the NRC will issue an operating license. Several allegations will be the subject of future SSERs.

My opinion of the findings in the SSER:

Each major area of concern investigated by the TRT contained substantiated problems, as would be expected on any major construction project. At Comanche Peak, however, there is a pattern of problems which reflects a poor management attitude and an ineffective Quality Assurance program. The TRT confined their attention to following up on allegations, resulting a highly biased view of the construction project. Enough problems were uncovered during that investigation to cast doubt on the quality of the systems and structures that were not identified by allegations. The overall result is a plant of questionable safety. Simply correcting the individual technical problems discovered by the TRT evaluation is not enough to assure plant safety; the QA/QC shortcomings were too pervasive.

The NRC correctly required TUEC to set up a program to identify and correct the identified problems, and in addition, to provide reasonable assurance that no safety-significant deficiencies remain undetected and unresolved in other areas of the plant not addressed by the investigation. Section P of Supplement 11 contains the integrated assessment of TUEC's QA/QC program for design, construction, and plant readiness testing at Comanche Peak. Prior supplements dealt with isolated incidents (the symptoms of the inadequate QA program). Section P deals with the root cause of those incidents and is probably the most important section in the SSER.

Recommendations:

The NRC Staff recognized that a problem existed at Comanche Peak and took decisive action, as summarized in the paragraph above. That action, if followed up properly by a detailed Staff review and acceptance of corrective actions, should satisfactorily resolve the issue of whether the plant is built to the requirements approved by the Staff and the ACRS. I recommend that the NRC Staff notify the ACRS of any corrective actions acceptable to the NRC Staff that do not conform to the commitments made by the licensee in their FSAR, and subsequently approved by the ACRS. Notification should include a description of the alternative action and the justification for that action.

The following summary looks at each area of concern, and summarizes the allegations, findings, and required corrective actions.

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SUPPLEMENT 7

Electrical and I&C Test Program Concerns

(J-7) There were 53 concerns and allegations in the Electrical and I & C (E&I) area relating to construction records, specs, drawings, procedures, and personnel training/qualification records, and inspections. 20 concerns were hardware related, 33 were QA/QC related. Concerns were consolidated into 9 categories:

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| 1 | Cable Terminations | Improper lug size, improper butt splices, non-conforming terminations, |
| 2 | Cable Tray & Conduit Installation | Problems with seismic supports, process pipe to cable clearance, loose conduit fittings, |
| 3 | Electrical Equipment Separation | Violation of cable separation criteria between cables, trays, and conduits. Specs didn't meet regulatory requirements, |
| 4 | Control Room Ceiling Fixture Supports | Non-seismic field run conduit, drywall, and lighting supports, |
| 5 | Electrical Nonconformance report activities. (NCR) | Improper generation and disposition of electrical NCRs. |
| 6 | Elec. QC Inspector Training & Quals | Inspectors inadequately qualified and received help to pass certification tests. |
| 7 | Cable Installation | Trays overfilled, cable splicing in trays, improper cable dressing. |
| 8 | Procedures | Electrical inspection requirements were changed without proper justification. |
| 9 | Inspection Reports, Inspection Item Removal Notices, Inprocess Inspections | Inspection reports written without re-inspections; in-process inspections not conducted. |

TRT Findings:

(J-8) The TRT found no problems with the concerns raised by the allegations or the special review team regarding the installation of electrical cables, nor could the TRT find any evidence of discrepancies in the electrical NCR activities, electrical procedures, electrical inspection reports, inspection removal notices and in-process inspections. The TRT concludes that the concerns in these areas either could not be substantiated or have no safety significance with respect to the items identified.

(J-9) Category 1, cable terminations: Problems were found with installation and inspection procedures and documentation of butt splices in panels, the documentation of safety related and associated termination in the panels, and the disposition of NCRs related to vendor installed terminal lugs. The group concludes that there are concerns about the adequacy of TUEC's QC inspection program.

(J-9) Category 2, installation of cable trays and conduit: The TRT verified one problem. Craft personnel training was inadequate in the use of an installation manual for conduit and junction box supports.

(J-9) Category 3, equipment separation: The TRT found several cases of safety and non safety related cables and conduits in the main control room panels that did not meet separation requirements. There were 2 instances of violation of the separation criteria for redundant instrumentation wiring. The NRC did not review TUEC's existing analysis substantiating the acceptability of the criteria for separation between independent conduits and cable trays. The TRT concludes that there are concerns about the adequacy of TUEC's QC inspection program.

(J-9) Category 4, control room ceiling fixture supports: Non-seismic conduit in the control room was inconsistent with seismic requirements. Suspended drywall ceiling and lighting supports appeared to meet seismic requirements, but was not confirmed by analysis. Non-safety-related conduit less than or equal to 2 inches diam. in other seismic cat I areas of the plant was also inconsistent with seismic installation requirements.

(J-9) Category 6, electrical QC inspector qualification program: Deficiencies identified with this program probably exist for all disciplines. [However the report here failed to state what deficiencies were found].

(J-10) Overall Assessment: Concerns raised by QC inspectors was very general and often without any specific connection to plant safety. Inspectors on requestioning could not provide specifics.

The general quality of the E&I installations was found to be acceptable except for those areas of isolated concerns.

Problems found with cable terminations, separation, control room fixtures, and inadequate training and quals of QC inspectors indicate a programmatic QC weakness.

(J-8, 10) Resolution by TUEC should not be considered final until they are properly integrated with the results of the QC/QA group review.

Startup Test Program Concerns

(J-11) 18 concerns and allegations were raised in the Test Program area. 13 of these were from a Citizens Association for Sound Energy presentation to the ASLB. 5 were presented by the Government Accountability Project. The concerns were consolidated into 7 categories.

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| 1 Hot Functional Testing | Not all components were installed at the time of the tests and NRC never noticed. TUEC & NRC accepted deficient test results. Accident conditions were not considered by the test program. |
| 2 Unit 2 testing | TUEC relied on Unit 1 test results for Unit 2. Reg Guide 1.68 requires each unit to be tested. |
| 3 Containment Leak Test | Should have been repeated after repairs to fix leaks. |
| 4 Prerequisite Testing | Testers were not properly qualified. Test engineers signed off without witnessing tests. |
| 5 Preop Testing | Administration of program was confusing and could have caused omissions. Calculations were performed incorrectly. Energized functional tests were omitted. |
| 6 Management Attitude | Relaxed standards whenever possible. Non-conservative approach toward health & safety. |

7 QA Surveillance of
Testing Activities

Minimal surveillance conducted.

TRT Findings

(J-13) Categories 2 & 7: Concerns were without basis.

Category 6: Valid basis for concerns. The Startup Group did not require supporting craft personnel to be qualified to ANSI N45.2.6. TUEC did not commit to this level of qualification in the FSAR, but it would have been nice if they required it. Startup management conducted the containment ILRT with 3 electrical penetrations isolated. This violated no technical requirement, but the NRC would like the test done with as close to the operating configuration as possible. In summary, no decision was unsafe.

Categories 1, 4, 5: Valid basis for concerns, but most had no safety significance. The exceptions were: three Hot Functional Test data packages were approved by the Joint Test Group but had not met objectives in test procedure. This violated 10 CFR 50 Appdx B, Criterion V. Test craftsmen were permitted to verify initial conditions. This violated a startup procedure and 10 CFR 50 Appdx B. Test engineers were not on controlled distribution for design changes. This was a weakness only. Test engineers had to get the document from the document center on their own initiative.

(J-14) Category 3: No safety significance, but it may indicate a generic problem. The leak rate calculation differed from that in the FSAR and the FSAR should have been amended. The calculation method was not approved by the NRC. The test was conducted in an abnormal configuration.

In general the test program was adequate and properly implemented. Training and experience were acceptable. The document control system had weaknesses that could have impacted on the adequacy of the program and should be improved.

Actions Required of TUEC

(J-15) Submit a program plan to assess the issues identified. Identify root causes and generic implications on safety related systems, programs, or areas. Address the collective significance of the deficiencies. Include action to prevent recurrence. NRC will not consider an Operating License until they evaluate the plan and its implementation.

- (J-15) Reevaluate all NCRs related to vendor installed terminal lugs in ITT Gould-Brown Boveri switchgear
- Develop adequate procedures for cable splicing
- Reinspect safety related terminations in the control and cable spreading rooms. Verify design documents. If too many non-conformances are found, expand the inspection scope to the entire station.
- Clarify procedures and augment QC inspector training in use of heat shrink sleeves on splices
- Evaluate effectiveness of QC program in identifying root causes and corrective actions.
- Evaluate effectiveness of craft training in the use of installation manuals.
- (J-16) Reinspect all panels for adequate separation of redundant safety related cables.
- Correct the 2 noted violations of cable separation criteria.
- Justify the separation criteria in use between independent cable trays and conduits.
- Justify the adequacy of the control room seismic support system for ceiling and lighting, and non-safety related conduit in other seismic cat I areas.
- Set up a QC electrical inspector qualification program that assures suitable proficiency is achieved and maintained.
- (J-17) Verify that inspector training and qualifications match the commitment in the FSAR. Where deficient, review the inspections made by the unqualified individual.
- Verify that all Hot Functional Test prerequisites and objectives were met. Resolve the four deficiencies noted by the TRT.
- Identify all containment leak rate deviations from FSAR commitments not previously identified to NRC.
- Cancel authorization for craft personnel to set system test prerequisites and assess the impact of those performed.
- Make sure the test engineers get up to date design documents and change notices.

-Assure the NRC that deficiencies in the document control system had no effect on testing.

SUPPLEMENT 8

Civil and Structural Group Concerns

(K-7) There were 57 allegations and concerns relating to reinforced concrete and testing design deficiencies, testing and inspection irregularities, incorrect construction practices, inadequate repairs, uncorrected unsafe conditions, and premature structural loading. The concerns were consolidated into the following 17 categories.

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| 1 Materials used in concrete | Reactor basemat contains rejected aggregate, overwatered concrete. Turbine bldg. has rejected concrete. Containment wall concrete has excessive slump. Circulating water intake has out of spec concrete. |
| 2 Bad concrete work and sloppy concrete placement | Allegations of shoddy work. Aux. bldg has a "soupy" slab. |
| 3 Pouring during bad weather | Unauthorized pouring during rain and freezing weather. Misapplied testing. |
| 4 Concrete voids, cracks, and crumbling | Voids exist behind reactor cavity liner, cracks in basemat, good concrete is covering crumbling concrete. |
| 5 Misc. concrete construction irregularities | Grout not allowed to harden before setting equipment, improper hanger inserts, trash under concrete. |
| 6 Improperly installed or omitted rebar | Uninspected rebar used. Rebar omitted from required locations. |
| 7 Uncontrolled concrete repairs | Hole repaired in uncontrolled manner. |
| 8 Falsified records | Test results falsified. |
| 9 Improper inspector re- | Open book exams. Answers were given |

certification	out with exams
10 Test procedure violation	Aggregate tests not performed or short cuts taken, cylinder compression tests run at improper loading rates, test cylinders allowed to dry out.
11 Rotofoam: poor workmanship	Foam improperly used to maintain required seismic gap between bldgs.
12 Concrete construction deficiencies	Spillway span, pillar or column was erected 77 to 80 deg. offset.
13 Concrete cracks at rx vessel bottom	In the basemat.
14 Control room area deficiencies	Conduit, drywall, and lighting support problem, previously discussed.
15 Unauthorized rebar cuts	Undocumented and unauthorized holes were cut through rebar
16 Excavation overbreak seismic response	Overexcavation and improper fill under Unit 1 containment could invalidate expected seismic response.
17 Improper concrete sampling	Personnel altered readings on concrete batch plant scales.

TRT Findings

(K-10) Fourteen of the 57 allegations were not substantiated. The validity of 21 allegations could not be determined. Two additional allegations could not be substantiated, nor could their safety significance be determined. Of the 20 substantiated allegations, 3 were found to have potential safety significance.

Rebar was omitted from the Unit 1 reactor cavity wall. No justifying analysis was performed.

Adequate air gaps may not have been left between structures. The use of elastic filler (rotofoam) between structures may invalidate seismic models.

The control room ceiling structures may be seismically inadequate as already discussed. The fundamental frequencies of the supported masses had not been determined to assess the response to the seismic spectrum at the ceiling elevation.

The preponderance of evidence suggests that falsification of concrete strength tests did not occur, but a number of other allegations were resolved on the basis of this assumption, so TUEC will be required to provide evidence to confirm concrete strength.

(K-11) The TRT could not determine if rebar had been cut in the concrete.

Hollow spaces behind the Unit 2 reactor cavity liner are in the process of being repaired.

The results of the evaluations for categories 1, 3, 4, 5, 6, 7, 8, 9, 10, 15, and 17 are being verified by QA/QC as part of its overall programmatic review.

In summary, the documentation, to the extent reviewed by the TRT, was judged to be adequate and consistent with applicable FSAR commitments, except for the noted deficiencies. The construction reviewed was adequate and well documented.

Actions Required of TUEC

(K-16) Category 6: Analyze the as-built condition of the Unit 1 reactor cavity, considering all load combinations.

Category 8: Determine areas where safety related concrete was poured between 1/76 and 2/77. Provide a program to assure acceptable concrete strength.

Category 11: Conduct an inspection to confirm adequate separation for all seismic Cat I structures. Show that the presence of rotofoam does not invalidate the seismic analysis of plant structures, components, and piping.

(K-17) Category 14: Show that non-seismic items in the control room satisfy the provisions of Reg Guide 1.29 and FSAR section 3.7B.2.8. Verify that the drywall, conduit, and light supports don't violate the seismic analysis. Demonstrate that the foregoing problems don't apply to other Cat II and nonseismic structures elsewhere in the plant.

Category 15: Provide information to show that the floor containing the rebar alleged to be cut has adequate strength assuming the rebar was cut.

Category 4: Show that the hollow places were filled.

Miscellaneous Concerns

(K-12) There were 25 miscellaneous allegations that did not fit into any of the formal categories. They were assigned to the following 20 categories:

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| 1 Nuclear Fuel | Fuel was received prior to a special nuclear material license. |
| 2 Reactor Pressure Vessel (RPV) | Unit 1 RPV is 3/16 in. off center. RPV expansion during testing allowed reflective insulation to contact the concrete shield wall. |
| 3 PSAR | Contains errors. |
| 4 Health Physics | Radioactive material was thrown into the lake. |
| 5 Main Turbine | Hi pressure turbine casing is cracked. |
| 6 Pressurizer Area Piping | A section was cut from a prefabricated pipe. |
| 7 Unit 1 main condenser | Has design and fabrication problems. |
| 8 Component cooling water surge tank | Damaged anchor bolts |
| 9 Pump Deficiencies | Hayward Tyler pumps may be deficient because of poor vendor QA. |
| 10 Unit 1 Diesel Generators | Two diesel generators were damaged. |
| 11 Polar Crane | Improper installation |
| 12 Missile Barrier Door | A deficient weld was accepted. |
| 13 Welding | A tube was cut at the wrong angle and welded to a baseplate leaving a large gap between the tube and baseplate. |
| 14 NRC Form 3 Posting | Posted at an insufficient number of site locations |
| 15 Drug Abuse | Management did not give proper attention to |

this allegedly widespread problem.

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| 16 HVAC | Seismic supports were not analyzed, components and supports inside containment were not analyzed as missiles, HVAC failure during a postulated accident would lead to unacceptable temperatures inside containment. |
| 17 Rx Vessel
Internals | Upper internals are damaged. |
| 18 Polar Crane | Wires broken in festooned cable. |
| 19 Radwaste System | Workers habitually urinated on stainless steel pipe. |
| 20 Instructions to
craft personnel | Inadequate rigging and handling instructions given. |

TRT Findings

(K-15) Twenty one the 24 allegations were either unfounded, involved non-safety related issues, or were already identified by TUEC's QA organization and corrective actions were completed or acceptable to the TRT.

(K-14) Category 2, the RPV insulation touching the concrete was shown to be not factual, but Hot Functional Testing showed unacceptable cooling in the annulus, possibly as a result of the unequal gap, or debris in the annulus. TUEC increased the airflow in the gap and removed debris, but will not test the result until future Hot Functional Tests are conducted. Apparently TUEC changed the location of the RPV insulation support ring without assessing the effect on cooling flow. Further action is required.

Category 11, the polar crane rail: The crane rail is apparently not mounted properly and is the subject of a continuing debate.

(K-15) Once the two items above are rectified, no outstanding issues raised by the Miscellaneous allegations will preclude licensing.

Actions Required of TUEC

(K-17) Category 2: Upgrade the procedures for approval of changes to non-safety-related equipment to assure that the design changes do not adversely affect safety-related equipment. Upgrade the

procedures for reporting significant design and construction deficiencies to assure that complete evaluations are conducted. Show that the cooling flow in the annulus is adequate for the as-built condition.

(K-18) Identify areas of the plant where unwanted debris may collect in critical spaces and have an adverse impact on the operation of safety related equipment. Inspect those areas prior to fuel load, and set up a periodic inspection and cleaning program for those spaces.

Category 11: Inspect the polar crane rail, analyze whether existing gaps are acceptable, correct problems.

SUPPLEMENT 9

Concerns About Coatings (paint)

(L-1) In the original SER, the NRC found the coating systems at Comanche Peak to be acceptable because TUEC agreed in the FSAR to apply qualified coatings inside the Containment Building. TUEC then proposed to amend the FSAR to eliminate the need for qualified coatings. (The NRC requires that coatings be applied and tested according to Reg Guide 1.54 and ANSI N101.2 unless the applicant can show that unqualified coatings will not affect the post accident performance of the plant. Paint debris can clog fluid systems, generate hydrogen, and foul heat transfer surfaces in air and fluid coolers plus the core fuel.)

(L-2) TUEC analyzed for all coatings (616,000 sq. ft.) in the containment failing and forming debris, but only 95,400 sq. ft. reaching the sump. Their calculations show a head loss from clogged filters of about .5 ft., but core spray and RHR pumps can tolerate a NPSH loss of 4.2 and 5.8 feet respectively. (L-6) Maximum hydrogen production from the primer coating has already been considered in the accident analysis. (L-10) Effects on core heat transfer are minimal. (L-13) The reactivity effects of entrained paint are insufficient to cause criticality. The NRC Staff therefore accepts this analysis and permits TUEC to amend the FSAR to permit unqualified coatings.

(L-3) The paints applied are inorganic zinc primers with organic topcoats, both similar to those qualified for use by other nuclear plants.

(L-5,6) TUEC also analyzed for insulation debris (mirror, metal encased fiber and particulate, and metal encased fiberglass), claiming that only a pipe break could scatter the insulation, and no sump blockage would occur.

(L-14) The NRC states other reasons for quality coatings (cleanliness, corrosion, ALARA, minor flow blockages) and therefore requires a program to assure "good workmanship quality" for coatings.

(M-9) Coatings applied prior to the NRC accepting the FSAR change relaxing the qualification requirement are considered to require qualification. They were included in the investigation for their significance to the TUEC QA/QC program which was inadequate to assure compliance with the requirements in effect at the time the work was performed.

(M-7) Sixty two allegations were made in the coatings area, broken down into the following 7 categories:

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| 1 | Backfit Test Program | Inspections for coatings' properties were not correct. Procedures inadequate, results improperly documented and reviewed. |
| 2 | Design Basis Accident Qual Testing | Some coatings were not DBA qualified. |
| 3 | Traceability | Not maintained for some materials. Improper storage, contaminated materials. |
| 4 | Coatings Procedures | Permitted unqualified coating systems. Technically incorrect instructions. Coatings applied to wrong surfaces. QC inspection inadequate. |
| 5 | Inspection Reports
NCR's. Design Change
Authorizations | Deficiencies were not properly identified, corrected, and documented. |
| 6 | Coatings Exempt Log | No allegations received. TRT reviewed the log anyway. |
| 7 | Training & Quals | Inadequate and poorly documented for painters and inspectors. |

(M-8) TRT did not investigate allegations of improper management pressure and selective assignment of QC inspectors to assure that coatings would pass inspection.

TRT Findings

All allegations but one are insignificant because they either could not be substantiated or they involved small areas. The exception is the coatings on miscellaneous steel items which failed the adhesion test, amounting to 6% of the area coated.

The allegations did demonstrate procedural and implementation deficiencies in QA/QC during the Backfit Test Program. TUEC has not demonstrated that the coatings are DBA qualified. Traceability was lost. Procedures were inadequate and resulted in technically incorrect coatings to be applied. NCRs and design change authorizations were dispositioned without documentation of adequate engineering evaluation and justification.

(M-10) TRT found a number of deficiencies in the training and qualification of inspectors with indeterminable effect on the coating work.

(M-11) The major concern is the breakdown of the QA/QC program in the coatings area.

Actions Required of TUEC

(M-13) TRT doesn't recommend any actions to remedy coatings deficiencies, but does require action to document the status of existing coatings so that future inspection and test programs can comply with the "good workmanship quality" plan.

Categories 1 & 6, Backfit Test Program: Reanalyze test data.

Category 2 Traceability: Identify areas where bad batches were used, justify their use, record in the Coatings Exempt Log if use can't be justified.

Category 4, Procedures: Upgrade the review and approval system.

Category 6, Coatings Exempt Log: Log all items which did not meet the requirements in effect at the time the coating work was performed.

SUPPLEMENT 10

Mechanical and Piping Concerns

(N-7) There were "over 400" allegations in this area covering

welding, piping, hangers & support, construction and documentation, and "other." There are also new allegations made by an intervenor that will be included in a future SSER. The Walsh/Doyle allegations brought up during the ASLB hearings will also be in a future SSER.

The allegations and concerns were consolidated into 50 categories as listed below:

(N-8) WELDING (45 allegations)

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| 1 | Procedures incorrect or not used | Temporary hangers fabricated without procedures by unqualified welders. Pipe support welded from magnetized scrap. Diesel generator skid repaired with uncontrolled procedure. |
| 2 | Procedures | Improper buildup of undersized welds, wrong beads, etc. |
| 3 | Pipe Weld | Excessive heat applied to pipe during weld. |
| 4 | Plug Weld | Used uncontrolled plug weld to fill mis-drilled holes. |
| 5 | Weld Design | Improper weld design used to attach Cadweld sleeves to containment penetration sleeves. |
| 6 | Welding Precautions | Improper inerting, purging, grounding, cleanliness |
| 7 | Examination & Test | Sloppy and/or improper testing |
| 9 | Rod Control | Cans not kept warm. Unauthorized filler used on diesel generator skid repair. |
| 42 | Primary Welds | Unauthorized repair to primary system safe end using unauthorized material. RCS field welds performed incorrectly. Authorized Nuclear Inspector resigned in protest. |
| 43 | Fuel Pool Liner | Defective fitups and welds |
| 45 | Misc. Deficiencies | Excessive surface grinding, unqualified pipefitters, defective S/G insulation welds, other defective welds |
| 46 | Quenching | 4 inch Westinghouse valve to stainless steel pipe weld was quenched incorrectly. |

50 Radiography Results falsified.

(N-9) PIPING (20 allegations)

10 Damaged Pipe	Gouges, unauthorized repairs, general concern regarding handling safety related piping.
11 Installation	Cold sprung RCS piping. Localized heating of Containment Spray piping to facilitate fitup.
13 Repair & Mods	Unauthorized enlargement of spent fuel storage pool sparger holes. Non-conforming stainless steel pipe used in containment spray system.
14 Misc. Problems	Crowbar not retrieved from pipe in core. Defective flexible boots used for penetration seals.
35 Design & Analysis	ADLPIPE code, simplified analysis technique, and seismic response criteria not validated and no provisions to account for Class 3 pipe support damage or failure of Class 5 supports
36 Seismic Analysis	Component modification cards not considered in small bore piping analysis. Consequences of nonseismic Cat I failures on seismic Cat I piping was not considered.
39 Small Bore Analysis	Analytical method used in the past could be deficient.

(N-10) HANGERS AND SUPPORTS (60 allegations)

15 Design	Pipe supports designed by unqualified personnel.
16 Design Change	Pipe support designer intimidated by TUEC engineers [did not reject change].
17 Anchor Bolts	Damaged or modified. Bolts improperly torqued and inspected. Bolt failures.

18 Pipe Supports	Bolts cut shorter than designed. Bolts improperly aligned and bent. Unclear requirements for jam nuts.
19 RHR Heat Exch	Tank support bolts loose, tank undersized.
21 NCRs- -	Three minor problems.
31 Welds	Improper fitups. Unauthorized cutting or welding.
31 Fabrication	Unauthorized support installed. Improper torch cutting. Sledge hammer used to straighten a support. Grinders used to obtain design clearances.
33 Traceability	Unqualified foreign steel substituted for domestic steel. Scrap metal used for supports. 15-20 supports with material traceability problems. Non-safety related materials used for safety related pipe supports.
34 Computer Codes	2 baseplate stress analysis programs were based on erroneous assumptions and not validated.
37 Inspections	QC inspectors confused about 5 degree strut and snubber installation requirement. Spring hanger and snubber adjustments were not performed prior to fuel load.
38 Anchor Bolts	Material from 2 manufacturers was interchanged.
44 & 47 Pipe Whip Restraints	Restraints were supplied with defective welds. Excessive installation gaps. Unauthorized weld rods used to lay a weave bead. Vendor welds were undersized, undercut, and possibly porous.
(N-12) CONSTRUCTION AND DOCUMENTATION CONTROL (30 allegations)	
8 Weld Data Card	Card lost, reconstructed, and accepted by QC.
20 Component Mod. Card	Card lost to prevent traceability of unauthorized work.

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22 Design Changes	TUEC changed the design of a vendor furnished pipe whip restraint without vendor approval.
23 Oxygen Analyzer	Calibration records for an oxygen analyzer were destroyed.
24 Welding Quality	Improperly trained welders. Unqualified inspectors. Questionable weld rods. Inaccessible welds were omitted. Disorganized documentation. Improper rebar welds. Welders forced to increase work rate.
25 Documentation	Unauthorized and uninspected weld repairs done on completed pipe supports. Document package contained radiograph of nonexistent weld. Documentation errors on S/G welds.
26, 27, 28 Personnel Qualification	Unqualified welders, inspectors, and documentation personnel used in some cases.
29, 41 Weld Inspection	Improperly certified liquid penetrant materials used. Radiographic exam program improperly implemented.
30 Steam Condenser	Tube sheet supports incorrectly drilled.
(N-13) OTHER AREAS ("many" allegations)	
12 Reactor Vessel	Support blocks damaged during final installation.
49 "Allegor A-45"	300 alleged defects.

TRT Findings

(N-13) Most of the approximately 400 concerns and allegations were either not substantiated or not specific enough to be either substantiated or refuted. About 60 allegations were at least partially substantiated, but most would not have prevented a safety system from performing its intended function. Review of category 44 is still ongoing. Five issues have potential safety significance and are discussed below:

(N-14) Welding Area: One significant concern exists with uncontrolled plug weld repairs to pipe supports, cable tray supports, baseplates and structural members. The supports are seismic Cat I, and the structural members could affect the integrity of the structures.

(N-15) Piping Area: Two potential problems exist. The main steam line was improperly supported by temporary hangers and sagged during flushing, possibly damaging the piping. Also, main steam, auxiliary steam, and feedwater pipes were routed from the Electrical Control building (seismic Cat I) to the Turbine building (non-seismic Cat I) without any isolation from non-seismic Cat I piping systems.

(N-16) Hanger and Support Area: The bolts holding the upper steam generator lateral supports to the wallplates were shortened from 9 in. to 7.5 in. The actual length of the bolts as installed can not be verified from documentation.

Some fillet welds in pipe supports can be undersized because of a lack of inspection criteria and lack of verification of proper inspection procedures being conducted to "Type 2 skewed welds."

Construction and Document Control Area: No items required further action.

Other Area: No items required further action.

Actions Required of TUEC

As part of the program plan already discussed, TUEC must:

(N-17) Category 31, Weld inspection: Revise inspection procedures and provide evidence that previous inspections of the deficient welds were performed to the appropriate procedures or reinspect the welds.

Category 18, S/G anchor bolts: Verify acceptable bolt length and repair if necessary. Propose measures to insure no similar concern exists for bolting.

(N-18) Category 36, Piping between Structures: Show that piping between seismic Cat I and non-seismic Cat I structures meets FSAR criteria.

Category 4, Plug welds: Do a sampling inspection of all areas of the plant having plug welds. Assess the effects on quality of uncontrolled plug welds, including the ability of the welded structures to perform their intended functions.

Category 11, Steam line stress: Assess the stresses on the main steam and feedwater lines during flushing and testing and submit the results to the NRC for review.

SUPPLEMENT 10

QA and QC Group Concerns

(O-7) There were 124 QA/QC concerns grouped into the following categories:

- | | |
|-----------------------|---|
| 1 Design Process | Changes not properly verified.
Vendor certified drawings (VCD) altered.
VCDs have incorrect welds and locations.
Vendor documents not controlled.
Design change analyses not performed. |
| 2 Document Control | Document control centers understaffed.
Documents not controlled properly,
destroyed, etc. Authorized Nuclear
Inspectors accepted deficient documentation
packages. |
| 3 Records | Records lost or destroyed, not kept in
fireproof vault. Unauthorized changes or
deletions. |
| 4 Training and Quals. | Inadequate. Cheating on certification
exams. Poor records. |
| 5A Repair & Rework | Undocumented repairs/rework, shoddy
practices, QA signoff without verification. |
| 5B Onsite Fabrication | No procedures or QC inspections. Improper
control of safety related material. |
| 5C Housekeeping | Snubbers not protected during welding.
Cleanliness not maintained during the early
phase of construction. |
| 5D NCRs | Improper control and dispositioning. |
| 5E Materials | Loss of traceability. Downgrading of safety
systems to avoid inspections. |

- | | |
|-----------------|--|
| 6 QC inspection | Misuse of inspection reports. Inspectors told to ignore problems. Interference with inspections. Inadequate final inspections. |
| 7 QA Scope | Inadequate management commitment to QA/QC. Inspectors not independent of areas inspected. Understaffed. Ineffective followup on reported deficiencies. |
| 8 As-Built | Inadequate post construction verification program. As built deficiencies in pipe supports, electrical conduit supports, and raceway hangers. |

Each QA/QC category comprises the concerns raised in the previous allegations.

TRT Findings

(O-9) An in-depth assessment of the overall design process will be included in a future SSER.

Category 1, design process: There were six allegations, but only three were substantiated (two certified drawing errors, one lack of document control).

(O-10) Category 2, document control: Of 30 allegations, 13 were substantiated and 6 were partially substantiated. The 19 concerns all related to procedure deviations or administrative flaws in the document control system. The current document control system is acceptable. Prior to 1984 there was a document control breakdown. The effect of this prior breakdown on construction and inspection have not been fully analyzed by TUEC.

Category 3, records issues: Of 11 allegations, 3 were substantiated and relate to loss of construction, fabrication, installation, or inspection records which were subsequently found or reconstructed to the NRC's satisfaction.

Category 4, training and qualifications: Five of the 8 allegations were substantiated. Numerous deficiencies were found in the site inspector qualification and certification program, specifically:

-No limit on the number of times an identical exam could be retaken following a failure,

- Twenty percent of the training records reviewed contained no verification of credentials.
- Waivers were frequently used for on-the-job training, but there were no guidelines provided for use of waivers.
- Seven inspectors had questionable qualifications.
- White out was used on certification exams.
- Eighty percent of the 102 inspectors reviewed were qualified under exceptions to the rules (ANSI N45.2.6).

The widespread deficiencies and minimal requirements in the QC inspector qualification program have potential quality and generic implications.

(O-11) Category 5A, repair & rework: Ten of 13 allegations were substantiated. Several Auxiliary Feedwater and Component Cooling Water welds were radiographed (not required by ASME Code) and not repaired promptly. They were subsequently re-radiographed and repaired correctly.

Valve parts were lost, damaged, and interchanged. NCRs were written to correct the problem, but no attempt was made to locate and correct the root cause. Valve failures may result from these problems and there are generic concerns even though the 10 identified problems were corrected.

(O-13) Category 5B, onsite fabrications: Of 3 allegations, 1, containing 12 items of concern, was partially substantiated. The iron fabrication shop failed to follow procedures and apply management controls, resulting in potential fabrication errors. The QA/QC group in its walkdown inspections found no evidence of poor workmanship or unacceptable quality. There is a concern of possible generic quality implications.

Category 5C, housekeeping: One of two allegations was substantiated. TUEC failed to apply adequate cleanliness controls during the early stages of construction. The current program was found to be satisfactory, but TUEC must verify that the reactor vessel has been adequately cleaned and that pipe support snubbers are protected from ongoing construction activity.

(O-14) Category 5D, NCRs: Four of 20 allegations were substantiated. Most of the problems were corrected, but there was no overall review by the QA organization of recurring problems and little, if any, corrective action.

Category 5E, Materials: One of seven allegations was substantiated, relating to the upgrading and downgrading of material safety classifications. There were problems in the early years but they were corrected.

(O-15) Category 6, QC inspections: Of six allegations, one was substantiated (Twenty one pipe whip restraint welds were reinspected and reanalyzed for stress. The reanalysis was not adequately documented to permit review and has generic quality implications) and one was partially substantiated (an inspector was told to ignore problems with pipe whip restraints).

(O-16) Category 7, QA scope: Four of 13 allegations were substantiated and three more were partially substantiated. The implementation of the QA program in a number of areas was ineffective because of a lack of senior TUEC management commitment to, and verification of, an effective QA program.

(O-17) Category 8, as-built issues: Two of four allegations were partially substantiated. Following an inspection of installed, QC accepted pipe supports, electrical hangers, and conduit supports, the QA/QC Group concluded that the final QC inspections were inadequate because the frequency of recurring deficiencies identified was excessive. QC did not detect and report these obvious nonconforming conditions.

Actions Required of TUEC

(O-20) TUEC shall submit to the NRC a program for performing a detailed and thorough assessment of the issues identified in [a January 8, 1985 letter from Darrell Eisenhut to D. Spence, pres. of TUGCo., found on page O-277 of the SSER]. The program plan should address the root cause of each problem identified and the generic implications on safety-related systems, programs, or areas. The collective significance of these deficiencies and those identified by the other TRT groups should also be addressed. The plan should also include the proposed TUEC action plan that will correct current problems and ensure that such problems will be precluded from occurring in the future.

THE TRT'S INTEGRATED ASSESSMENT OF TUEC'S QA/QC PROGRAM:

(P-1) This is not a complete programmatic review of the entire QA/QC program, rather it is an assessment as a result of investigating various allegations. The conclusions reflect the findings of all TRT Groups in relation to QA/QC concerns and discrepancies for the area assessed.

Conclusions

(P-27) Design Process: Control of changes to design documents, incorporation of field changes, design interaction with plant organizations. The interactions among the engineering, construction, and QC groups were deficient and are the subject of a future SER supplement.

(P-28) Document Control: Although many of the past document control inadequacies have been corrected, the implications of past inadequacies on construction and inspection have potential generic significance which has not yet been fully analyzed by TUEC.

Training & Qualifications: There was a pattern of inadequacies with the training, certification and qualification program. Further evaluation by TUEC is required in order to assess the impact of the deficiencies on the safety of the project.

(P-29) Construction and Testing: Several recurring construction deficiencies were found indicating a lack of proper first level supervision. This has the potential for significant quality and safety impact on critical plant systems.

(P-30) Nonconformances and Corrective Actions: The QA/QC group found deficiencies in NCR implementation with some unsatisfactory corrective actions. Brown & Root's and TUGCo's corrective action systems were poorly structured, ineffective, and poorly applied.

(P-31) Inspection: Several QC inspection deficiencies have a potential plant wide impact, especially in the areas of coatings and mechanical hardware. QC inspectors failed to follow design documents and inspection procedures. Critical installations may be inadequately constructed and improperly represented on documents in the plant permanent records. These inaccurate documents may have been used in stress analyses by the engineering group. Thus these inadequacies could have a significant safety impact on the plant.

Audits and Reporting: TUEC's audit procedures did not comply with NRC requirements. During the height of construction (1981-1982) the audit staff consisted of 4 auditors, not necessarily QA auditor qualified. TUEC management failed to periodically review the status and adequacy of the QA program. Recurrent deficiencies occurred. The audit and reporting system was less than adequate and remains questionable.

(P-34) Procedures: Construction and inspection procedures in some areas were inadequate, contradictory, uncontrolled, or nonexistent.

David Ward
September 10, 1985

(P-35) The pattern of failures by QA and QC personnel to detect and document deficiencies suggests an ineffective B&R and TUGCO inspection system.

TUEC Actions:

The results presented in this evaluation are based on a biased survey guided by allegations. Nevertheless the TRT believes the results to be meaningful. TUEC shall evaluate the findings and consider the implications to the quality of construction at Comanche Peak. They must then submit a plan to address the problems and provide reasonable assurance that no safety-significant deficiencies remain undetected and unresolved. TUEC should consider management personnel with a fresh perspective and using an independent consultant to provide oversight to the program. TUEC should also consider the prudence of relying on the same contractor management personnel responsible for the identified problems.

cc: ACRS Members
ACRS Technical Staff
ACRS Fellows

EXCERPT FROM
ACTIONS, AGREEMENTS, ASSIGNMENTS, AND REQUESTS
305th ACRS MEETING
SEPTEMBER 12-14, 1985

ACRS Review of Comanche Peak Steam Electric Station

4. The Committee prepared a letter to the EDO regarding the efforts of the NRC Staff to evaluate and resolve the technical concerns and allegations, and quality assurance and quality control issues raised in conjunction with construction practices at the Comanche Peak Steam Electric Station, Units 1 and 2.

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