ATTACHMENT (2)

KG&E MANAGEMENT PLAN

NOVEMBER 14, 1984 (Revision 1)

MANAGEMENT PLAN FOR THE RESOLUTION OF CAR-19

Overview

The objectives of this plan are as delineated in CAR-19. These objectives will be met by providing objective evidence that each of the corrective actions specified within CAR-19 are satisfactorily implemented. The intent is to verify that both the hardware and programmatic aspects of all safety related activities utilizing AWS D1.1 welding are in compliance with the FSAR (i.e. AWS D1.1 - 1975) and the Design and Construction Program Manual (Section 17.1B).

The attached logic chart illustrates the approach to be used in providing the above mentioned verifications. The Corrective Actions associated with each of the steps on the logic chart are identified on the chart.

All Corrective Actions shall be implemented in strict accordance with CAR-19 including review and approval of specific items by KG&E QA where requested. Flow diagrams (attachments C-1 and C-2 of the CAR) have been and will continue to be considered in developing corrective actions.

Upon completion of each of the corrective actions necessary to resolve CAR-19, reports will be prepared which summarize action taken. These summary reports will be used internally by DIC in the preparation of evaluations which will be submitted to KG&E to be used in the preparation of a final report.

Findings and Corrective Actions

The following pages include the Findings and Corrective Actions as presented in the subject CAR. The detailed activities required to implement each Corrective Action are listed beneath the Corrective

Actions. The numbering system for findings and corrective actions used in CAR-19 correspond directly with those used herein. Responsible key personnel are also provided.

Finding #1: "The results of the Document Reconciliation Task Force indicated that 1509 of 6816 MSSWR's for Safety Related Structural Steel Welds are missing."

RESPONSIBILITY

1a) "Based on DIC program requirements assure that all of the welders and welding procedures were qualified to AWS D1.1."

K. Hollingsworth
B. Newton

1a-1 DIC develop AWS D1.1 attribute checklist and review welding procedure and welder qualification procedure against this checklist; include documentation of procedure review cycle.

K. Hollingsworth
B. Newton

1a-2 DIC perform statistical sampling plan in accordance with MIL-STD-105D to verify qualifications of welders appearing on randomly selected MSSWR's.

G. Stanley
M. Pitre

1a-3 Bechtel review and comment on DIC Welding Procedure Specification and Welder Qualification Procedure as to compliance to AWS D1.1.

D. Mauldin

1a-4 Provide report summarizing the results of the above.

1b) "Review the DIC program for the purchase and control of filler material to ensure that only acceptable filler material was used in safety related welds. Assure that both safety related and non-safety related filler materials were properly controlled to preclude improper application."

K. Hollingsworth B. Newton	1b-1	DIC review procedures for the purchase and control of filler and base materials and prepare description/justification.
G. Stanley	1b-2	Bechtel review procedures for the purchase and control of filler materials and comment.
D. Mauldin	1b-3	Prepare summary report.

1c) "Evaluate the adequacy of the DIC inspection criteria and procedures to determine if these elements could have adversely impacted the inspection results. Document and provide this evaluation to KG&E QA for review prior to inspection implementation. Any changes in inspection criteria and procedures shall be provided to KG&E QA for review prior to implementation.

D. Mauldin J. Ayres	1c-1	Develop AWS and site specification attribute checklist related to inspection requirements. Review DIC inspection criteria and procedures in accordance with checklists.
J. Ayres	1c-2.0	Document this evaluation.
J. Ayres	1c-2.1	Summarize results of 1c-2.0 and provide results to KG&E QA.
J. Ayres	1c-2.2	Continue further actions as a result of 1c-2.0 evaluations.
J. Ayres	1c-3.0	Discuss evaluation with KG&E QA.
D. Pigdon T. Halecki	1c-3.1	KG&E QA provide input/comment on evaluation of 1c-3.0 to DIC.
J. Ayres	1c-4	Prepare changes/revisions as necessary and submit to KG&E QA for review.

D. Mauldin
J. Ayres

1c-5 Prepare summary report items 1c-1 through 1c-4.

L. Pardi

1d) "Obtain a documented evaluation to determine the validity of inspections performed with the presence of paint on the weld."

K. Hollingsworth
B. Newton

1d-1 Obtain information from other utility/AE's that have developed a validation plan.

B. Newton
G. Brown

1d-2 DIC Welding Engineering and Bechtel Review; add site specific requirements/justification as necessary and develop site position letter.

G. Stanley

1d-3 Submit letter to KG&E for review and approval.

D. Mauldin

1d-4 Prepare summary report items 1d-1 through 1d-3.

1e) "Utilize personnel certified to ANSI N45.2.6 - 1978 for the inspection of safety related structural steel welds. Inspections shall be performed in accordance with the DIC Quality Program and training shall be performed and documented to assure that inspectors are cognizant of the DIC Quality program requirements."

D. Mauldin

1e-1 Incorporate CAR-19 Inspection Verification Plan into DIC procedure QCP-VII-200, "Inspection of Welding Process."

W. G. Westhoff
J. Fletcher

1e-2 Inspection personnel to be certified to ANSI N45.2.6 - 1978 in accordance with DIC certification program based on education and experience levels.

L. Easterwood
J. Fletcher

1e-3 Site specific qualifications will be limited to the re-inspection of structural steel welds in accordance with the requirements of QCP-VII-200.

D. Mauldin

1e-4 Prepare summary report items 1e-1 through 1e-3.

1f) "Perform a 100% reinspection of all structurally significant safety related structural steel welds. The identification of "structurally significant" welds shall be made by the Architect - Engineer."

G. Brown
J. Fletcher

1f-1 Identification of "structurally significant" welds by the Architect - Engineer.

"Structurally significant" joints are defined as all field welded joints which support or potentially support safety related equipment and building components. This basically includes all field welds on structural and miscellaneous steel with the exception of handrail, toeplates, grating, checkered plate, stairs, ladders and monorail supports. These are non-Q items which typically see significant service loads during the construction process. Some are designated as II/I, however, II/I seismic loads are considered to be less severe than service loads. Monorails have been load tested as part of startup procedures.

The joints are selected by Bechtel based on a review of erection drawings prepared by the structural and miscellaneous steel fabricators.

L. Easterwood
J. Fletcher

1f-2 Perform re-inspections in accordance with the CAR-19 Inspection Verification Plan.

- Use the project nonconformance program to obtain and document a suitability for service evaluation of inaccessible welds.
- Report all identified deficiencies on an NCR.

Bechtel will perform a case by case evaluation of each joint inspected to determine if:

- as-built condition meets design allowables.
- if the as-built condition is a significant deficiency in accordance with 10CFR50.55(e).
- any rework is required.

D. Mauldin
J. Fletcher

1f-2.1 Summarize data from 1f-1, 1f-2.

V. McBride
D. Armstrong

1f-3.0 Collect relative data from FCR's, CVR's, NCR's for additional structural welds and furnish to Bechtel.

V. McBride
D. Armstrong

1f-3.1 Collect information and furnish to Bechtel for evaluation to determine if any additional structurally significant welds were made. Reinspect any additional welds as directed from Bechtel evaluation.

D. Mauldin

1f-4 Prepare summary report on data from items 1f-1, 1f-2, 1f-3.

Finding #2: "An Inspection verification effort of safety-related structural steel welding, undertaken by AWS certified welding inspectors identified several areas of deficiencies. These deficiencies have been categorized below:"

- Undersized welds
- Weld defects
- Incorrect configuration
- Weld underrun
- Weld undercut

RESPONSIBILITY	CORRECTIVE ACTIONS
D. Mauldin J. Ayres	2a) "Determine and document the "root cause" of the previous acceptance of deficient structural welds. Analyze the HVAC Support, Electrical Support, Pipe-Whip Restraint and any other safety-related program utilizing AWS D1.1 Welding to ensure that the same "root causes" inherent in the structural steel welding program were not generic to other programs."
D. Mauldin J. Ayres	2a-1 Review evaluations of DIC inspection program as performed in 1c. Determine if procedures could contribute to "root cause".
D. Mauldin D. Garrett	2a-2 Review inspection training and certification procedures to verify compliance to ANSI N45.2.6 - 1978.
D. Mauldin J. Ayres	2a-3 Analyze the deficiencies found in structurally significant safety related structural steel welds as documented in the CAR-19 Inspection Verification Plan utilizing the original MSSWR, the Re-Inspection Data Sheets, and the Architect Engineer evaluation.

J. Ayres	2a-4	Identify all safety related activities utilizing AWS D1.1 welding.
J. Ayres	2a-5	Review previously compiled information relative to inspection and acceptance of HVAC and Electrical Supports, and Pipe Whip Restraints and any other safety related program utilizing AWS D1.1. Examples of compiled information include Construction Self Assessment, task force reports, QA audits and surveillances.
D. Mauldin J. Ayres	2a-6	Summarize results of any previous investigations/reports related to welding/inspection of above items.
D. Mauldin J. Ayres	2a-7	Analyze programmatic elements utilized in the erection/welding of structural steel and HVAC and Electrical Supports, Pipe Whip Restraints and other items. Develop list of programmatic differences and determine extent to which these differences would influence "root causes".
D. Mauldin	2a-8	Provide summary report items 2a-1 through 2a-7.

Finding #3: "A small number of safety related structural steel welds were not made or had missing material."

RESPONSIBILITY	CORRECTIVE ACTIONS
	3a) "Forward the "as-built" information to the Architect/Engineer via an NCR to obtain an engineering evaluation and disposition."

L. Easterwood J. Fletcher	3a-1	Missing welds or material detected in the inspections performed in 1f shall be documented on NCR(s) showing the "as-built" information. These NCR(s) shall be given to the AE for evaluation and disposition.
D. Blizzard F. Rayczner	3a-2	Verification of incorporation of design changes.
D. Armstrong	3a-3	Evaluate and determine probable cause of 3a-1.
D. Mauldin	3a-4	Prepare summary report.

Finding #4 One (1) weld was documented as having been inspected when in reality the weld was not made. (Ref. NCR ISN 20495CW)

RESPONSIBILITY		CORRECTIVE ACTIONS
	4a)	"Investigate the concern to determine the root cause of the error. Immediately notify KG&E Quality Assurance if any other problems of this nature are identified. Document the investigative actions. The notification of KG&E QA shall not preclude the issuance of an NCR."
D. Mauldin D. Armstrong	4a-1	Evaluate the results of the CAR-19 Inspection Verification Plan (i.e., those inspections performed in 1f) and determine whether a pattern of deficiencies is found.
D. Armstrong F. Rayczner	4a-2	Identify further actions required if a pattern of deficiencies is found.
D. Mauldin	4a-3	Prepare summary report.

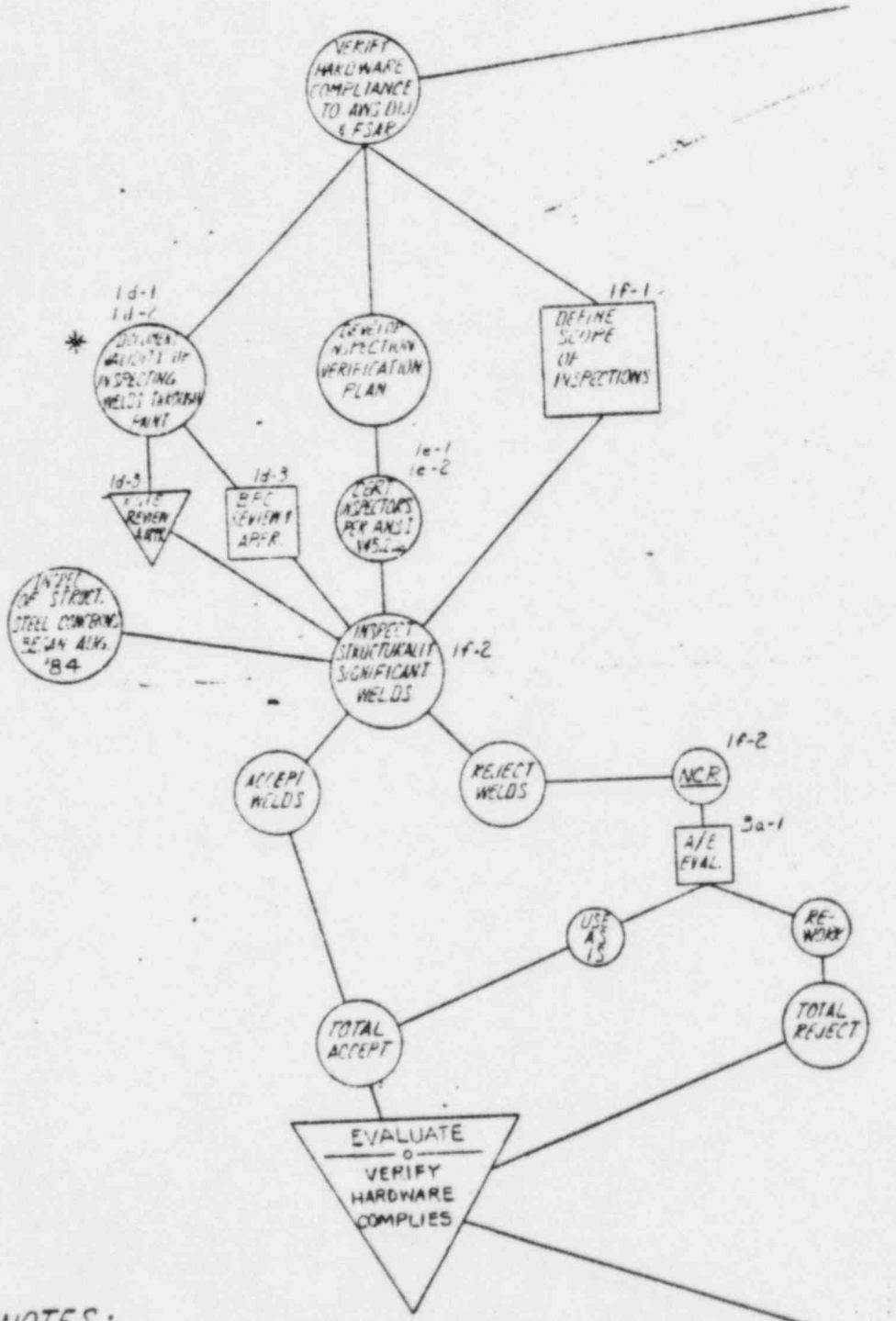
Finding #5: "Objective evidence that the mechanical and structural welding inspection/documentation problems identified in KG&E QA Surveillance Report S-372 were rectified has not been provided."

RESPONSIBILITY	CORRECTIVE ACTIONS
	5a) "Provide objective evidence that the mechanical and structural support welding inspection/documentation problems identified in Surveillance Report S-372 have been corrected. If such evidence is not available, research the extent of the problem and take the appropriate remedial actions."
D. Mauldin	5a-1 Review and provide objective evidence that Mechanical Deficiency Reports identified in S-372 have been correctly closed out.
D. Mauldin	5a-2 Review and provide objective evidence that Civil Deficiency Reports identified in S-372 have been correctly closed out.
D. Mauldin	5a-3 Prepare summary report.

RESPONSIBILITY #6 REPORT

D. Mauldin — A final comprehensive report including all evaluations performed and the results of activities conducted to provide objective evidence to satisfy the corrective actions required by CAR-10 will be prepared and submitted to KG&E Quality. This report will also include an evaluation of Construction/Quality programs in areas other than AWS D1.1 welding to determine the potential of programmatic deficiencies.

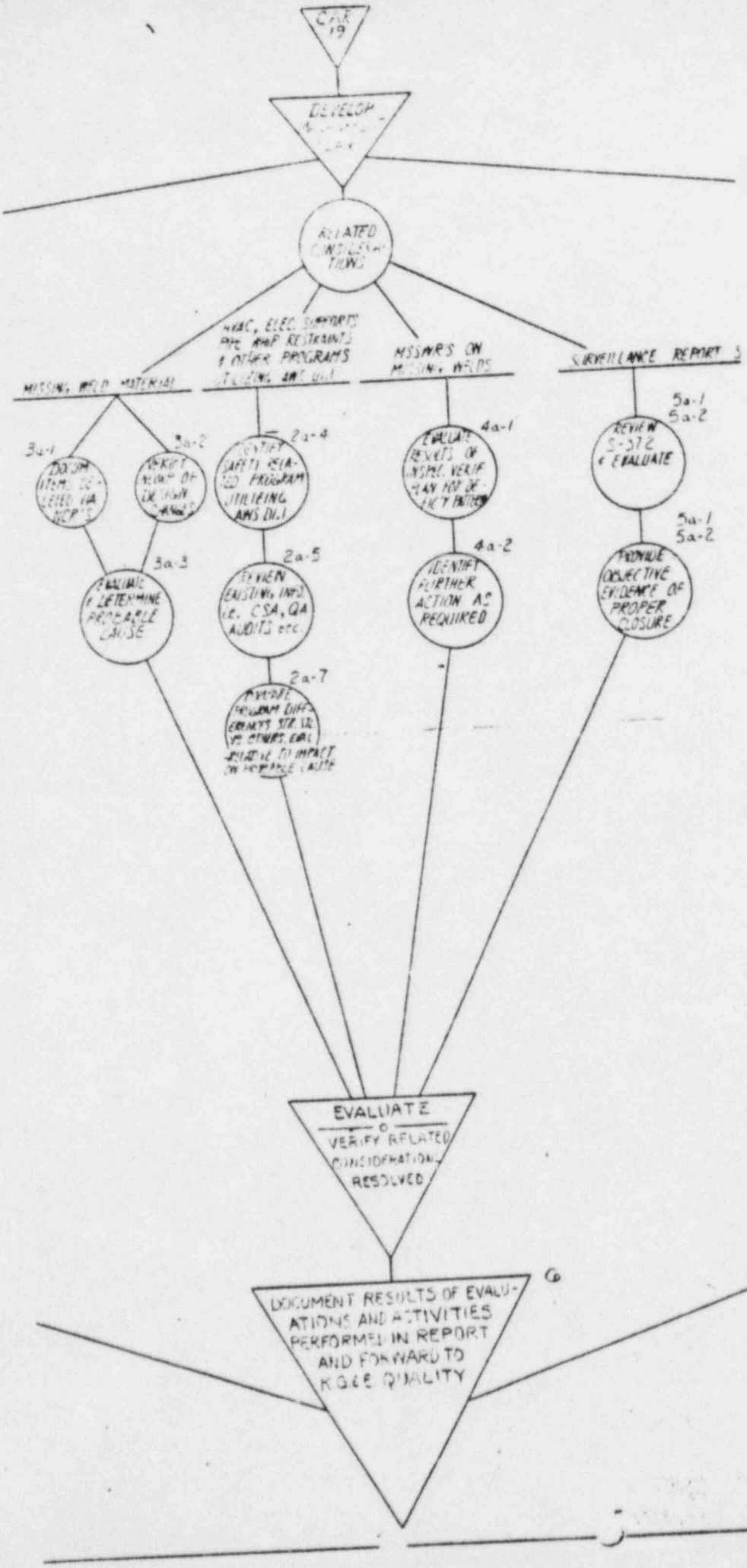
BLUEPRINT IS IN "3" PARTS

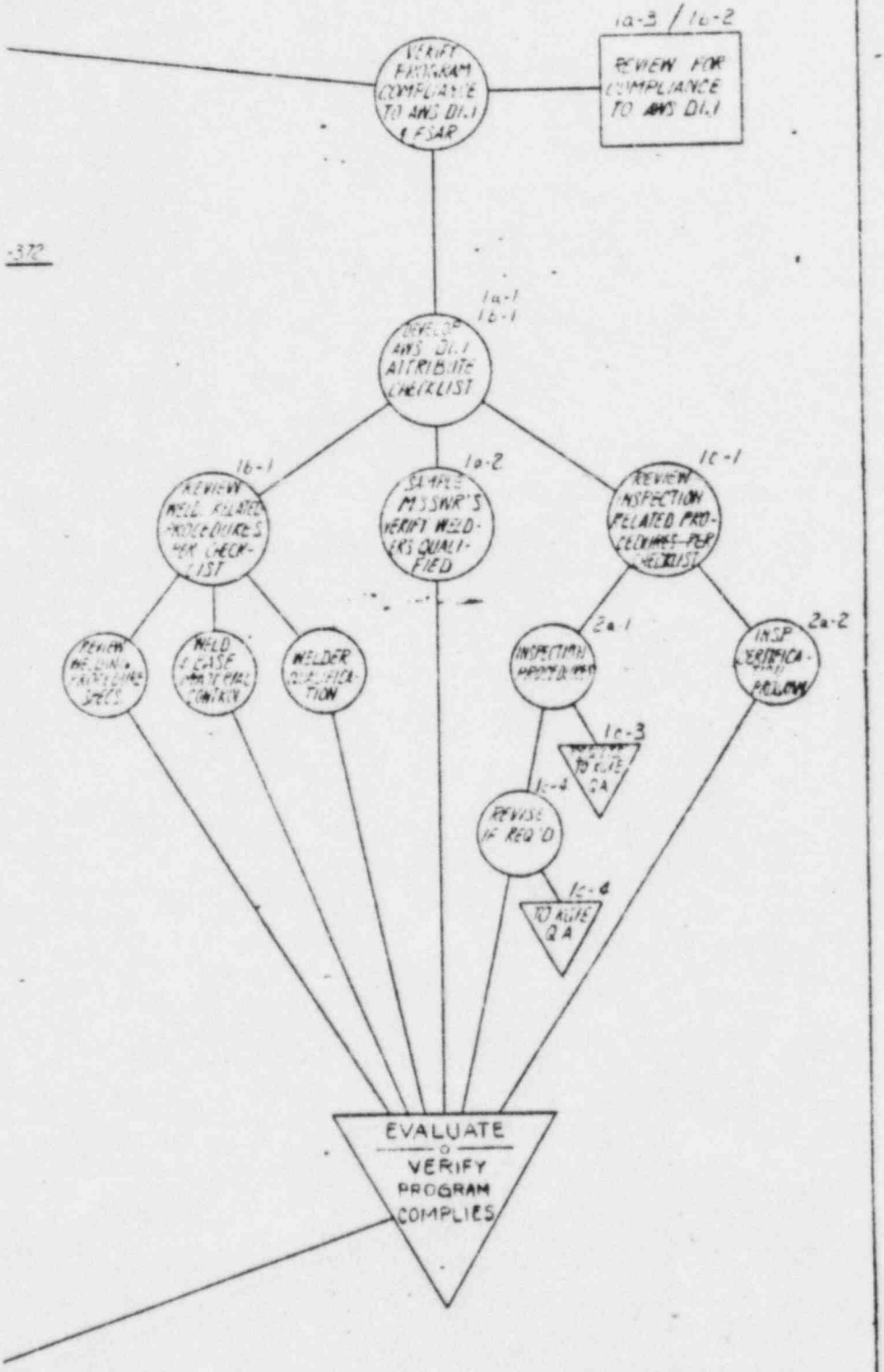


NOTES:

*-INSPECTIONS (1f-2) OF VALIDATING INSPECTING THROUGH PAINT. BEGUN CONCURRENTLY WITH PROCESS

P. 1


CAR 19
DEVELOP
RELATED CONSIDERATIONS
MISSING WELD MATERIAL
HVAC, ELEC. SUPPORTS PIPE WHIP RESTRAINTS & OTHER PROGRAMS UTILIZING SAT DATA
MSSRS ON MISSING WELDS
SURVEILLANCE REPORT S
3a-1
DOCUMENT ITEMS DE-LETED VIA NCR'S
3a-2
VERIFY SIGN OFF OF ORIGINAL DRAWING
3a-3
EVALUATE & DETERMINE PROBABLE CAUSE
2a-4
IDENTIFY (AFFECTED) RELATED PROGRAM UTILIZING AMS DATA
2a-5
REVIEW EXISTING INFO i.e. CSA, QA AUDITS etc.
2a-7
PROVIDE PROGRAM DIFFERENTS STR. VS OTHERS. EVAL RELATIVE TO IMPACT ON PROBABLE CAUSE
4a-1
EVALUATE RESULTS OF INSPEC. VERIF. MAY NOT BE APPLICABLE FOR
4a-2
IDENTIFY FURTHER ACTION AS REQUIRED
5a-1
5a-2
REVIEW S-372 & EVALUATE
5a-1
5a-2
PROVIDE OBJECTIVE EVIDENCE OF PROPER CLOSURE
EVALUATE
VERIFY RELATED CONSIDERATIONS RESOLVED
6
DOCUMENT RESULTS OF EVALUATIONS AND ACTIVITIES PERFORMED IN REPORT AND FORWARD TO KG&E QUALITY



LEGEND

- ○ D.I.C. ACTION
- ▽ KG&E
- □ BECHTEL ACTION

0	INITIAL ISSUE		
REV.	DESCRIPTION		
SCALE	DATE 10/26/84		

KANSAS GAS AND ELECTRIC COMPANY

LOGIC CHART FOR RESOLUTION CAR 19

JOB NO. | DRAWING NUMBER | REV. 0

P. 3

- OCP-VIII-200/PCN-014

STRUCTURAL STEEL WELDING
PRESENTATION

KANSAS GAS AND ELECTRIC COMPANY
WOLF CREEK GENERATING STATION

FEBRUARY 27, 1985

D-4

KG&E/NRC MEETING
AWS STRUCTURAL STEEL WELDING
PHILLIPS BUILDING • BETHESDA, MARYLAND • FEBRUARY 27, 1985

INTRODUCTION
- NRC
- KG&E - Gene Rathbun; Manager Licensing and Radiological Services

GENERAL DESIGN PHILOSOPHY
James Ivany; Civil Engineering Supervisor, Bechtel

QUALITY ASSURANCE PROGRAM AND HISTORY OF CORRECTIVE ACTION REPORT NO. 19
William Rudolph; Manager Quality Assurance (WCGS)

WELDING HISTORY AND MANAGEMENT PLAN
John Berra; Vice President - Operations, Daniel International Corporation

ENGINEERING EVALUATION
Jerry Brown; Civil Engineering Group Leader, Bechtel

INDEPENDENT REVIEWS
Glenn L. Koester; Vice President - Nuclear
- Roger Reedy; Professional Engineer, Reedy Associates
- Dr. John Fisher; Professor of Civil Engineering, Lehigh University
- Dr. Geoffrey Egan; President, APTECH

SUMMARY
Glenn L. Koester

- STRUCTURAL STEEL WELDING IS DONE TO AWS D1.1 — 1975
- AWS IS NOT CODIFIED
- CODE APPLICATION BY OWNER — ARCHITECT/ENGINEER

KG&E SUBMITTALS TO NRC CONCERNING AWS STRUCTURAL STEEL WELDING

10CFR50.55(e) REPORTS

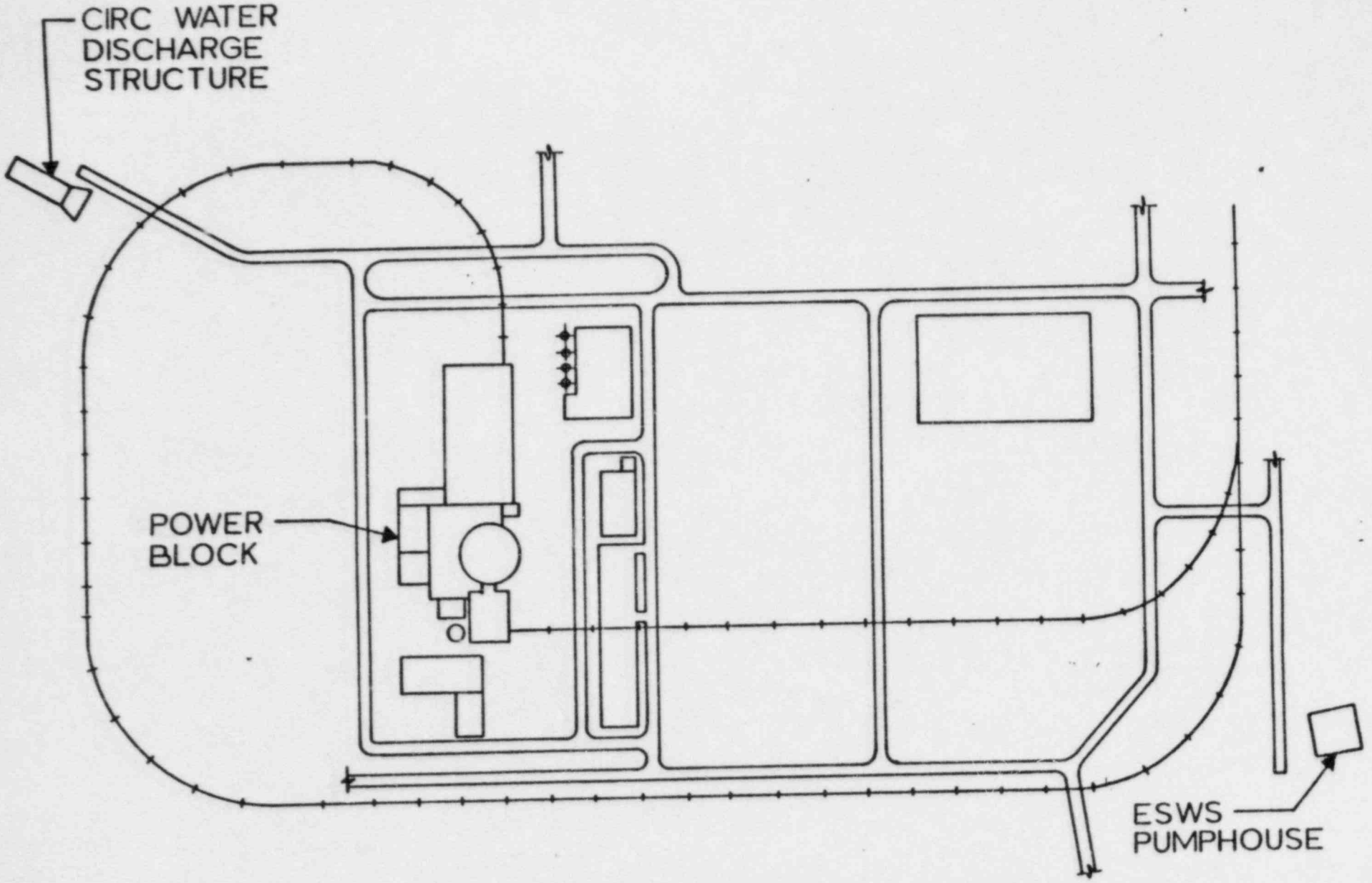
- October 17, 1984 - KMLNRC 84-187
- January 18, 1985 - KMLNRC 85-025

FINAL REPORT

- December 31, 1984 - KMLNRC 84-238
- January 21, 1985 - KMLNRC 85-037

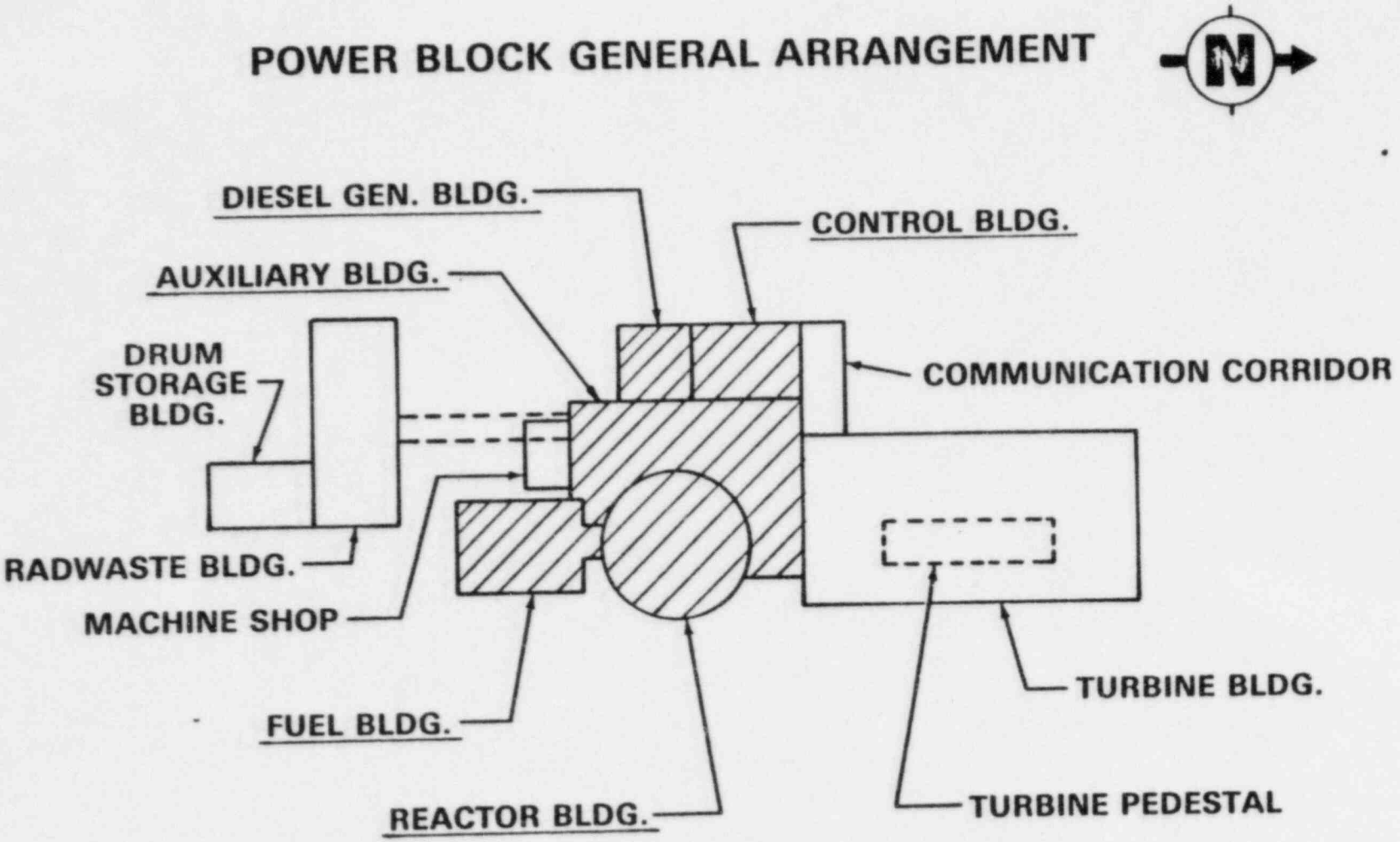
SUPPLEMENTAL INFORMATION

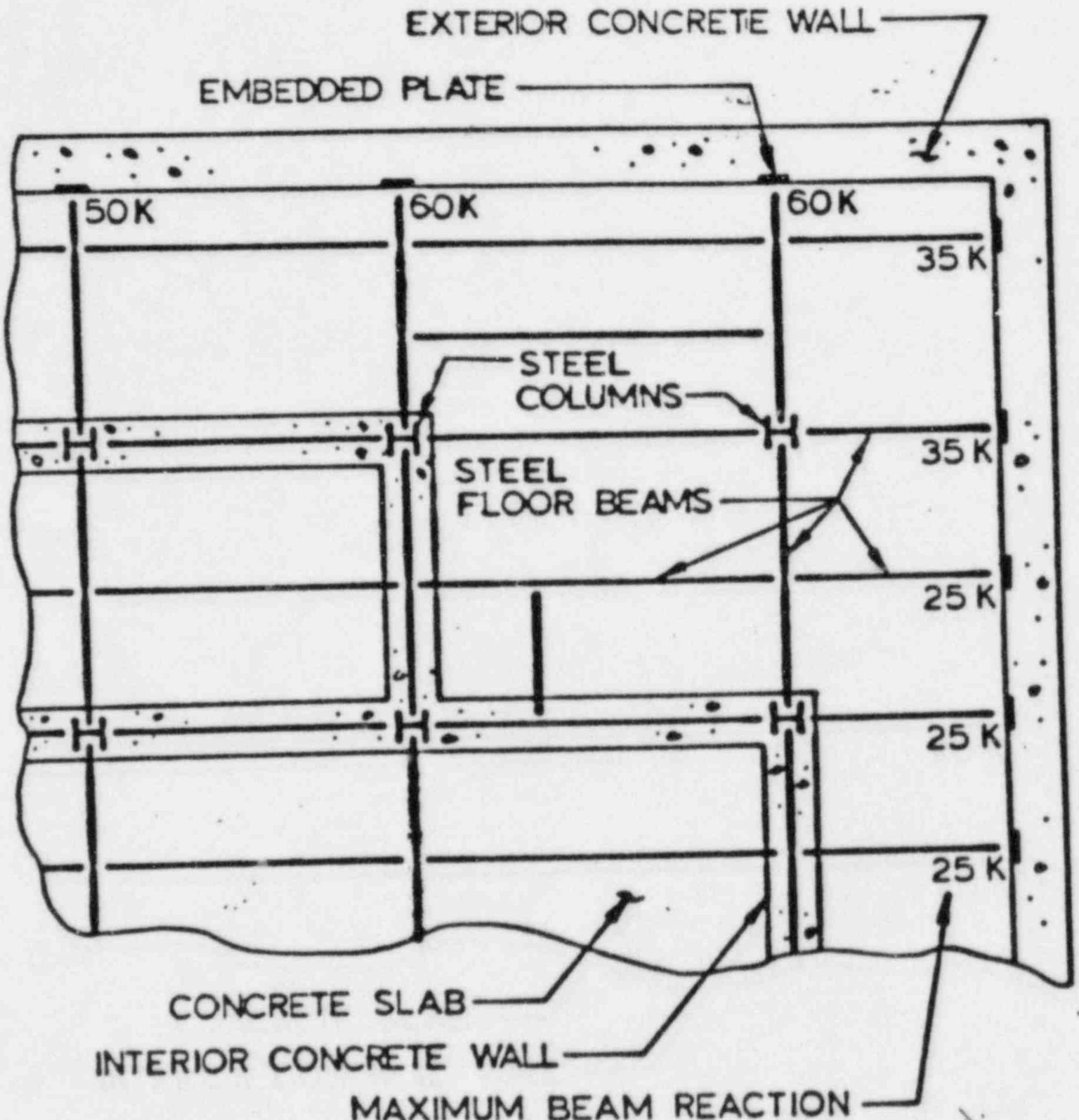
- February 14, 1985 - KMLNRC 85-054
- February 15, 1985 - KMLNRC 85-057
- February 18, 1985 - KMLNRC 85-058



PLANT SITE FEATURES

POWER BLOCK GENERAL ARRANGEMENT





FLOOR PLAN"

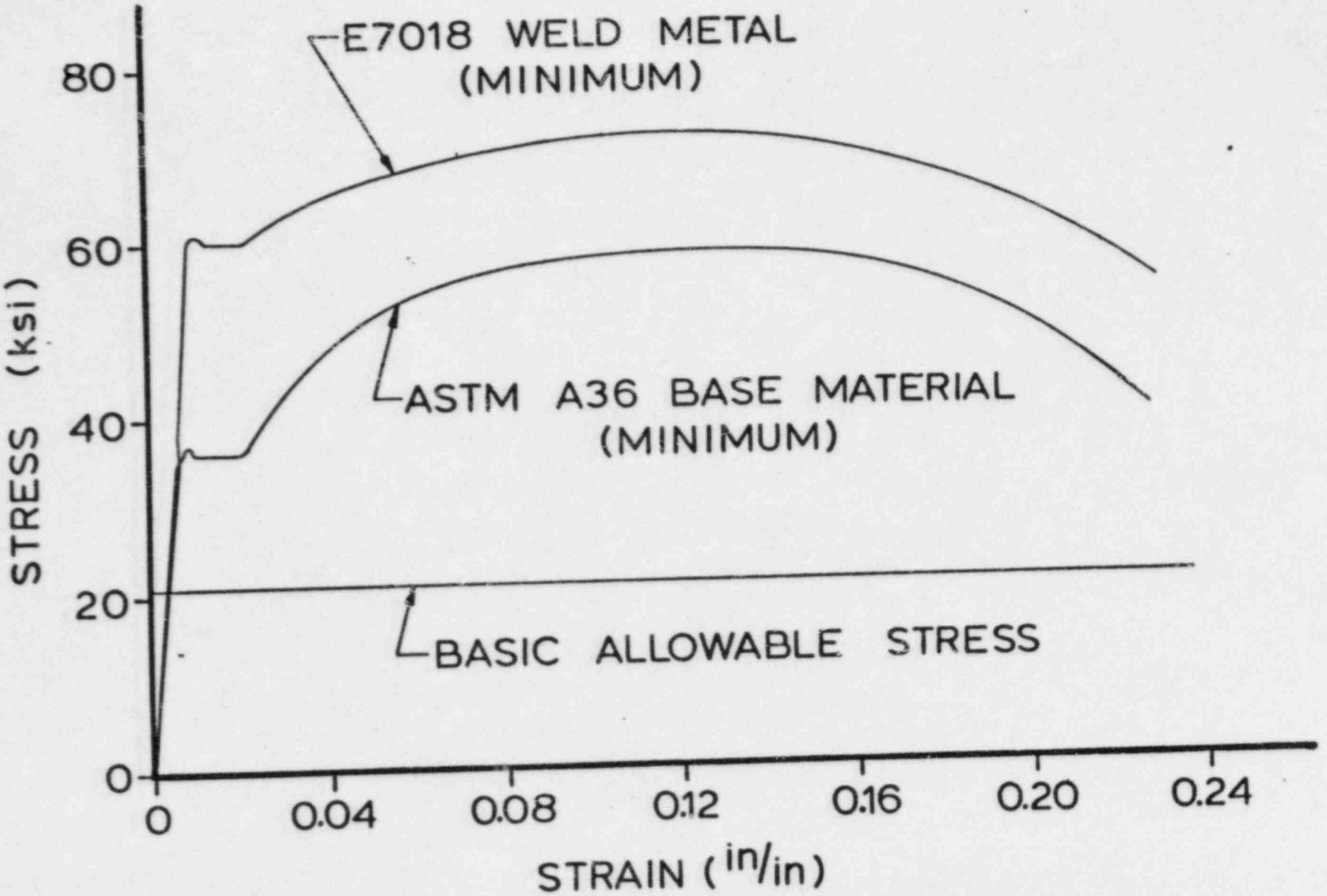
11,000 + BEAM
44% S.W.
35% BOLTED
21% F.W.

The design, fabrication, erection, and inspection of welded connections in structural steel for buildings are governed by the following standards:

- **Structural Welding Code AWS D1.1, developed by the Structural Welding Committee of the American Welding Society (AWS)**

- **Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings, developed by the American Institute of Steel Construction (AISC)**

Allowable shear stresses for fillet welds are set at 30 percent of the weld metal ultimate tensile strength, whereas the ultimate shear strength is in the range of 65 to 75 percent of ultimate tensile strength.


E7018 WELD METAL
(MINIMUM)
ASTM A36 BASE MATERIAL
(MINIMUM)
BASIC ALLOWABLE STRESS
STRESS (ksi)
80
60
40
20
0
0
0.04
0.08
0.12
0.16
0.20
0.24
STRAIN (in/in)

Allowable stresses are specified at a level *below* ultimate capacity for several reasons, including the following:

- **Load Definition**
- **Variations in Materials and Construction**

SUMMARY
BASIC DESIGN MARGINS
STRUCTURAL STEEL
WELDED CONNECTIONS

- CONSERVATIVE CODE ALLOWABLES
- CONSERVATIVE DEFINITION OF LOADS
- CONSERVATIVE USE OF *MINIMUM MATERIAL* STRENGTHS
- MINIMIZED VARIATIONS IN MATERIALS AND CONSTRUCTION

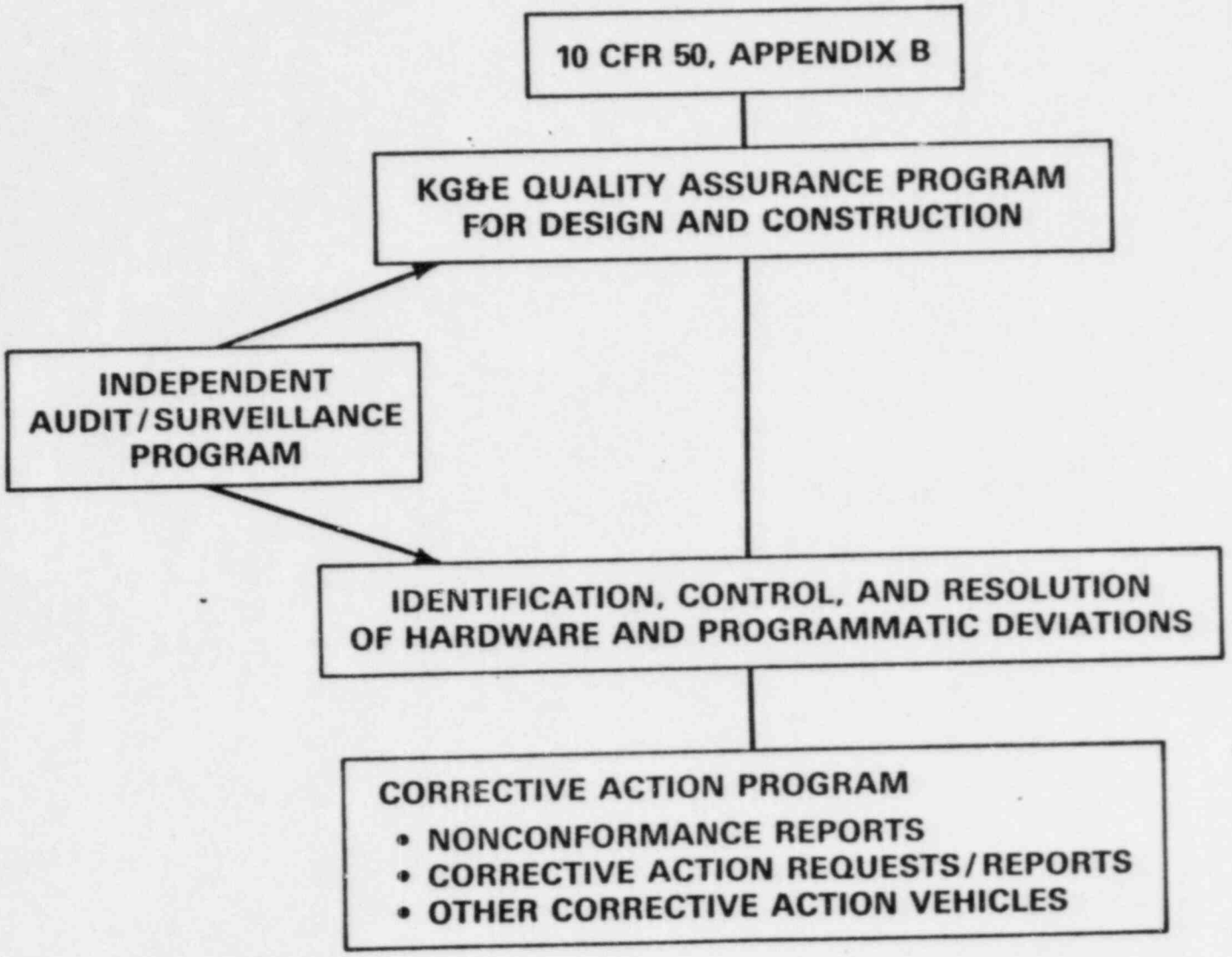
PLUS

- CONSERVATIVE ENVELOPING OF MULTISITE EARTHQUAKES
- CONSERVATIVE DESIGN METHODOLOGY
- CONSEQUENCE CONSIDERATIONS

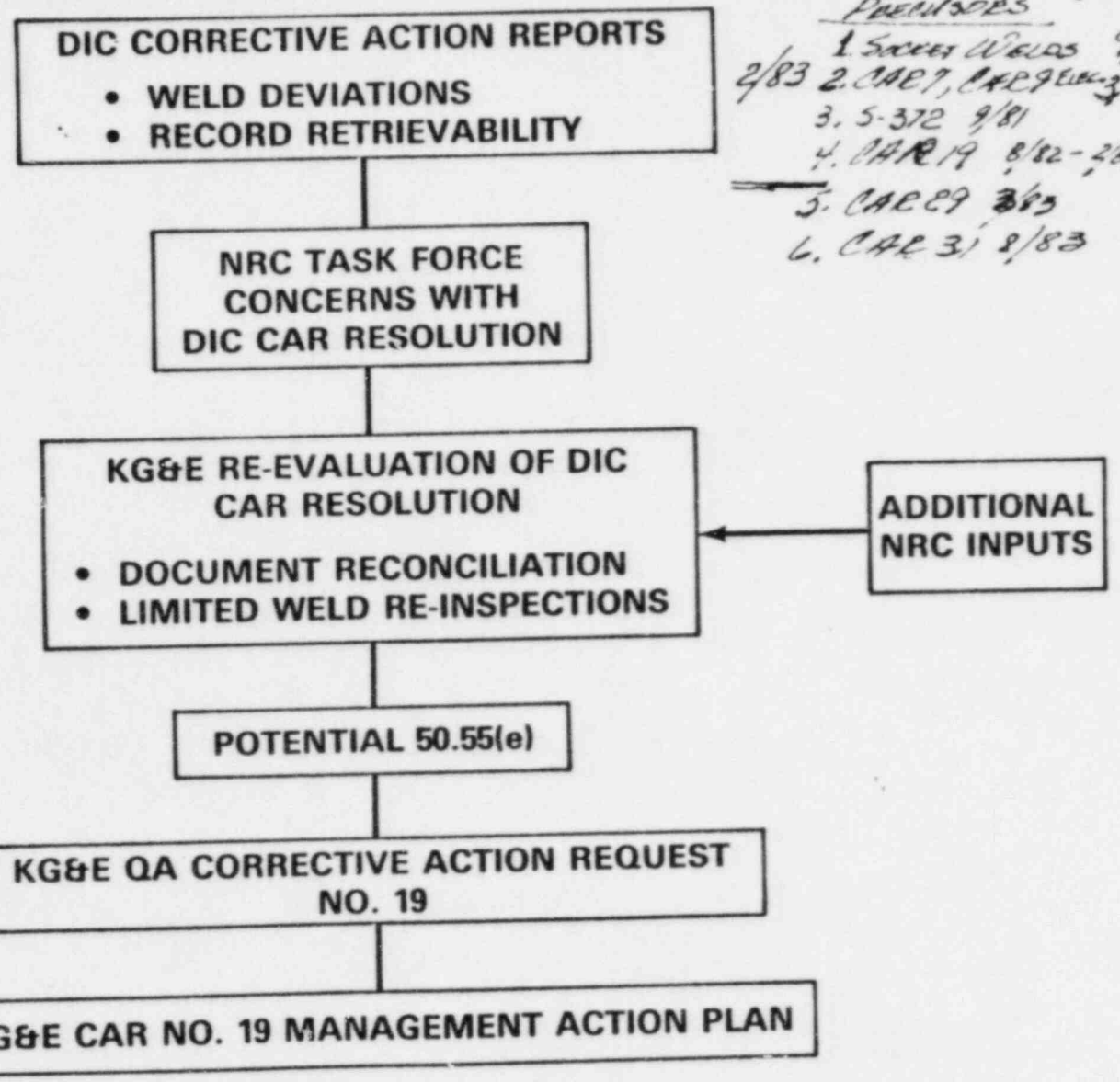
EQUALS

LARGE FACTORS OF SAFETY AGAINST FAILURE

KG&E QUALITY ASSURANCE PROGRAM OVERVIEW



AWS D1.1 STRUCTURAL STEEL WELDING CONCERNS BACKGROUND INFORMATION



PREMISES
1. Socket Welds 9/80
2. CAR 7, CAR 9 rev. 3/81
3. S-372 9/81
4. CAR 19 8/82 - 2/84 Hostile
5. CAR 29 3/83
6. CAR 31 8/83

KG&E QA CORRECTIVE ACTION REQUEST NO. 19 PROGRAM OBJECTIVES

- DOCUMENT A CONSOLIDATED PROJECT PLAN
- ASSURE BY OBJECTIVE EVIDENCE THAT AWS D1.1 SAFETY-RELATED STRUCTURAL STEEL WELDING COMPLIES WITH ALL QUALITY CRITERIA
- ASSURE THAT INSPECTION DOCUMENTATION REFLECTS APPROPRIATE INFORMATION AND IS:
  - AVAILABLE
  - COMPLETE
  - TRACEABLE
- EVALUATE OTHER AWS D1.1 SAFETY-RELATED WELDING ACTIVITIES

KG&E QA CORRECTIVE ACTION REQUEST NO. 19 FINDINGS - OVERVIEW

- MISSING WELD RECORD DOCUMENTATION
- WELD DEVIATIONS
- WELDS NOT MADE/MISSING MATERIAL
- PRESENCE OF WELD INSPECTION DOCUMENTATION WITHOUT PRESENCE OF WELD
- VERIFICATION OF COMPLETED CORRECTIVE ACTION TO KG&E SURVEILLANCE REPORT S-372

KG&E CAR NO. 19 MANAGEMENT ACTION PLAN

QA VERIFICATION PROCESS

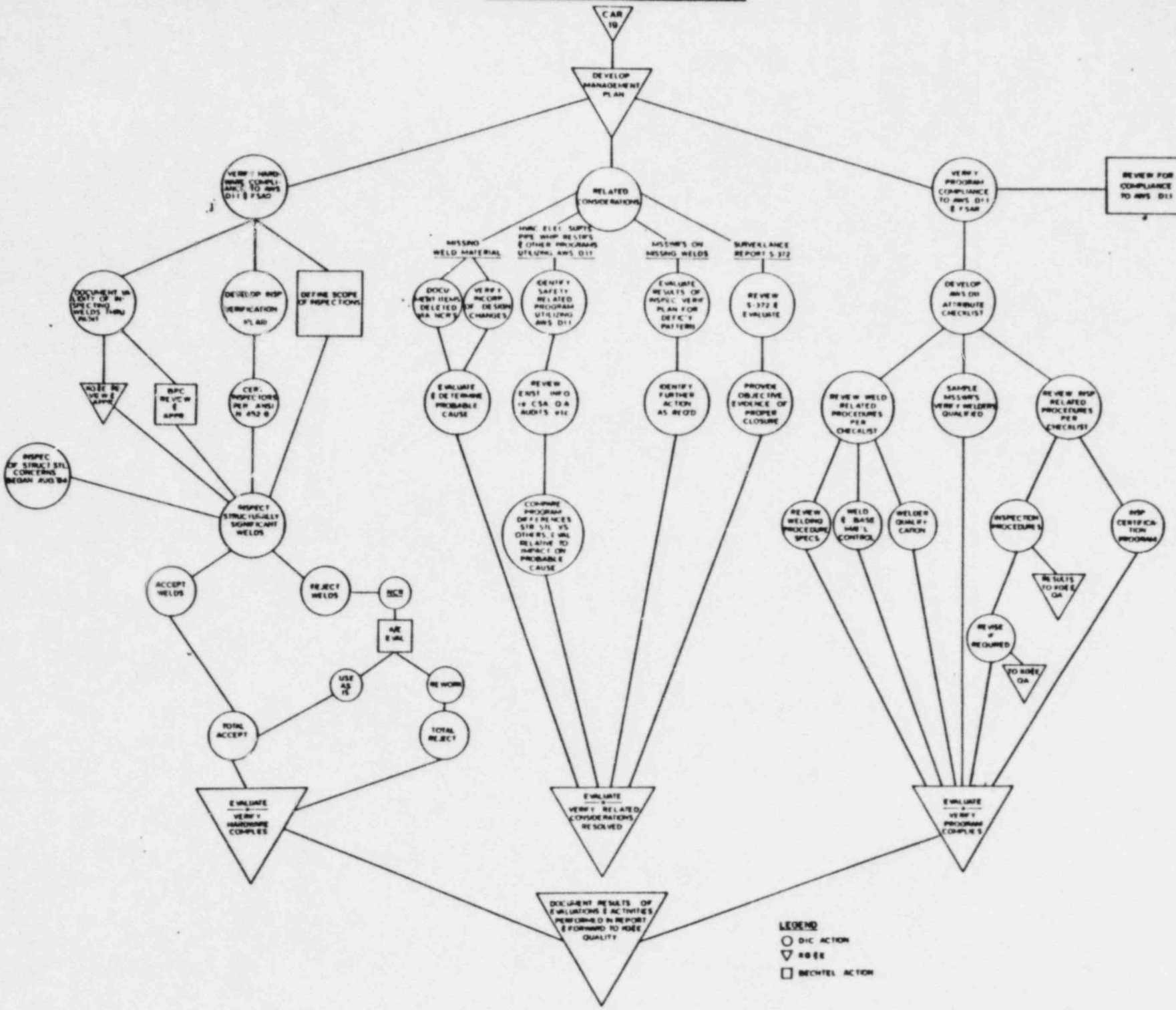
- TWO EXPERIENCED QA AUDITORS ASSIGNED ON A FULL-TIME BASIS
- IN-PROCESS SURVEILLANCES WERE PERFORMED
- A THOROUGH AUDIT OF EACH CORRECTIVE ACTION STEP WAS PERFORMED
- RESULTS OF THE AUDIT AND SURVEILLANCES:
  - CAR No. 19 Management Action Plan was Effective
  - CAR No. 19 Findings were Satisfactorily Resolved

KG&E QA CORRECTIVE ACTION REQUEST NO. 19

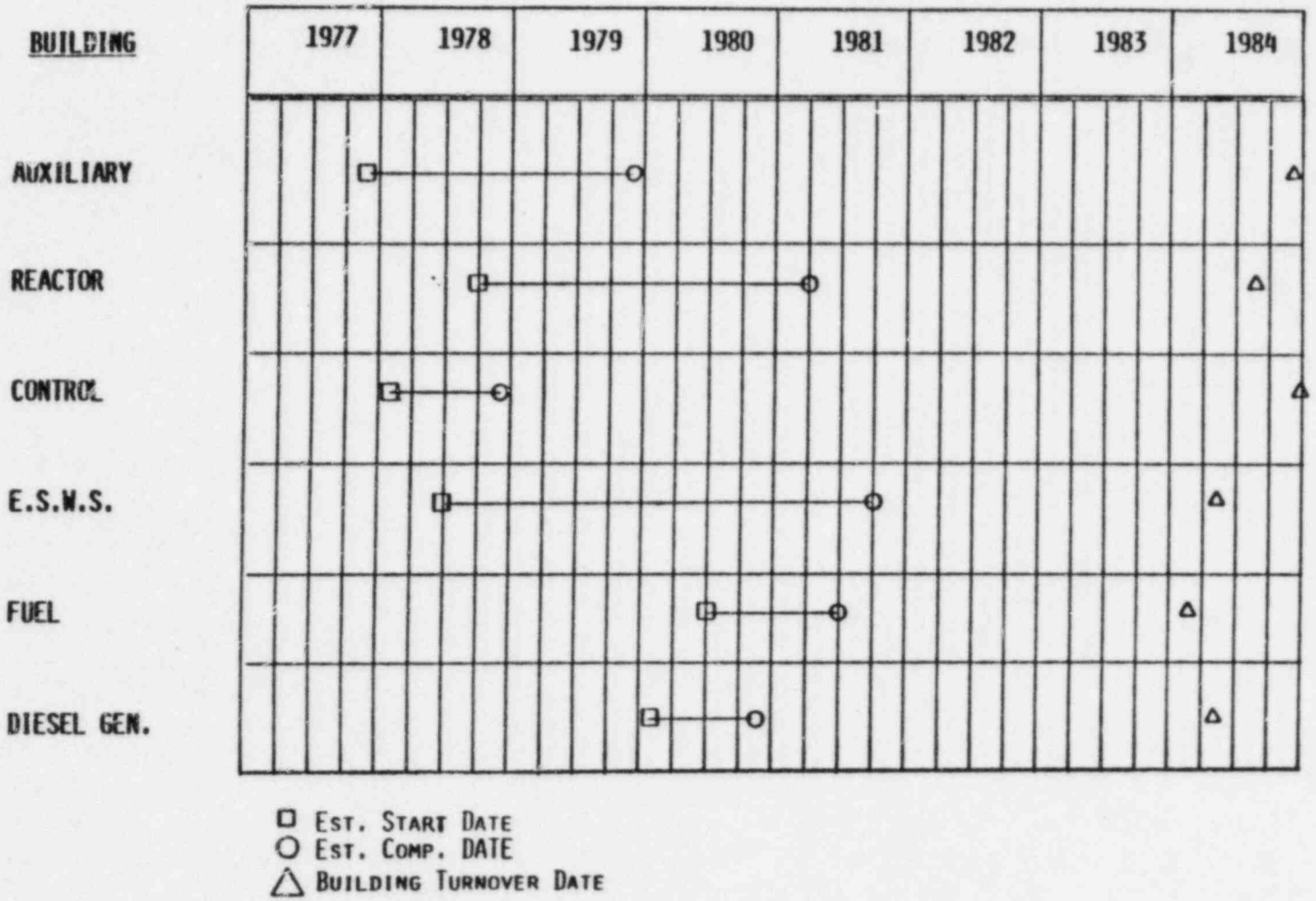
SUMMARY

- KG&E QA CAR 19 RECOMMENDED CORRECTIVE ACTIONS - READILY ADOPTED
- KG&E MANAGEMENT ACTION PLAN - EXCEEDED CAR 19 RECOMMENDATIONS THUS PROVIDING A MORE COMPREHENSIVE TREATMENT OF AWS D1.1 WELDING CONCERNS
- RE-INSPECTION OF VIRTUALLY *ALL* SIGNIFICANT SAFETY-RELATED STRUCTURAL STEEL WELDING - WITH AND WITHOUT RECORDS
- EVALUATION OF OTHER AWS D1.1 SAFETY-RELATED WELDING PROGRAMS
- EVALUATION OF OTHER SAFETY-RELATED PROGRAMS BEYOND AWS D1.1

LOGIC CHART FOR RESOLUTION CAR 19



SUMMARY OF STRUCTURAL STEEL ERECTION



AWS D.1.1-75

- DESIGN OF WELDED CONNECTIONS
- WORKMANSHIP
- FILLER METAL REQUIREMENTS
- WELD PROCEDURE QUALIFICATION
- WELDER QUALIFICATIONS
- INSPECTION

RG 1.28

MISCELLANEOUS STRUCTURAL STEEL WELD RECORDS

MSSWR

- DRAWING NUMBER
- JOINT NUMBER
- AREA / LOCATION
- BASE MATERIAL PIECE OR HEAT NUMBER
- ROD WITHDRAWAL DATA
- FILLER MATERIAL HEAT NUMBER / LOT NUMBER
- WELD PROCEDURE
- WELDER IDENTIFICATION NUMBER
- QUALITY INSPECTOR

WELD ATTRIBUTES TO BE INSPECTED PER AWS D1.1-75

- PRESENCE
- LOCATION
- LENGTH
- SIZE
- UNDERCUT
- CRACKS
- CRATERS
- FUSION
- PROFILE
- OVERLAP
- POROSITY
- ARC STRIKES
- SLAG
- SPATTER

WELDING HISTORY SUMMARY

- ERECTION/WELDING PERFORMED IN 1977-1981
- WELDING PROGRAM WAS IN ACCORDANCE WITH AWS D.1.1-1975

CAR 19 MANAGEMENT PLAN PROGRAMMATIC REVIEW

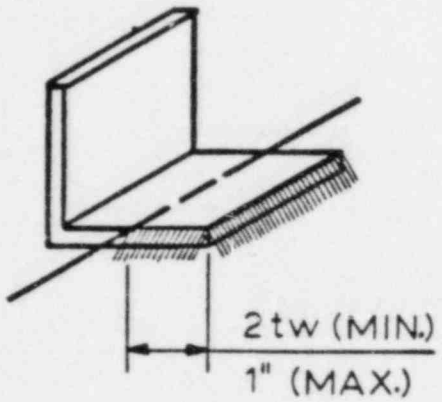
- WELDERS QUALIFIED IN ACCORDANCE WITH AWS D.1.1-75
- WELDING PROCEDURES IN ACCORDANCE WITH AWS D.1.1-75
- FILLER MATERIAL PURCHASE AND CONTROL IN ACCORDANCE WITH AWS D.1.1-75
- INSPECTION CRITERIA COMPLIED WITH AWS D.1.1-75
- INSPECTORS CERTIFIED TO ANSI 45.2.6
- DOCUMENTATION IN ACCORDANCE WITH AWS D.1.1 AND ANSI 45.2
- KG&E SURVEILLANCE REPORT S-372 CLOSURE VERIFICATION

CAR 19 MANAGEMENT PLAN
WELDING HARDWARE REVIEW

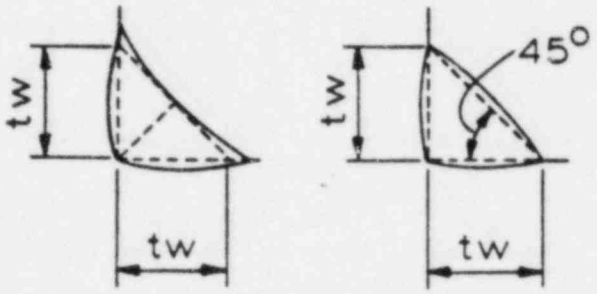
- DEVELOPMENT OF SECONDARY INSPECTION PROCEDURES
- CERTIFICATION OF INSPECTORS
- IDENTIFICATION OF STRUCTURALLY SIGNIFICANT JOINTS BY ENGINEER
- VALIDITY OF INSPECTION IN PRESENCE OF PAINT
- FIREPROOFING REMOVAL
- INSPECTION OF STRUCTURALLY SIGNIFICANT JOINTS

CAR 19 MANAGEMENT PLAN
WELDING HARDWARE REVIEW
(Continued)

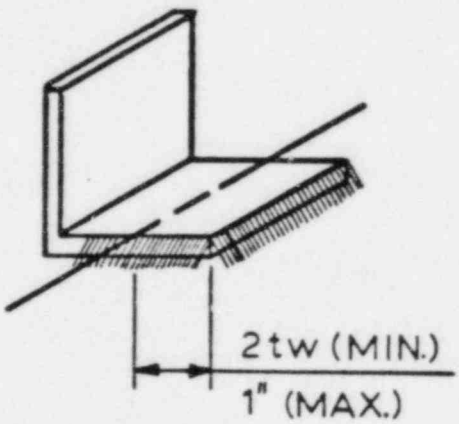
- INVESTIGATION OF MISSING WELDS WITH PRIMARY RECORDS
- DOCUMENTING CONSTRUCTED CONFIGURATION OF JOINTS
- EVALUATION OF CONSTRUCTED CONFIGURATION BY THE ENGINEER
- REWORKING JOINTS
- ISSUANCE OF SUMMARY REPORT



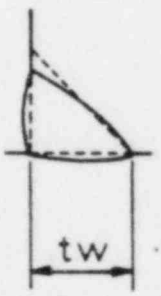
ACCEPTABLE RETURN WELD



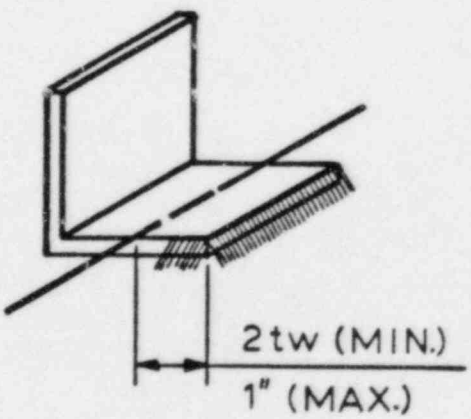
ACCEPTABLE PROFILES



OVERRUN



UNDERSIZE



UNDERRUN

tw = REQUIRED WELD LEG

CAR 19 MANAGEMENT PLAN CONCLUSIONS

- QA PROGRAM DEFICIENCIES CONFINED TO CAR 19 ISSUES
- PRESENCE OF WELD INSPECTION DOCUMENTATION WITHOUT PRESENCE OF WELDING WAS CAUSED BY HUMAN ERROR
- WELD RECORD RETRIEVABILITY PROBLEMS DID NOT CARRY OVER TO OTHER PROGRAMS
- WELDING PROGRAM IS IN ACCORDANCE WITH AWS D.1.1-75
- ALL QUALITY CRITERIA AS SPECIFIED IN THE RELATED DESIGN DOCUMENTS ARE MET
- ALL STRUCTURAL STEEL ERECTION COMMITMENTS IN THE WOLF CREEK FSAR ARE SATISFIED

Structurally significant AWS field welded joints are joints which:

1) support or potentially support safety-related equipment and building components,

2) are located in the Reactor Building, Auxiliary Building, Control Building, Diesel Generator Building, Fuel Building, or Essential Service Water System Pumphouse,

3) were installed under the structural steel erection contract (Bechtel Specification 10466-C122) or the miscellaneous steel erection contract (Bechtel Specification 10466-C132), and

4) were originally inspected under the Daniel International Corporation (DIC) "Miscellaneous/ Structural Steel Weld Records" (MSSWR) Inspection Program.

WELD ATTRIBUTES TO BE INSPECTED PER AWS D1.1-75

- PRESENCE
- LOCATION
- LENGTH
- SIZE
- UNDERCUT
- CRACKS
- CRATERS
- FUSION
- PROFILE
- OVERLAP
- POROSITY
- ARC STRIKES
- SLAG
- SPATTER

REINSPECTION DATA
AWS STRUCTURAL STEEL
WELDING AT WOLF CREEK

Structurally Significant Joints	2,670
Totally Inaccessible Joints	119
Reinspected Joints	2,551
Unpainted Joints	1,043
Joints Requiring Rework[1]	82
Additional Joints Reworked[2]	67
Significantly Deficient Joints (10CFR50.55(e))	0

(1) DESIGN ALLOWABLE STRESSES ARE EXCEEDED IN THE AS-BUILT CONDITION.

(2) DESIGN ALLOWABLE STRESSES ARE NOT EXCEEDED IN THE AS-BUILT CONDITION. THESE JOINTS ARE BEING REWORKED PER KG&E MANAGEMENT DIRECTION TO INSTALL MISSING AND UNDERLENGTH WELDS UNLESS PROHIBITED BY FIELD CONDITIONS.

2/27/85

Figure A

Values of measured leg size of fillet weld from "AWS-AISC Fillet Weld Study" for the American Institute of Steel Construction tested by Testing Engineers, Inc., Oakland, CA, May 31, 1968

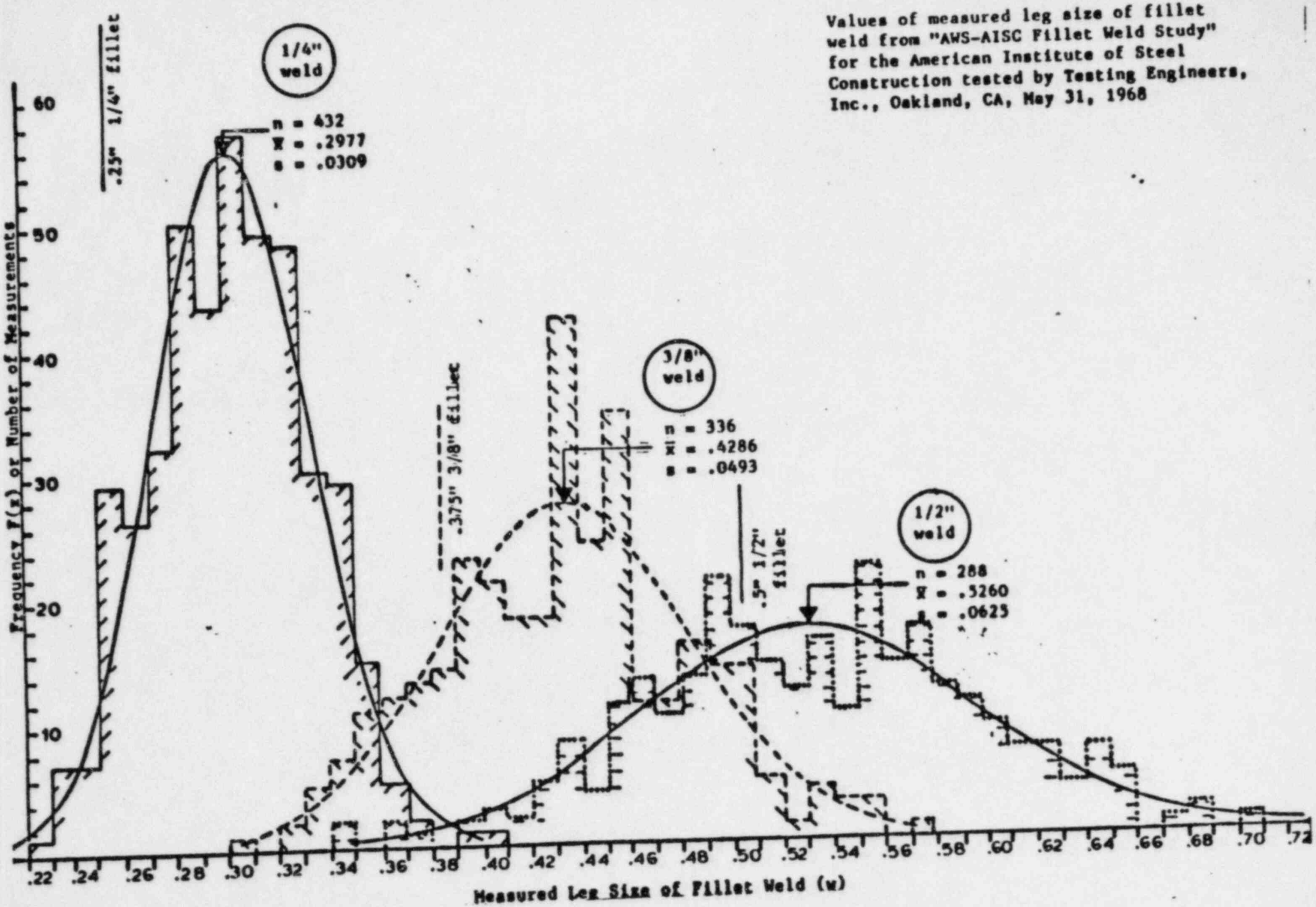


FIGURE D

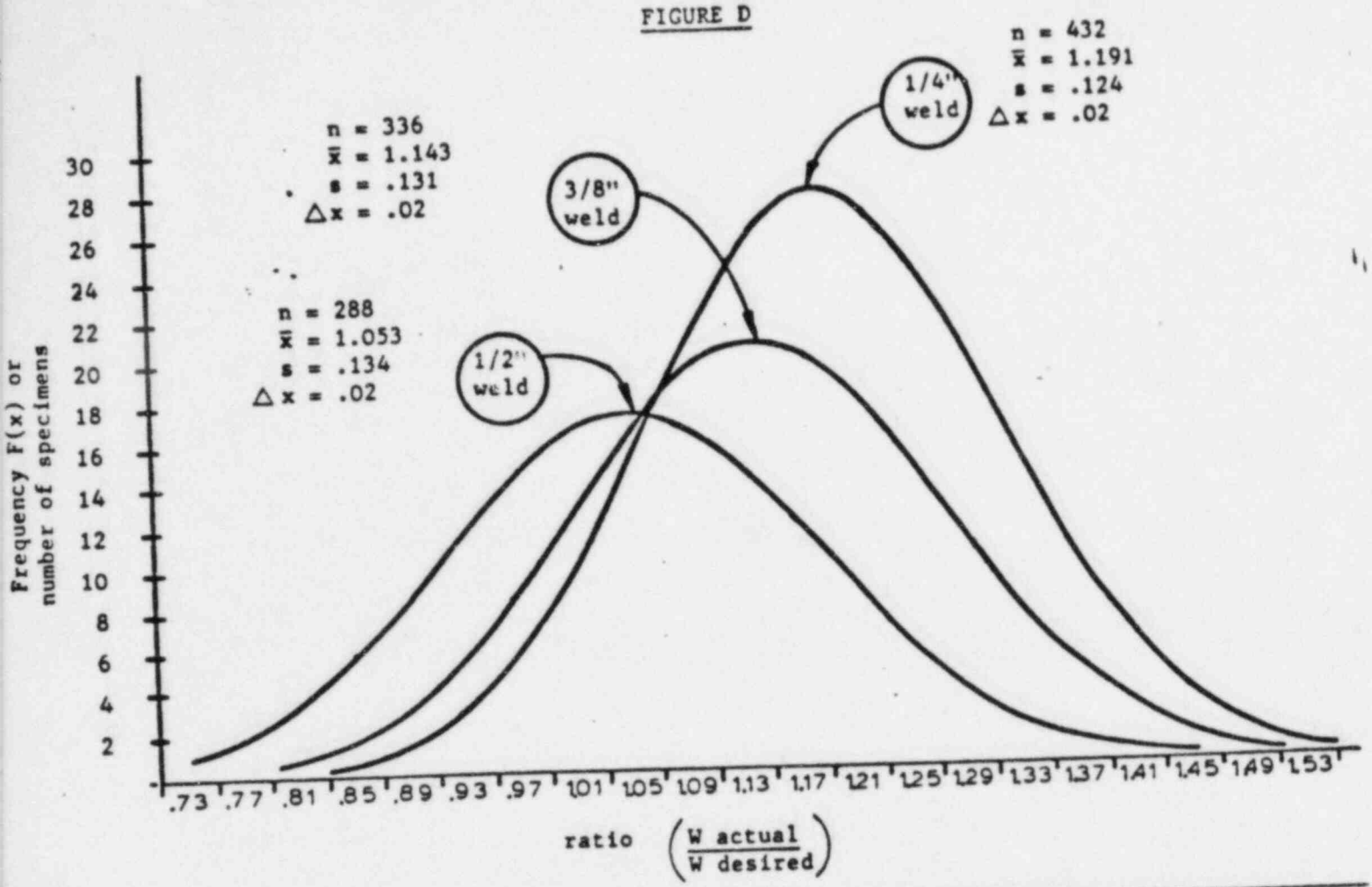
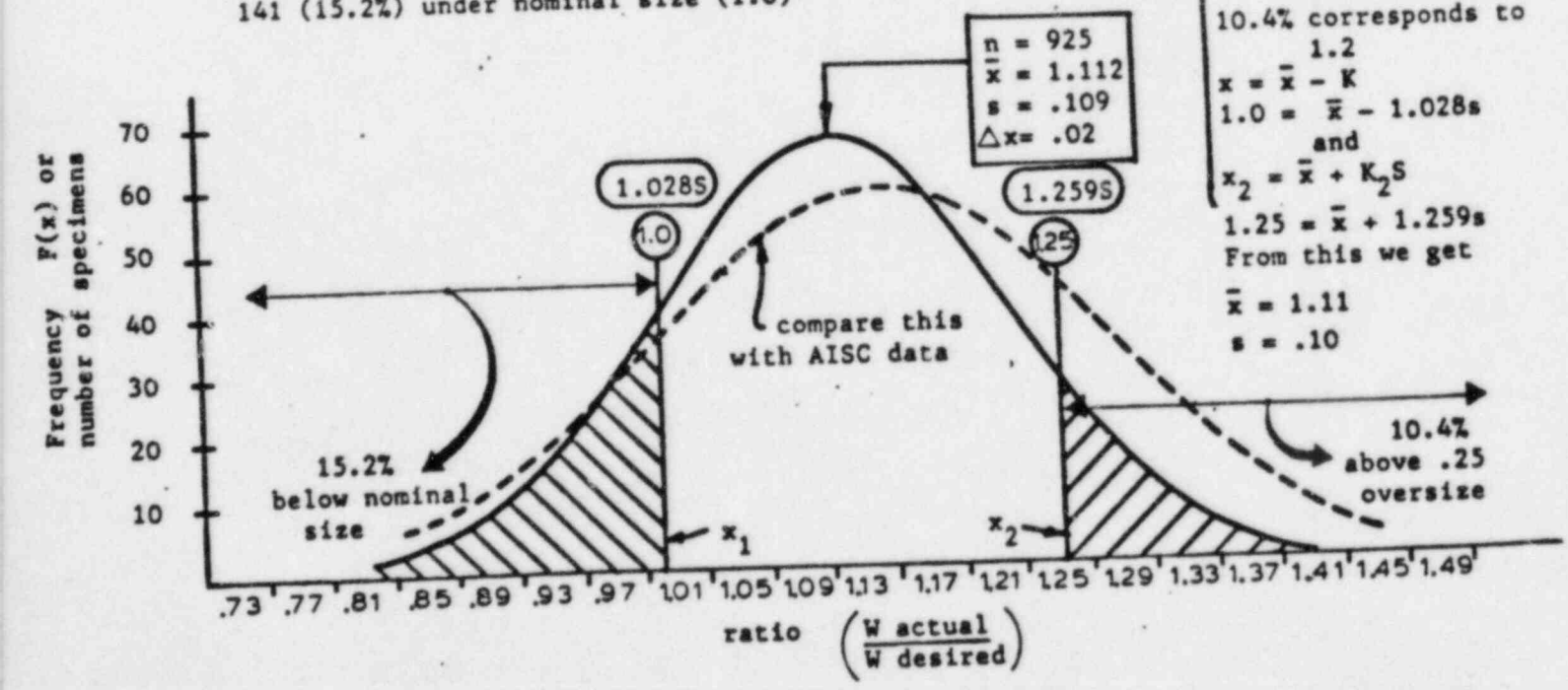
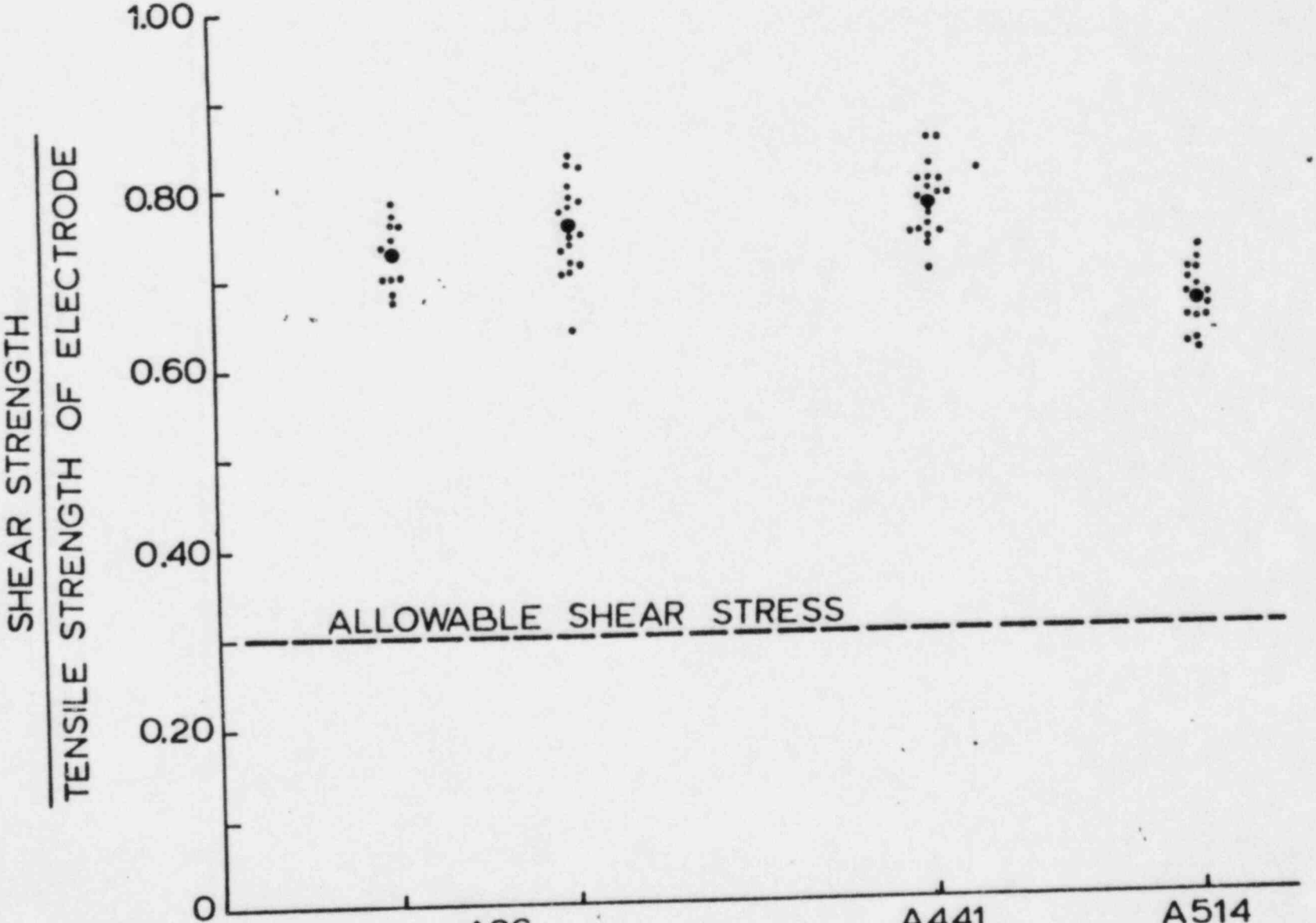


FIGURE E

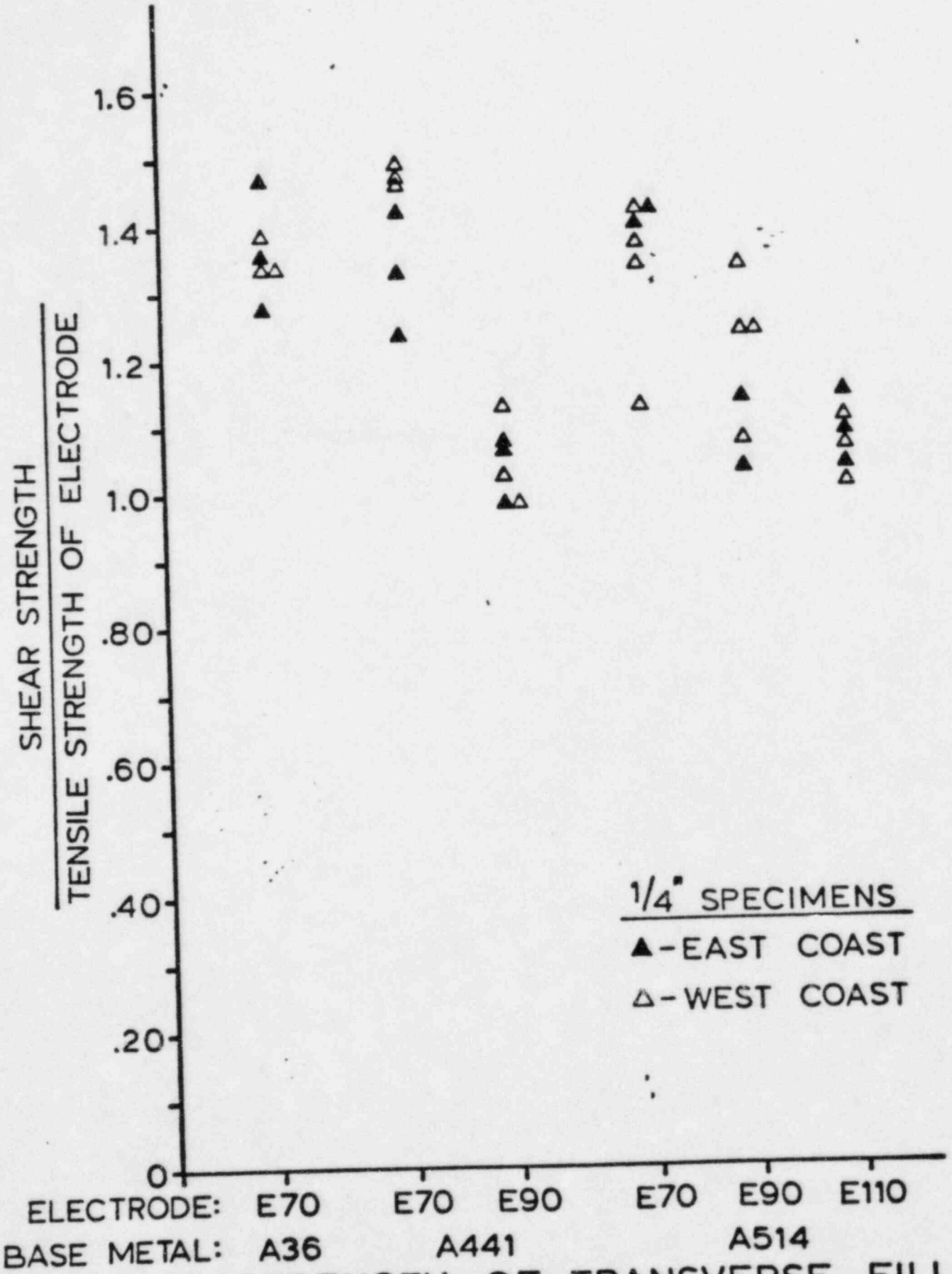
Correspondence from Mr. W. C. Cadwell, Asst. Ch. Eng. of Caterpillar Tractor Co.
Peoria, IL Dec. 22, 1964
of 925 fillet welds checked from 1/8" to 1/2"
688 (74.4%) from nominal (1.0) to 25% oversize (1.25)
96 (10.4%) exceeded 25% oversize (1.25)
141 (15.2%) under nominal size (1.0)

From this data:
15.2% corresponds to 1.02
10.4% corresponds to 1.2
$x = \bar{x} - K$
$1.0 = \bar{x} - 1.028s$
and
$x_2 = \bar{x} + K_2 S$
$1.25 = \bar{x} + 1.259s$
From this we get
$\bar{x} = 1.11$
$s = .10$



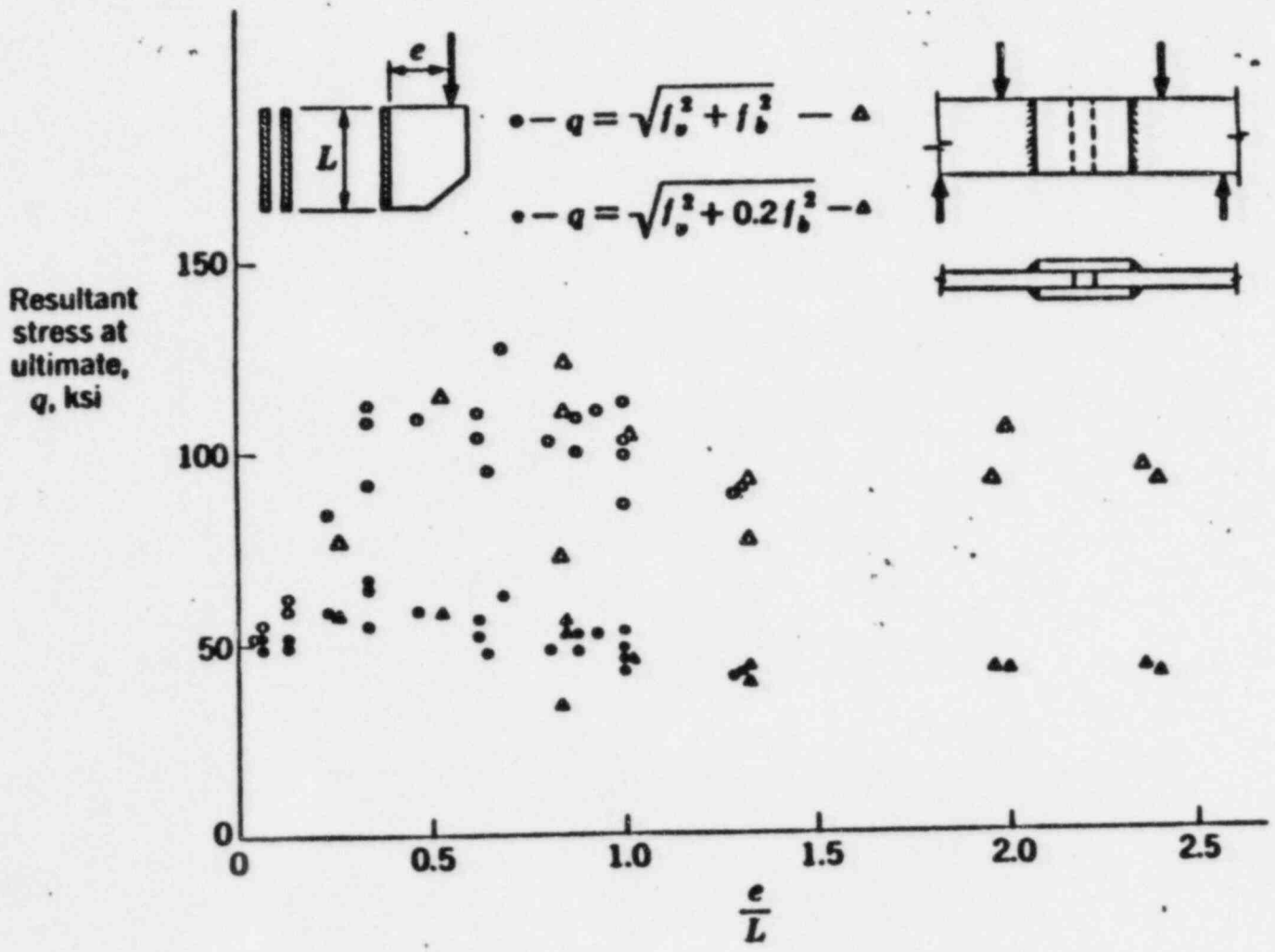


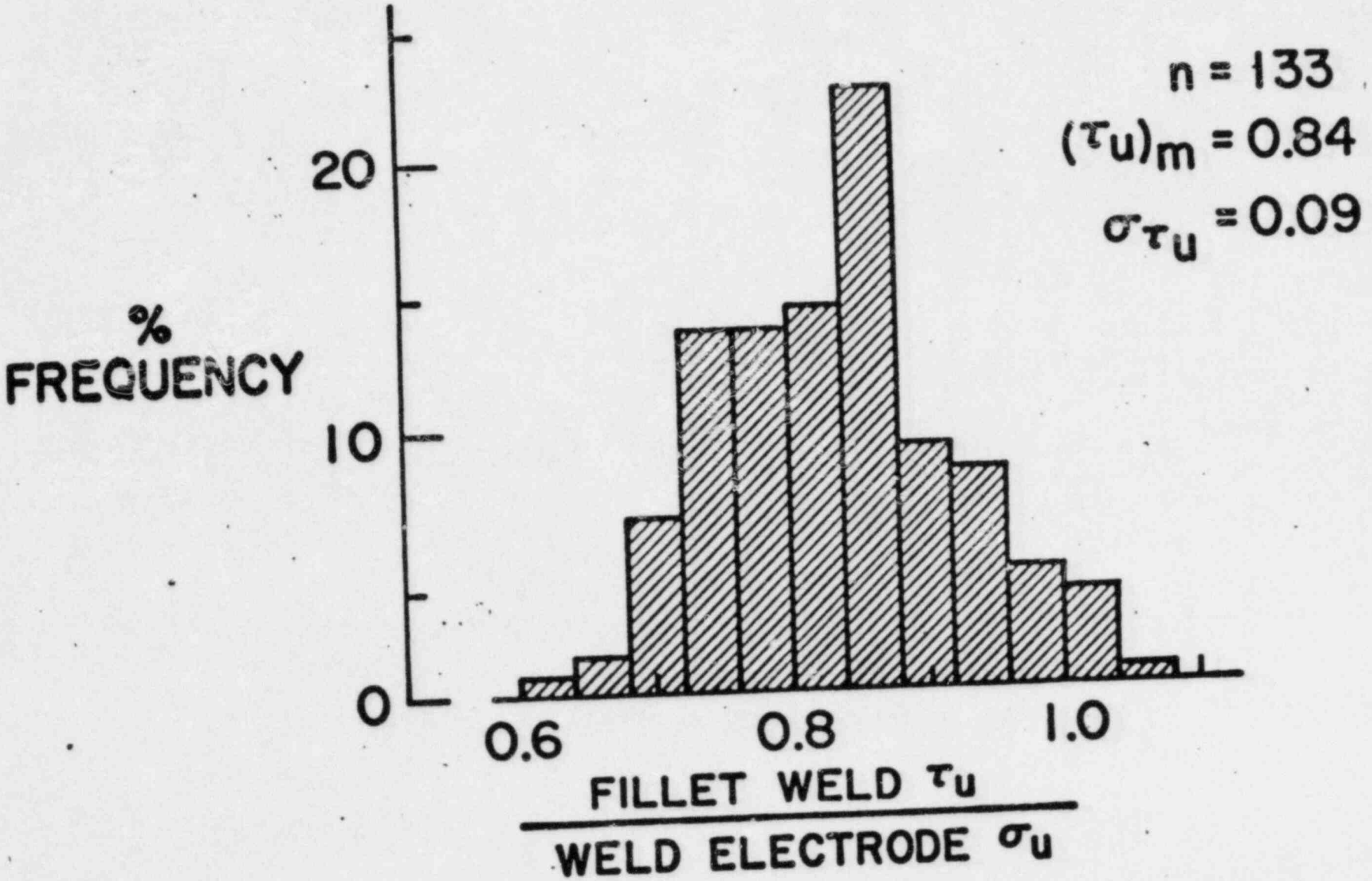
SHEAR STRENGTH OF LONGITUDINAL FILLET WELDS
WITH MATCHED BASE MATERIAL



SHEAR STRENGTH OF TRANSVERSE FILLET WELDS WITH MATCHED BASE METAL

WELDS SUBJECTED TO BENDING AND SHEAR
(COURTESY CIVIL ENGINEERING AND PUBLIC WORKS REVIEW)




n = 133
$(\tau_u)_m$ = 0.84
σ_{τ_u} = 0.09
% FREQUENCY
20
10
0
0.6
0.8
1.0
FILLET WELD τ_u
WELD ELECTRODE σ_u

OBJECTIVE

TO INDEPENDENTLY EVALUATE KG&E's APPROACH TO THE RESOLUTION OF CORRECTIVE ACTION REQUEST (CAR) NUMBER 19 AND MAKE RECOMMENDATIONS FOR A TIMELY CLOSEOUT OF CAR 19

ACTIVITIES

1) FINAL REPORT REVIEW (KG&E REPORT)
2) SITE VISIT (FEBRUARY 15-17)
3) REVIEW OF SUPPORTING DOCUMENTS
   - Weld Procedures
   - Filler Metal
   - DIC Inspection Criteria
   - Reinspection Validation (Painted)
4) WELD INSPECTION OF PAINTED AND UNPAINTED WELDS IN THE AUXILIARY AND REACTOR BUILDINGS
5) DISCUSSIONS WITH KG&E, DIC, AND BECHTEL PERSONNEL
6) PREPARATION OF REPORT

RESULTS

- RELATED WELDING ACTIVITIES ARE SOUND AND DOCUMENTED
- REINSPECTION PROGRAM HAS BEEN EXTENSIVE, PROPERLY PERFORMED, AND DOCUMENTED
- VALIDATION OF INSPECTION WITH PAINT HAS BEEN COMPLETED
- IMPERFECTIONS NOTED IN REINSPECTION ARE TYPICAL FOR C/Mn STRUCTURAL WELDING
- *NO SAFETY SIGNIFICANCE OF THE IMPERFECTIONS*

CONCLUSIONS

- REINSPECTION PROGRAM IS SOUND AND EFFECTIVE, AND ENSURES AWS D1.1 QUALITY WELDS
- IMPERFECTIONS ARE MINOR AND STRUCTURAL INTEGRITY IS ASSURED

SUMMARY BY GLENN L. KOESTER - 2/27/85

KG&E HAS ALWAYS HAD, AND CONTINUES TO HAVE A FIRM COMMITMENT TO PROTECT THE HEALTH AND SAFETY OF THE PUBLIC AS WELL AS OUR OWN EMPLOYEES. THAT IS WHY WE UNDERTOOK SUCH AN EXTENSIVE PROGRAM TO EVALUATE THE ACCEPTABILITY OF THE STRUCTURAL STEEL WELDING AT WOLF CREEK. AS YOU HEARD EARLIER, OUR REINSPECTION EFFORTS FOUND SEVERAL MINOR DEVIATIONS THAT GAVE THE APPEARANCE OF A HIGHER THAN EXPECTED REJECT RATE. HOWEVER, THE PRIMARY REASON FOR THESE REJECTS RESULTED FROM THE "NO TOLERANCE" INSPECTION PHILOSOPHY DISCUSSED BY MR. REEDY. THE VAST MAJORITY OF THESE DEVIATIONS WOULD NOT BE REJECTED BY A QUALIFIED AWS INSPECTOR AT ANOTHER FACILITY UNLESS THEY WERE MAKING THE SAME TYPE SECONDARY INSPECTION THAT WE MADE. THE FACT THAT KG&E TOOK A MORE CONSERVATIVE APPROACH DURING THE REINSPECTION EFFORTS DOES NOT IN ANY WAY INVALIDATE THE INITIAL WELD INSPECTIONS.

AS DISCUSSED EARLIER, THE REINSPECTIONS DID IDENTIFY A FEW JOINTS IN WHICH SOME WELDS HAD NOT BEEN MADE. THESE PRIMARILY RESULTED FROM A MISINTERPRETATION OF THE WELD DETAIL AND NOT FROM GROSS INADEQUACIES IN THE INSPECTION PROGRAM. WHILE WE STRIVE FOR PERFECTION, WE MUST RECOGNIZE THAT HUMAN ERRORS CAN AND DO OCCUR. THAT IS ONE REASON WHY WE DESIGN AND BUILD THESE PLANTS WITH SO MUCH CONSERVATISM. THIS IS DEMONSTRATED BY THE FACT THAT NONE OF THE JOINTS WITH MISSING WELDS WOULD HAVE FAILED. A POINT THAT NEEDS TO BE EMPHASIZED IS THAT WE MEAN IT WOULD NOT HAVE FAILED UNDER THE WORST POSTULATED LOADING CONDITIONS. THIS WOULD INCLUDE NORMAL LOADING PLUS ANY LOADS RESULTING FROM A POSTULATED WORST CASE ACCIDENT.

OUR PRIMARY OBJECTIVE IN THE OVERALL CORRECTIVE ACTION PROGRAM DISCUSSED EARLIER WAS TO ASSURE THAT WOLF CREEK IS STRUCTURALLY SOUND AND WILL NOT FAIL UNDER THE WORST POSTULATED ACCIDENT CONDITIONS.

WE HAVE DONE THAT.

IN DOING SO, WE ALSO REAFFIRMED THAT THE AWS WELDING WAS DONE IN ACCORDANCE WITH THE APPLICABLE CODES.

WE DID NOT LIMIT OUR REVIEW OF THIS MATTER TO WELDING ALONE. WE ALSO LOOKED AT OTHER AREAS TO ASSURE THEY WERE COMPLETED IN ACCORDANCE WITH APPLICABLE REQUIREMENTS AND IN A MANNER THAT PROVIDES ADEQUATE PROTECTION OF THE HEALTH AND SAFETY OF THE PUBLIC.

WE ALSO HAD THREE OF THE LEADING AUTHORITIES IN STRUCTURAL STEEL WELDING INDEPENDENTLY REVIEW OUR PROGRAM TO ASSURE THAT WE WERE NOT TAKING A BIASED LOOK AT OURSELVES. AS YOU HEARD FROM THEIR DISCUSSIONS TODAY, FROM THEIR REVIEW OF THE VARIOUS ASPECTS OF OUR PROGRAM, WE DID A VERY THOROUGH, CONSERVATIVE, ASSESSMENT OF OUR AWS WELDING PROGRAM AND THEY FOUND NOTHING TO QUESTION OR INVALIDATE THE CONCLUSIONS WE HAVE MADE.

I SINCERELY BELIEVE THAT ANYONE KNOWLEDGEABLE IN ENGINEERING AND CONSTRUCTION PRACTICES WOULD HAVE TO AGREE THAT KG&E'S CORRECTIVE ACTION PROGRAM VERIFIED THAT THE STRUCTURAL STEEL AT WOLF CREEK GENERATING STATION IS SAFE AND SOUND.

THIS COMPLETES OUR PRESENTATION ON AWS STRUCTURAL STEEL WELDING AT WOLF CREEK. WE FIRMLY BELIEVE THE RECORD IS CLEAR AND WE ARE READY TO RECEIVE OUR OPERATING LICENSE AND COMMENCE LOADING FUEL AND PROCEED THROUGH POWER ASCENSION.

MANAGEMENT PLAN OVERVIEW

- Verify hardware & programatic aspects of safety related activities utilizing AWS D1.1 welding are in conformance with the FSAR

- Implement in strict accordance with CAR 19

- Numbering system utilized in the plan

  Example: 1. - Finding Number in CAR

  1a. - Recommended corrective action in CAR

  1a-1 - Actions planned in management plan

FINDING #1 - MISSING MSSWR'S

ACTIONS

a. Verify welders & procedures qualified to AWS D1.1-75 SAMPLE ?

b. Verify purchase & control of filler & base material was acceptable 100%

c. Verify inspection criteria and procedures did not adversely impact inspection results

d. Document validity of inspection for CAR 19 attributes with the presence of paint on welds

e. Utilize personnel certified to ANSI N45.2.6 - 1978 for the CAR 19 inspection verification plan

f. Perform a 100% reinspection of structurally significant welds with missing records

g. Obtain and document a suitability for service evaluation of inaccessable welds

h. Initiate an NCR for all identified deficiencies

FINDING #2 - INSPECTION VERIFICATION PLAN HAS IDENTIFIED SEVERAL AREAS OF DEFICIENCIES

ACTIONS

a. Determine "Root Cause" of previous acceptance of deficient structural welds and analyze other AWS programs to determine if "Root Cause" was generic to those programs.

b. Perform a 100% reinspectior of structurally significant welds having MSSWR's

c. Evaluate the results of the completed Inspection Verification Plan against the acceptance criteria

d. Initiate the NCR for all identified deficiencies

FINDING # 3 - MISSING MATERIAL AND WELDS

a. A/E perform "As Built" engineering evaluation and disposition

b. Verify the incorporation of design changes

c. Evaluate for Root Cause determination

FINDING # 4 - MISSING WELD(s) WITH EXISTING DOCUMENTATION

a. Investigate to determine "Root Cause"

- Evaluate CAR 19 inspection verification plan results for patterns
- Identify further actions as required

FINDING #5 - OBJECTIVE EVIDENCE THAT MECHANICAL AND STRUCTURAL WELDING/DOCUMENTATION IN KG&E QA SURVEILLANCE REPORT S-372 HAS NOT BEEN PROVIDED

a. Provide objective evidence for:

- Civil deficiency reports in S-372
- Mechanical deficiency reports in S-372

50-101

MAR 18 1985

MEETING SUMMARY DISTRIBUTION

Docket File
NRC PDR
L PDR
NSIC
PRC System
LB#1 Reading File
Project Manager P. O'Connor
M. Rushbrook
Attorney, OELD
R. Hartfield*
OPA*

NRC Participants

L. Martin, RIV
R. Denise, RIV
F. Miraglia
T. Novak
B. J. Youngblood
S. Diab
P. O'Connor

OTHERS

bcc: Applicant & Service List

*Caseload Forecast Panel Visits

NPR Release D-3

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

MAR 18 1985

Docket No.: STN 50-482

APPLICANT: Kansas Gas and Electric Company (KG&E)

FACILITY: Wolf Creek Generating Station

SUBJECT: SUMMARY OF MEETING WITH KANSAS GAS & ELECTRIC COMPANY REGARDING THE SCHEDULE FOR COMPLETION FOR WOLF CREEK GENERATING STATION

On November 28, 1984, a meeting was held with Kansas Gas and Electric Company (KG&E) to discuss issues related to the status of completion and future schedule for licensing of Wolf Creek Generating Station.

KG&E described recent organizational changes that have been implemented at Wolf Creek and introduced Chuck Mason the new Director of Nuclear Operations. KG&E emphasized that the plant is moving from a construction related operation into a preparation for operation mode under Mr. Mason who previously served as Plant Superintendent at Sequoyah.

KG&E stated that their current date of construction complete is December 31, 1984 and that the date is based on a no contingency, optimistic schedule. They stated that the integrated leak rate test and structural integrity test were the major items on their critical path. They also stated that they were planning for a 50 day schedule between fuel load and initial criticality.

T. Novak, Assistant Director for Licensing, NRR, stated that we would not issue a license before completion of all construction and we did not plan to issue a "fuel load only" license.

KG&E presented a detailed description of their plan to reinspect 100% of the accessible structural steel welds and provided a status report of the work that had been completed.

KG&E described a failure of the pressurizer power operated relief valves to close during a test and proposed a modification to correct the non-closure.

25pp

Forest Rhodes, KG&E, described the results of leak rate testing on ECCS check valves test results for some valves did not meet the acceptance criteria given in FSAR Section 14.2.1.38. KG&E committed to document the results and submit a proposed resolution to NRC for approval.

Forest Rhodes described the KG&E proposed power ascension test program for the NRC staff.

Enclosure 1 lists the meeting attendees and Enclosure 2 presents the visual aids used by KG&E at this meeting.

Paul W. O'Connor

Paul W. O'Connor, Project Manager
Licensing Branch No. 1
Division of Licensing

Enclosures: As stated

cc: See next page

WOLF CREEK

MAR 1 7 1985

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Wichita, Kansas 67201

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Executive Director, SNUPPS
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Rockville, Maryland 20850

Jay Silberg, Esq.
Shaw, Pittman, Potts & Trowbridge
1800 M Street, N. W.
Washington, D. C. 20036

Mr. Donald T. McPhee
Vice President - Production
Kansas City Power & Light Company
1330 Baltimore Avenue
Kansas City, Missouri 64141

Ms. Mary Ellen Salava
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Burlington, Kansas 66839

A. Scott Cauger
Assistant General Counsel
Public Service Commission
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Jefferson City, Missouri 65101

Mr. Howard Bundy
Resident Inspector/Wolf Creek NPS
c/o U.S.N.R.C
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Brian P. Cassidy, Regional Counsel
Federal Emergency Management Agency
Region I
J. W. McCormack POCH
Boston, Massachusetts 02109

cc: Terri Sculley, Director
Special Projects Division
Kansas Corporation Commission
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Topeka, Kansas 66612

Mr. Gerald Allen
Public Health Physicist
Bureau of Air Quality & Radiation
Control
Division of Environment
Kansas Dept. of Health & Environment
Forbes Field Bldg. 321
Topeka, Kansas 66620

ENCLOSURE 1

KANSAS GAS & ELECTRIC COMPANY MEETING

HELD ON NOVEMBER 28, 1984

Name	Organization
C. Mason	KG&E
J. Bailey	KG&E
F. Rhodes	KG&E
O. Maynard	KG&E
J. Berra	KG&E
W. Rudolph	KG&E
D. Ridgeway	KG&E
G. Rathbun	KG&E
G. Koester	KG&E
S. Shaw	Westinghouse
W. Guerin	Westinghouse
J. McInerney	Westinghouse
M. Lacey	Westinghouse
J. Irons	Westinghouse
G. Brown	Bechtel
N. Goel	Bechtel
J. Palermo	KCP&L
F. Crawford	KCP&L
M. Fletcher	SNUPPS
L. Martin	NRC/Region IV
R. Denise	NRC/Region IV
F. Miraglia	NRC/DD/DL
T. Novak	NRC/AD/L/DL
P. O'Connor	NRC/DL/LB#1
B. J. Youngblood	NRC/DL/LB#1
S. Diab	NRC/NRR/RSB

ENCLOSURE 2

AGENDA

for

November 28, 1984

Meeting

(KG&E, NRR, & Region IV)

I. Introduction (Otto Maynard)

II. Recent Organization Changes (Glenn Koester)

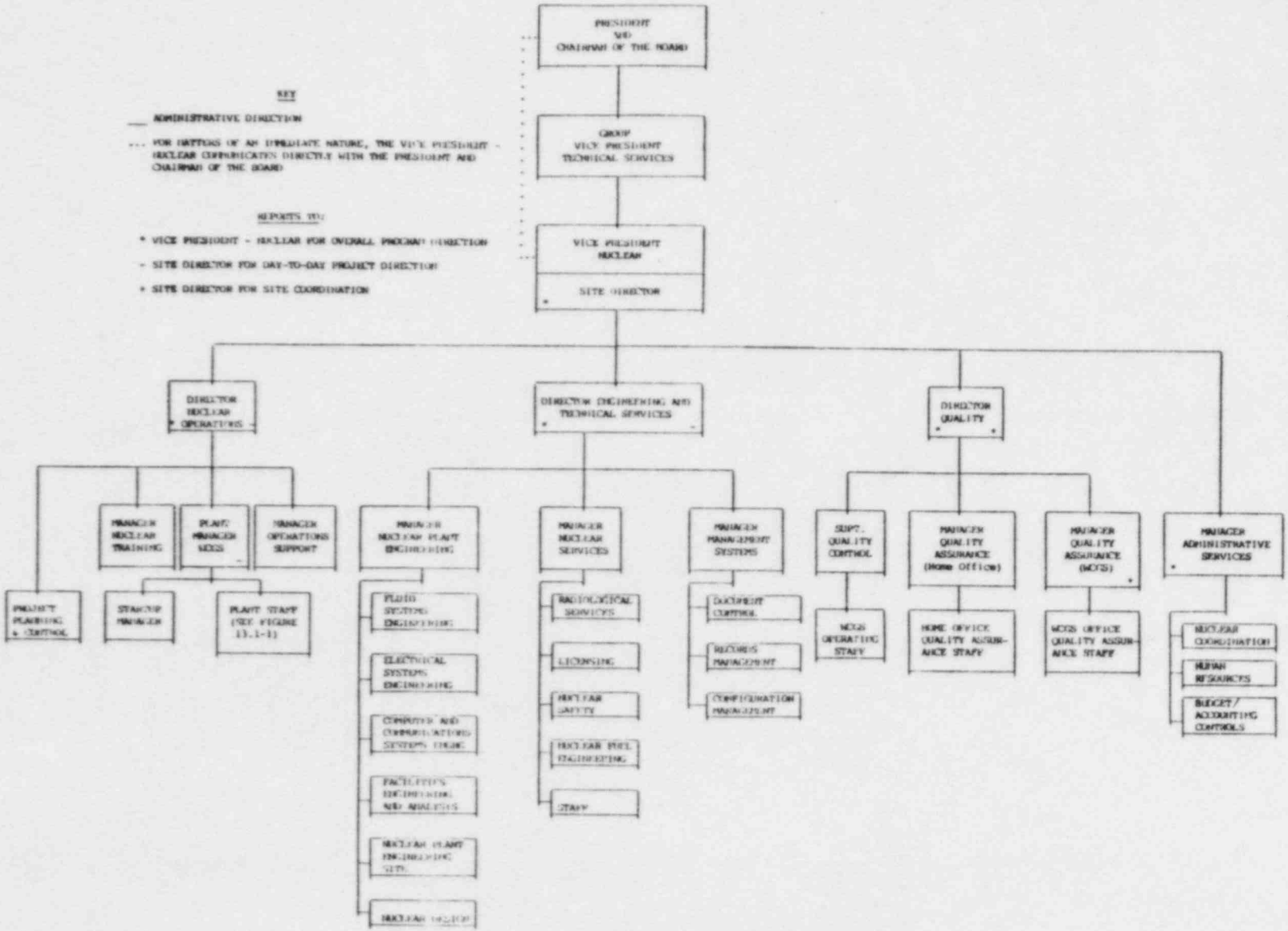
III. Current Schedule (Chuck Mason)

IV. AWS Welding (Bill Rudolph, John Berra)

V. PORVs (John Bailey)

VI. ECCS Check Valves (Forrest Rhodes)

VII. Power Ascention Test Reviews (Forrest Rhodes)


KEY
ADMINISTRATIVE DIRECTION
... FOR MATTERS OF AN EMERGENCY NATURE, THE VICE PRESIDENT - NUCLEAR COMMUNICATES DIRECTLY WITH THE PRESIDENT AND CHAIRMAN OF THE BOARD
REPORTS TO:
* VICE PRESIDENT - NUCLEAR FOR OVERALL PROGRAM DIRECTION
- SITE DIRECTOR FOR DAY-TO-DAY PROJECT DIRECTION
+ SITE DIRECTOR FOR SITE COORDINATION
PRESIDENT AND CHAIRMAN OF THE BOARD
GROUP VICE PRESIDENT TECHNICAL SERVICES
VICE PRESIDENT NUCLEAR
SITE DIRECTOR
DIRECTOR NUCLEAR OPERATIONS
DIRECTOR ENGINEERING AND TECHNICAL SERVICES
DIRECTOR QUALITY
MANAGER NUCLEAR TRAINING
PLANT MANAGER MCGS
MANAGER OPERATIONS SUPPORT
MANAGER NUCLEAR PLANT ENGINEERING
MANAGER NUCLEAR SERVICES
MANAGER MANAGEMENT SYSTEMS
SUPT., QUALITY CONTROL
MANAGER QUALITY ASSURANCE (Home Office)
MANAGER QUALITY ASSURANCE (MCGS)
MANAGER ADMINISTRATIVE SERVICES
PROJECT PLANNING & CONTROL
STAGING MANAGER
PLANT STAFF (SEE FIGURE 13.1-1)
FLUID SYSTEMS ENGINEERING
ELECTRICAL SYSTEMS ENGINEERING
FACILITIES ENGINEERING AND ANALYSIS
RADIOLOGICAL SERVICES
LICENSING
NUCLEAR SAFETY
NUCLEAR FUEL ENGINEERING
STAFF
DOCUMENT CONTROL
RECORDS MANAGEMENT
CONFIGURATION MANAGEMENT
MCGS OPERATING STAFF
HOME OFFICE QUALITY ASSURANCE STAFF
MCGS OFFICE QUALITY ASSURANCE STAFF
NUCLEAR COORDINATION
HUMAN RESOURCES
BUDGET/ ACCOUNTING CONTROLS

NG&E QA CORRECTIVE ACTION REQUEST #19

PROGRAM OBJECTIVES

- DOCUMENT A CONSOLIDATED PROJECT PLAN

- ASSURE BY OBJECTIVE EVIDENCE, THAT AWS D1.1 SAFETY RELATED STRUCTURAL STEEL WELDING COMPLIES WITH ALL QUALITY CRITERIA.

- ASSURE THAT INSPECTION DOUCMENTATION IS:

  AVAILABLE
  COMPLETE
  REFLECTS APPROPRIATE INFORMATION
  TRACEABLE

- EVALUATE OTHER AWS D1.1 SAFETY RELATED WELDING ACTVITIES.

KG&E QA CORRECTIVE ACTION REQUEST #19

FINDINGS - OVERVIEW

- MISSING WELD RECORD DOCUMENTATION

- WELD DEFICIENCIES

- WELDS NOT MADE/MISSING MATERIAL

- PRESENCE OF WELD INSPECTION DOCUMENTATION WITHOUT PRESENCE OF WELD (1 INSTANCE NOTED)

- VERIFICATION OF COMPLETED CORRECTIVE ACTION TO KG&E SURVEILLANCE REPORT S-372

11/27/84

FINDING #1 - MISSING MSSWR'S

ACTIONS

C a. Verify welders and procedures qualified to AWS D1.1-75.

C b. Verify purchase and control of filler and base material was acceptable.

C c. Verify inspection criteria and procedures did not adversely impact inspection results.

C d. Document validity of inspection for CAR 19 attributes with the presence of paint on welds.

C e. Utilize personnel certified to ANSI N45.2.6 - 1978 for the CAR 19 inspection verification plan.

f. Perform a 100% reinspection of structurally significant welds with missing records.

g. Obtain and document a suitability for service evaluation of inaccessible welds.

h. Initiate an NCR for all identified deficiencies.

FINDING #2 - INSPECTION VERIFICATION PLAN HAS IDENTIFIED SEVERAL AREAS OF DEFICIENCIES

a. Determine "Root Cause" of previous acceptance of deficient structural welds and analyze other AWS programs to determine if "Root Cause" was generic to those programs.

b. Perform a 100% reinspection of structurally significant welds having MSSWR's.

c. Evaluate the results of the completed Inspection Verification Plan against the acceptance criteria.

d. Initiate the NCR for all identified deficiencies.

11/27/84

FINDING #3 - MISSING MATERIAL AND WELDS

a. A/E perform "As Built" engineering evaluation and disposition.

C b. Verify the incorporation of design changes.

c. Evaluate for Root Cause determination.

FINDING #4 - MISSING WELD(S) WITH EXISTING DOCUMENTATION

a. Investigate to determine "Root Cause".

-Evaluate CAR 19 inspection verification plan results for patterns.

-Identify further actions as required.

FINDING #5 - OBJECTIVE EVIDENCE THAT MECHANICAL AND STRUCTURAL WELDING/DOCUMENTATION IN KG&E QA SURVEILLANCE REPORT S-372 HAS NOT BEEN PROVIDED

C a. Provide objective evidence for:

-Civil Deficiency Reports in S-372.

-Mechanical Deficiency Reports in S-372.

"C" designates activity completed.

STATUS OF AWS WELDING
INSPECTIONS AND ENGINEERING EVALUATIONS
11-27-84

BUILDING	TOTAL JOINTS	JOINTS INSPECTED	JOINTS EVALUATED	JOINTS REQUIRING REWORK (1)	ADDITIONAL JOINTS TO BE REWORKED (2)	SIGNIFICANTLY DEFICIENT JOINTS (10CFR50.55(e))
AUXILIARY	630	570	400	2	23	0
REACTOR	1210	1050	820	8	1	0
CONTROL	260	250	110	6	7	0
DIESEL GENERATOR	100	90	80	1	2	0
FUEL	200	200	190	0	5	0
RSWS PUMPHOUSE	20	20	20	0	0	0
TOTAL	2420	2180	1620	17	38	0

(1) DESIGN ALLOWABLE STRESSES ARE EXCEEDED IN THE AS-BUILT CONDITION

(2) DESIGN ALLOWABLE STRESSES ARE NOT EXCEEDED IN THE AS-BUILT CONDITION. THESE JOINTS ARE BEING REWORKED PER KG&E MANAGEMENT DIRECTION TO INSTALL MISSING AND UNDERLENGTH WELDS.

INTRODUCTION

THE WOLF CREEK PRESSURIZER POWER OPERATED RELIEF VALVES (PORVS), MANUFACTURED BY GARRETT, ARE 3" x 6" AND ARE SOLENOID OPERATED. THEY ARE INTENDED TO CONTROL PRESSURIZER PRESSURE TO A VALUE BELOW THE FIXED HIGH-PRESSURE REACTOR TRIP SETPOINT FOR A 40% LOAD REJECTION ASSUMING FAILURE OF THE PRESSURIZER SPRAY SYSTEM. THEY ALSO PROVIDE A SAFETY GRADE MEANS FOR REACTOR COOLANT SYSTEM DEPRESSURIZATION TO ACHIEVE COLD SHUTDOWN. ADDITIONALLY, THEY SERVE AS PART OF THE COLD OVERPRESSURE MITIGATION SYSTEM (COMS).

THE PORVs ARE NOT REQUIRED TO OPEN IN ORDER TO PREVENT OVERPRESSURIZATION OF THE REACTOR COOLANT SYSTEM FOR THE LOSS OF LOAD EVENT DISCUSSED IN THE OVERPRESSURE PROTECTION REPORT. THE PRESSURIZER SAFETY VALVES PERFORM THIS FUNCTION ASSUMING PRESSURIZER SPRAY AND PORVs FAIL TO OPERATE.

THE PORVs ARE ELECTRICALLY ACTUATED VALVES WHICH RESPOND TO A SIGNAL FROM THE PRESSURE SENSING SYSTEM OR TO MANUAL CONTROL. THEY ARE PROVIDED WITH CLASS 1E DIRECT POSITION INDICATION IN THE MAIN CONTROL ROOM. FOR EACH VALVE THERE ARE INDICATION LIGHTS AND ALARMS THAT ARE ACTIVATED BY STEM-ACTUATED LIMIT SWITCHES.

FIGURE 1 SHOWS THE FUNCTIONAL SCHEMATIC OF THE PORV. THE MODE OF OPERATION OF THE VALVE IS AS FOLLOWS:

THE VALVE IS A LINE-PRESSURE ACTUATED, SOLENOID-CONTROLLED, RELIEF VALVE OF THE CAGED-PLUG TYPE. THE SCHEMATIC DIAGRAM OF FIGURE 1 SHOWS THE UNIT WITH THE SOLENOID DE-ENERGIZED AND THE VALVE CLOSED. INLET PRESSURE (EITHER VAPOR OR WATER) FLOWS INTO THE VALVE INLET CONNECTION AND IS PORTED THROUGH THE SOLENOID SEAT TO THE ACTUATOR HEAD CHAMBER OF THE VALVE. INLET PRESSURE IS ALSO PORTED UNDERNEATH THE PISTON AND THROUGH THE CAGE HOLES TO SURROUND THE PLUG. THE FORCES TENDING TO HOLD THE VALVE CLOSED INCLUDE THE PRESSURE IN THE ACTUATOR HEAD CHAMBER ACTING ON THE ENTIRE PISTON AREA AND THE ACTUATOR SPRING LOAD. INLET PRESSURE ALSO ACTS ON THE ANNULAR AREA BENEATH THE PISTON (AND OUTSIDE THE SEAT DIAMETER) IN A DIRECTION TO OPEN THE VALVE. SINCE THE ANNULAR AREA IS LESS THAN THE TOTAL PISTON AREA, THE CLOSING FORCE PREDOMINATES AND THE PLUG IS HELD DOWN AGAINST THE SEAT WITH A FORCE EQUAL TO THE VALUE OF INLET PRESSURE MULTIPLIED BY THE SEAT AREA.

WHEN THE SOLENOID IS ENERGIZED, THE MAGNETIC FORCE ACTS ON THE SOLENOID ARMATURE TO MOVE THE BALL FROM THE VENT SEAT (AS SHOWN) TO THE OPPOSITE SEAT, THUS SEALING OFF INLET PRESSURE FROM THE ACTUATOR HEAD CHAMBER. AT THE SAME TIME, THE ACTUATOR HEAD PRESSURE IS VENTED TO DISCHARGE THROUGH THE VENT SEAT OF THE SOLENOID. WITH THE ACTUATOR HEAD CHAMBER NOW AT DISCHARGE PRESSURE, INLET PRESSURE ACTING ON THE ANNULAR AREA IS SUFFICIENT TO OVERCOME THE ACTUATOR SPRING LOAD. THE PLUG MOVES AWAY FROM THE SEAT IN THE DIRECTION TO OPEN THE VALVE.

AS THE VALVE OPENS, PRESSURE INSIDE THE CAGE BUILDS UP UNDERNEATH THAT PORTION OF THE PLUG EXPOSED TO DISCHARGE PRESSURE. BECAUSE OF THE PRESSURE DROP THROUGH THE CAGE FLOW HOLES, THIS PRESSURE IS LESS THAN INLET PRESSURE BUT HIGHER THAN THE DISCHARGE PRESSURE. THE LARGE SEATING FORCE THAT EXISTS WHEN THE VALVE IS CLOSED IS THUS TURNED INTO AN OPENING FORCE, CAUSING THE PLUG TO MOVE TO THE FULL-LIFT POSITION.

WHEN THE SOLENOID IS DE-ENERGIZED, THE BALL MOVES BACK TO THE SEAT AS SHOWN, SEALING OFF THE PATH TO DISCHARGE AND REPRESSURIZING THE ACTUATOR HEAD CHAMBER WITH INLET PRESSURE. WITH THE PLUG IN THE FULL-LIFT POSITION, THE OPENING FORCE CONSISTS OF INLET PRESSURE ACTING ON THE ANNULAR AREA AND CAGE PRESSURE ACTING ON THE BASE OF THE PLUG. THE CLOSING FORCES (CONSISTING OF INLET PRESSURE IN THE ACTUATOR HEAD CHAMBER AND THE ACTUATOR SPRING LOAD) OVERCOME THE OPENING FORCES AND CAUSE THE PLUG TO MOVE TOWARD THE SEAT. DISCHARGE PRESSURE DROPS TO A MINIMUM AS THE VALVE RESEATS, AND THE VALVE IS ONCE MORE HELD IN THE CLOSED POSITION BY A FORCE THAT IS EQUAL TO INLET PRESSURE MULTIPLIED BY THE SEAT AREA.

DISCUSSION OF VALVE MALFUNCTION

IT WAS IN THE CLOSING MODE, DESCRIBED ABOVE, IN WHICH THE VALVES MALFUNCTIONED. SPECIFICALLY, THE VALVES WERE BEING OPERATED IN THE MANUAL MODE, DISCHARGING STEAM, AND BEING HELD OPEN FOR A PERIOD OF APPROXIMATELY 32 SECONDS. PRIOR TO OPENING THE VALVE, THE INLET PIPING (CONSISTING OF APPROXIMATELY FOURTEEN FEET OF VERTICAL DOWNWARD RUN LOOP SEAL) WAS FILLED WITH COLD WATER AS WERE THE VALVES THEMSELVES. THE VALVES ARE LOCATED IN A COMPARTMENT WHICH IS BELOW THE TOP OF THE PRESSURIZER. THIS LOCATION AWAY FROM THE TOP OF THE PRESSURIZER RESULTS IN VALVES BEING SUBSTANTIALLY COLDER

THAN IF THEY WERE AT THE TOP OF THE PRESSURIZER. VALVE AMBIENT TEMPERATURE AT WOLF CREEK IS APPROXIMATELY 90 DEGREES FAHRENHEIT.

THE PREOPERATIONAL TEST ITSELF REQUIRED APPROXIMATELY 32 SECONDS OF CONTINUOUS OPERATION TO ACHIEVE PRESSURE RELIEF OF 200 PSI. THE PURPOSE OF THE TEST IS TO VERIFY VALVE STROKE TIME AND LEAKAGE AFTER THE VALVE HAS BEEN OPENED FOR MORE THAN TWO SECONDS. THIS TEST SIMULATES CERTAIN CONDITIONS WHICH MAY BE ENCOUNTERED DURING PLANT OPERATION SUCH AS LOSS OF LOAD. THE VALVE EQUIPMENT SPECIFICATION CONTAINS REQUIREMENTS SUCH AS: VALVE CYCLE TIME; DISCHARGE FLUID RATES; NUMBER OF DESIGN CYCLES; ETC. THESE DESIGN REQUIREMENTS ARE ADEQUATE TO ASSURE THAT THE VALVE WILL PERFORM ITS INTENDED FUNCTION.

IN ADDITION TO ASSURING OPERABILITY THROUGH EQUIPMENT SPECIFICATION REQUIREMENTS, CONSIDERABLE TESTING HAS BEEN PERFORMED ON THESE VALVES. THIS TESTING INCLUDES PREOPERATIONAL TESTS AT OTHER FOREIGN AND DOMESTIC PLANTS AND THE FOLLOWING SUCCESSFUL TESTS AT WOLF CREEK. AT WOLF CREEK, TESTS PERFORMED IN THE AUTOMATIC MODE, DURING WHICH THE VALVE REMAINED OPEN FOR A PERIOD OF APPROXIMATELY TWO SECONDS, WERE SUCCESSFUL. ADDITIONALLY ALL WOLF CREEK TESTING PERFORMED WITHOUT A COLD LOOP SEAL WAS COMPLETED SUCCESSFULLY. FURTHER, A NUMBER OF ISOTHERMAL TESTS HAVE BEEN PERFORMED ON THE GARRETT POWER OPERATED RELIEF VALVES. THESE INCLUDE THE EPRI SAFETY AND RELIEF VALVE TEST PROGRAM, AND GARRETT OPERABILITY TESTS. IN THESE TESTS, THE VALVES CLOSED AS REQUIRED.

WHEN THE VALVES FAILED TO CLOSE WHEN SIGNALED AFTER THE DISCHARGE PERIOD OF APPROXIMATELY 32 SECONDS, THE MOTOR-OPERATED BLOCK VALVES, WHICH ARE INSTALLED UPSTREAM OF THE PORVs AND WHOSE FUNCTION IS TO PRECLUDE THE LOSS

OF REACTOR COOLANT IF A LEAK SHOULD DEVELOP IN A PORV, WERE CLOSED. CLOSING OF THE PORVs WAS OBSERVED TO OCCUR SIMULTANEOUSLY WITH BLOCK VALVE CLOSURE. THIS OCCURRED BECAUSE THE HEAD ACTUATOR CHAMBER (WHICH WAS ISOLATED) WAS AT APPROXIMATELY 500 PSIG, THE NORMAL DISCHARGE PRESSURE. CLOSURE OF THE BLOCK VALVE REDUCED INLET PRESSURE. SINCE THE ACTIVE AREA ABOVE THE PISTON IS THREE TIMES GREATER THAN THAT BELOW THE PISTON, THE 500 PSIG WAS SUFFICIENT TO OVERCOME THE FALLING INLET PRESSURE.

SUMMARY OF INVESTIGATION

THE POSTULATED CAUSES FOR THE VALVE MALFUNCTION CONSIDERED WERE: SOLENOID FAILURE, PLUG TO CAGE BINDING, AND FAILURE TO GET REQUIRED FLUID PRESSURE TO ACTUATOR HEAD CHAMBER. PROPER SOLENOID OPERATION WAS VERIFIED. THE FACT THAT THE VALVE OPERATED AS DESIGNED IN THE SUTOMATIC MODE AND INSPECTION OF THE VALVE INTERNALS SHOWED NO EVIDENCE OF BINDING (I.E., GOUGING ETC.), ELIMINATED THE BINDING SUPPOSITION. THEREFORE, THERE WAS STRONG INDICATION THAT THE THIRD POSTULATED CAUSE, THAT OF FAILURE TO GET REQUIRED FLUID PRESSURE TO THE ACTUATOR HEAD CHAMBER, WAS THE SOURCE OF THE MALFUNCTION. BY REVIEWING THE VALVE DESIGN IN CONJUNCTION WITH DETAILED MANUFACTURING DRAWINGS IT WAS DETERMINED THAT DIFFERENTIAL THERMAL EXPANSION BETWEEN THE VALVE CAGE AND THE VALVE BODY BORE IN WHICH THE CAGE IS HOUSED, WOULD CAUSE THE CAGE-TO-BODY ANNULUS TO BE REDUCED IN SIZE EVEN TO A POINT OF TOTAL CLOSURE. THIS ANNULUS SERVES AS A PATH FOR INLET FLUID TO TRAVEL TO THE SOLENOID PORT AND EVENTUALLY TO THE ACTUATOR HEAD CHAMBER AS DEFINED PREVIOUSLY. TO VERIFY THIS SUPPOSITION, A SUBSEQUENT MANUAL TEST, SIMILAR TO THE TESTS IN WHICH MALFUNCTION OCCURRED, WAS PERFORMED WITH THE VALVE BODY HEATED TO 228 DEGREES FAHRENHEIT. THE VALVE FUNCTIONED AS REQUIRED PROVIDING STRONG SUPPORT TO THE PREMISE THAT DIFFERENTIAL THERMAL EXPANSION WAS THE CAUSE OF THE MALFUNCTION. IT SHOULD BE NOTED THAT BY HEATING THE VALVE BODY TO 228 DEGREES FAHRENHEIT THE VALVE BODY BORE WAS INCREASED BY

SIX MILS WHICH RESULTS IN AN ADDITIONAL ANNULAR CLEARANCE UNDER THE FLOW CONDITIONS.

IN REVIEW OF THE VALVE MANUFACTURING DRAWINGS, IT WAS DETERMINED THAT THE MAXIMUM AND MINIMUM RADIAL ANNULAR CLEARANCE AT AMBIENT TEMPERATURE WHEN THE PARTS (VALVE BODY AND CAGE) ARE MACHINED TO WITHIN SPECIFIED TOLERANCES ARE NINE AND SIX MILS (0.009 - 0.006) RESPECTIVELY WITH DIAMETRAL CLEARANCE BEING EIGHTEEN TO TWELVE MILS(0.018 - 0.012).

BASED ON THE INFORMATION FROM THE TESTING DESCRIBED ABOVE AND THE SMALL MANUFACTURING TOLERANCES, AN ANALYSIS WAS PERFORMED TO DETERMINE THE EFFECTS OF DIFFERENTIAL TEMPERATURE ON THE VALVE BODY AND CAGE. FIGURE 2 IS A PLOT OF THE RESULTS AND SHOWS THAT FOR 100 DEGREES FAHRENHEIT OF TEMPERATURE DIFFERENTIAL THE ANNULAR GAP IS REDUCED BY APPROXIMATELY THREE AND ONE HALF MILS(.0035). THIS IS BASED ON THE EXPANSION OF THE CAGE WITH NO EXPANSION OF THE VALVE BODY. BY HEATING THE VALVE IN THE SUCCESSFUL TEST, APPROXIMATELY SIX MILS (0.006) ANNULAR CLEARANCE WAS ADDED DUE TO THE THERMAL EXPANSION OF THE VALVE BODY AT ITS INITIAL CONDITION OF 228 DEGREES FAHRENHEIT.

THIS PHENOMENON WAS THEN ANALYZED TO DETERMINE THE EFFECTS OF GAP CLOSURE ON FLUID FLOW WITH A HOMOGENEOUS FLOW MODEL. THE RESULTS SUBSTANTIATE THE HEATED TEST RESULTS AND THE DIFFERENTIAL EXPANSION PREMISE. SPECIFICALLY, FOR ALL RELIEF CONDITIONS, THE MINIMUM ANNULAR DIAMETRAL GAP BETWEEN THE BODY AND THE CAGE NECESSARY FOR THE PORV TO FUNCTION PROPERLY IS 1.12 MILS. WITH THE VALVE STARTING COLD (90 DEGREES FAHRENHEIT) AND SUDDENLY EXPOSED TO HIGH PRESSURE STEAM (650 DEGREES FAHRENHEIT) IT WILL TAKE 5.75 SECONDS FOR THE ANNULAR ORIFICE GAP TO BE REDUCED FROM 15 MILS TO 1.12 MILS. IN

7.47 SECONDS, THE ANNULAR ORIFICE IS COMPLETELY CLOSED OFF. IF THE ANNULAR ORIFICE GAP STARTED OUT AT 18 MILS, IT WOULD TAKE APPROXIMATELY 9 SECONDS FOR THE GAP TO BE REDUCED TO 1.12 MILS. BY 11 SECONDS, THE 18 MIL GAP WOULD BE COMPLETELY CLOSED. IN THIS ANALYSIS THE CAGE EXPANDS AS A FUNCTION OF TIME AND TEMPERATURE AND THE THERMAL EXPANSION OF THE VALVE BODY DURING THESE TIME INTERVALS IS NEGLIGIBLE.

CORRECTIVE ACTION TAKEN

THE VALVES UNDER DISCUSSION WERE DISASSEMBLED AND DIMENSIONS OF THE BODY BORE I.D. AND CAGE O.D. WERE TAKEN. THIS SHOWED THAT THE DIAMETRAL ANNULAR CLEARANCES AT AMBIENT TEMPERATURE WERE NOMINALLY 15 MILS AND 18 MILS FOR THE TWO VALVES. A FIELD CHANGE NOTICE (FCN) WAS PREPARED TO MACHINE THE CAGES TO AN O.D. OF 4.55 TO 4.57 INCHES, THEREBY PROVIDING A FINAL DIAMETRAL ANNULAR CLEARANCE OF 114 MILS AND 111 MILS RESPECTIVELY. THIS ACTION WAS TAKEN WITH FULL COGNIZANCE AND TECHNICAL SUPPORT/ASSURANCE BY THE VALVE DESIGNER/MANUFACTURER (GARRETT) AND WESTINGHOUSE.

IN DESIGNING THE VALVE TO MEET THE SPECIFICATION REQUIREMENTS, THE DESIGNER KEPT THE ANNULAR CLEARANCE SMALL SO THAT IT WOULD SERVE AS A FILTER TO PREVENT ANY DEBRIS THAT MAY BE ENTRAINED IN THE FLUID FROM FOULING THE THREE-WAY BALL VALVE OF THE SOLENOID. HOWEVER, THE VALVE MANUFACTURER (GARRETT) HAS DETERMINED THAT THE CLEARANCE PROVIDED BY THIS DESIGN NEED NOT BE THIS SMALL. GARRETT HAS ALSO CONFIRMED THAT THE MACHINING TO RESIZE THE CAGE IS A PRODUCT IMPROVEMENT.

SUMMARY AND CONCLUSION

THE WOLF CREEK PRESSURIZER PROVs FAILED TO CLOSE AFTER A DISCHARGE OF WATER FOLLOWED BY STEAM WHICH WAS CONDUCTED MANUALLY FOR AN EXTENDED PERIOD OF

TIME. THE CAUSE OF THIS MALFUNCTION WAS DETERMINED TO BE DIFFERENTIAL THERMAL EXPANSION (VALVE BODY TO CAGE) RESULTING IN A RESTRICTION OF AN ESSENTIAL FLUID FLOW PATH TO THE VALVE ACTUATOR HEAD ASSEMBLY. IDENTIFICATION OF THE CAUSE OF THE MALFUNCTION IS SUPPORTED BY TESTING IN OTHER OPERATING MODES, SUCCESSFULLY REPEATING THE FAILED TEST WITH REDUCED DIFFERENTIAL TEMPERATURES, AND A DETAILED ENGINEERING ANALYSIS.

A VALVE MODIFICATION, SPECIFIED BY WESTINGHOUSE AND CONCURRED WITH BY GARRETT (THE VALVE DESIGNER/MANUFACTURER) HAS BEEN MADE WHICH CORRECTS THE MALFUNCTION WITHOUT HAVING ANY DELETERIOUS EFFECTS ON VALVE FUNCTION.

BASED ON THE INFORMATION CONTAINED HEREIN AND SUPPORTING DOCUMENTATION, IT IS CONCLUDED THAT THE GARRETT PRESSURIZER POWER-OPERATED RELIEF VALVES WILL FUNCTION UNDER ALL DESIGN CONDITIONS.

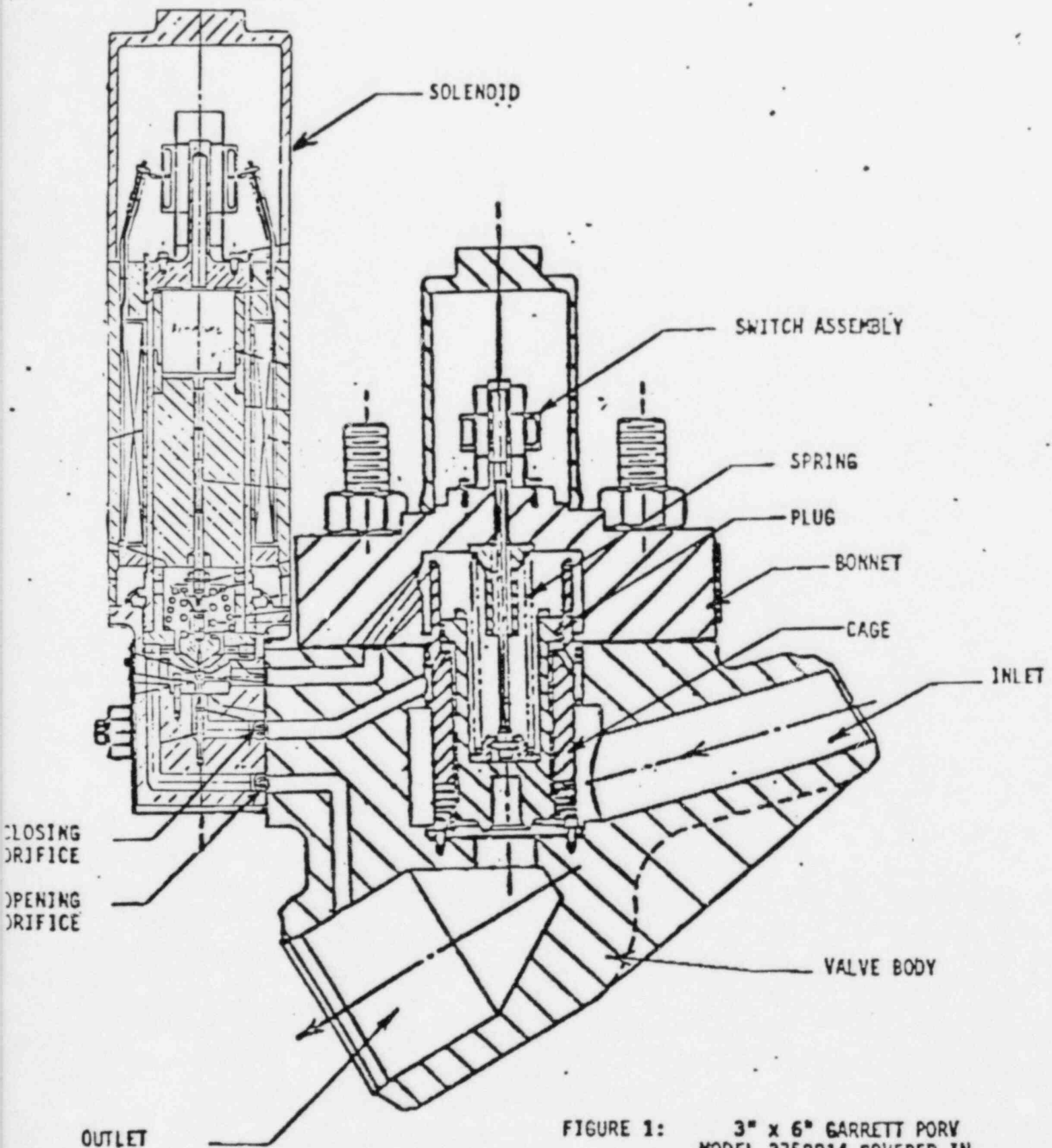


FIGURE 1: 3" x 6" GARRETT PORV MODEL 3750014 COVERED IN SPECIFICATION G-955245, REV. 0

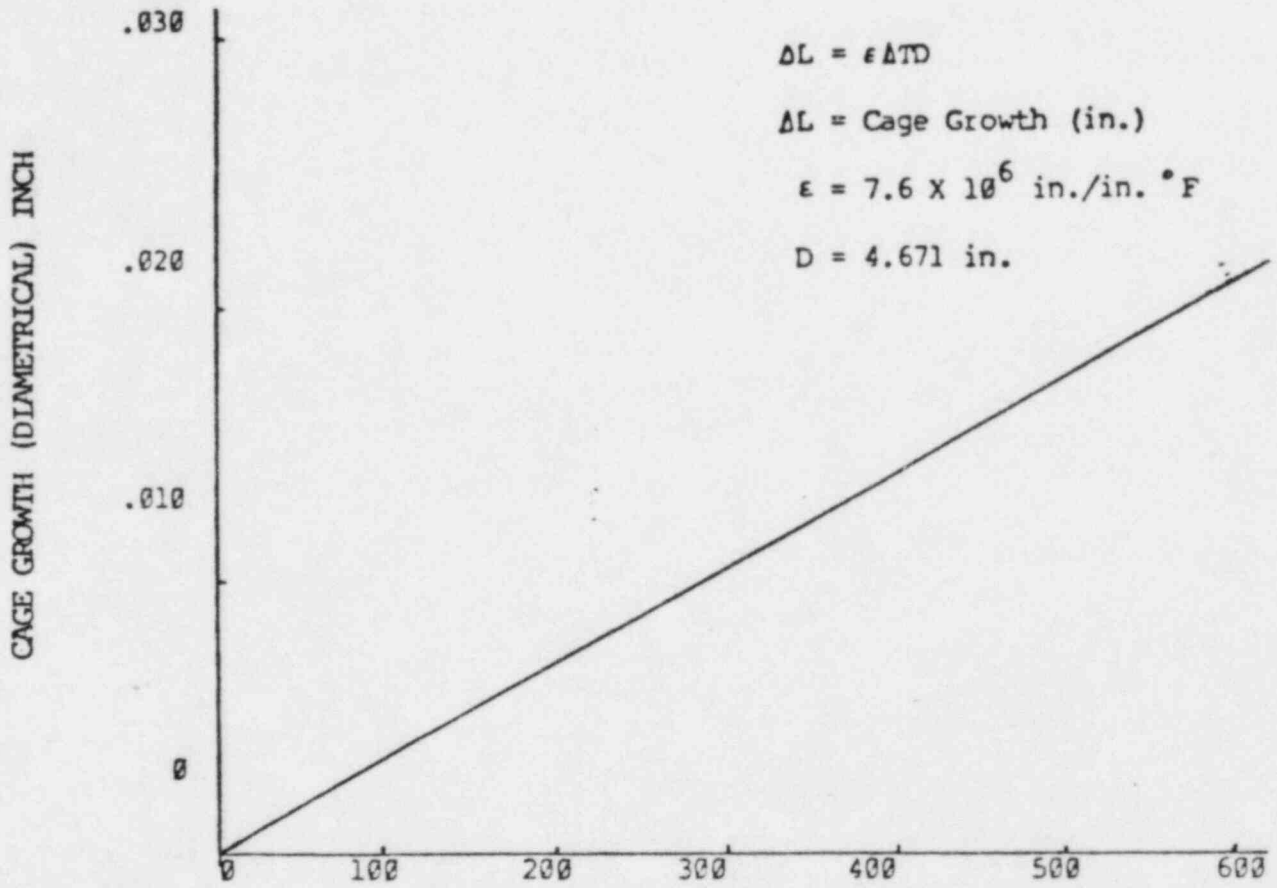


FIGURE 2

CAGE GROWTH VS. CAGE ΔT °F

Valve No.	Size	Allowable Leakage Specif.	Allowable Leakage IWV-3426	Actual Leakage (cc/hr)	RCS (2) Press (PSIG)
BB-8948A	10"	30 cc/hr	600 ml/hr	0	>2235
BB-8948B	10"	30 cc/hr	600 ml/hr	268	>2235
BB-8948C	10"	30 cc/hr	600 ml/hr	6824 (1)	>2235
BB-8948D	10"	30 cc/hr	600 ml/hr	478	>2235
EP-8956A	10"	30 cc/hr	600 ml/hr	700	>2235
EP-8956B	10"	30 cc/hr	600 ml/hr	2464 (1)	>2235
EP-8956C	10"	30 cc/hr	600 ml/hr	914	>2235
EP-8956D	10"	30 cc/hr	600 ml/hr	0	>2235
EP-8818A	6"	18 cc/hr	360 ml/hr	18	>2235
EP-8818B	6"	18 cc/hr	360 ml/hr	(3)	>2235
EP-8818C	6"	18 cc/hr	360 ml/hr	5998 (1)	>2235
EP-8818D	6"	18 cc/hr	360 ml/hr	(3)	>2235
BB-8949A	6"	18 cc/hr	360 ml/hr	(3)	>2235
BB-8949B	6"	18 cc/hr	360 ml/hr	19	>2235
BB-8949C	6"	18 cc/hr	360 ml/hr	(3)	>2235
BB-8949D	6"	18 cc/hr	360 ml/hr	(3)	>2235
EJ-8841A	6"	18 cc/hr	360 ml/hr	76	>2235
EJ-8841B	6"	18 cc/hr	360 ml/hr	920 (1)	>2235
EM-8815A	3"	9 cc/hr	180 ml/hr	96	>2235
EP-V010	2"	6 cc/hr	120 ml/hr	454	>2235
EP-V020	2"	6 cc/hr	120 ml/hr	5	>2235
EP-V030	2"	6 cc/hr	120 ml/hr	136	>2235
EP-V040	2"	6 cc/hr	120 ml/hr	14	>2235
EM-V001	2"	6 cc/hr	120 ml/hr	62	>2235
EM-V002	2"	6 cc/hr	120 ml/hr	1506	>2235
EM-V003	2"	6 cc/hr	120 ml/hr	8.5	>2235
EM-V004	2"	6 cc/hr	120 ml/hr	4	>2235
BB-V001	1-1/2"	4.5 cc/hr	90 ml/hr	144	>2235
BB-V022	1-1/2"	4.5 cc/hr	90 ml/hr	138	>2235
BB-V040	1-1/2"	4.5 cc/hr	90 ml/hr	128	>2235
BB-V059	1-1/2"	4.5 cc/hr	90 ml/hr	96	>2235

Notes:

1. These valves exceed required limits and will be reworked and retested.

2. RCS pressure for the balance of testing was being controlled at >2235 psig by SU3-BB05. For the period 9-16-84 through 10-04-84 there were two pressure transits resulting in an RCS pressure of <2235 (9-23-84 and 9-28-84 through 10-01-84). No check valve leak test data was recorded on those dates.

3. Total actual leakage recorded = 20,965 cc/hr which = 5.45 gal/hr. Utilizing WCGS Tech Spec para. 3.4.6.3.f value of 1 GPM total leakage leaves us with a margin of 54.55 gal/hr.

   Performance of CWP-EM-419-M recorded a total leakage of 0.124 gal/min which = 7.44 gal/hr.

   7.44 gal/hr (CWP results)
   -5.45 gal/hr (EM03 results)
   1.99 gal/hr to account for leakage of the five 6" check valves which do not have recorded leakage data (see Page 1).

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

MAR 2 6 1985

Docket No.: STN 50-482

APPLICANT: Kansas Gas and Electric Company (KG&E)

FACILITY: Wolf Creek Generating Station

SUBJECT: SUMMARY OF MEETING WITH KANSAS GAS AND ELECTRIC COMPANY REGARDING THE OPERATIONAL READINESS OF THE WOLF CREEK GENERATING STATION

On January 15, 1985, a meeting was held with Kansas Gas and Electric Company (KG&E) to discuss the operational readiness of the Wolf Creek Generating Station. This meeting was held at the plant site. It had previously been scheduled to be held on January 10 and had to be rescheduled for January 15, 1985 due to weather conditions.

The following two scenarios which were exercised by KG&E operating personnel on the Wolf Creek simulator.

(1) Main steam line break outside containment

- plant at full power; Xe at equilibrium
- power reduced to 75%
- unrelated control rod drop
- leak in main steam line
- main steam isolation valve on affected steam generator fails to close

(2) Primary system leak in centrifugal charging pump letdown line

- unrelated, inadvertent Safety Injection
- bomb threat received
- bomb explodes, causing primary system leak

The operating crew for these exercises consisted of two reactor operators, one senior operator, and one advisor. The advisors are on operating crew to provide commercial operating experience. All three of the operators in this exercise hold Senior Operator Licenses as do most of the operators at Wolf Creek. The exercises got off to a rather slow start and a minor simulator problem. As we proceeded into the scenario the pace picked up and the response and performance of the crew met the demands of the situation. The Emergency Operating Procedures were appropriately used in the exercise. In summary the crew generally demonstrated their ability to use the procedures and the adequacy of the procedures for coping with operating conditions throughout the identified scenarios.

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It was noted that using senior operators as reactor operators may have some adverse impact on maintaining the chain of command because the senior operator, serving in the reactor operator position, tends to act without receiving clear direction from the senior operator in command of the shift.

Following the simulator exercise, the staff toured the plant with KG&E operating personnel and observed plant conditions. At 1:15 p.m., the NRC staff met with KG&E staff in the Education Center.

The staff was represented by the following participants:

Paul O'Connor	Project Manager, Licensing Branch No. 1 Division of Licensing, NRR
B. J. Youngblood	Chief, Licensing Branch No. 1, Division of Licensing, NRR
Robert Bernero	Director, Division of Systems Integration, NRR
Dennis Ziemann	Chief, Procedures and Systems Review Branch, Division of Human Factors Safety, NRR
John Collins	Acting Deputy Director, Office of Inspection and Enforcement
Richard Denise	Director, Wolf Creek Task Force, Region IV
Robert Smith	Inspector, Region IV
James Knight	Acting Director, Division of Engineering, NRR

The agenda for the management visit to Wolf Creek is provided in Enclosure 1 and the slides used by the applicant are provided in Enclosure 2.

MAR 26 1985

Based on the staff's observations during the tour and the presentation by KG&E we concluded that schedule for completion of preoperational testing related to ECCS sequencing and shutdown sequencing are on the critical path to licensing and that the applicants' schedule for licensing by February is optimistic and can only be achieved by completion of the outstanding preoperational tests on a schedule to permit the staff adequate time to review the results prior to declaring the plant ready to license.

Paul W. O'Connor

Paul W. O'Connor, Project Manager
Licensing Branch No. 1
Division of Licensing

Enclosures:
As stated

WOLF CREEK

MAR 0 1 1995

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ENCLOSURE 1

AGENDA FOR MANAGEMENT VISIT TO

WOLF CREEK ON JANUARY 10, 1985

Time	Item	Location
8:30 AM	Simulator Exercise	Education Center
10:15 AM	Plant Tour and Discussion with Operating Personnel	Wolf Creek Generating Station
12:15 PM	Lunch	Wolf Creek Cafeteria
1:15 PM	Meeting	

1. Organization Staffing and Training
2. Operational Experience
3. Operational Readiness
4. Selected Technical Issues
   a. Plans for preventative maintenance
   b. Structural Steel Welding
   c. Quality First Program Status
   d. Fire Protection Modifications
   e. Construction Appraisal
   f. Callaway Lessons Learned
   g. Technical Specifications

ENCLOSURE 2

NRC MANAGEMENT READINESS VISIT

January 15, 1985

WOLF CREEK GENERATING STATION

NRC MANAGEMENT READINESS VISIT

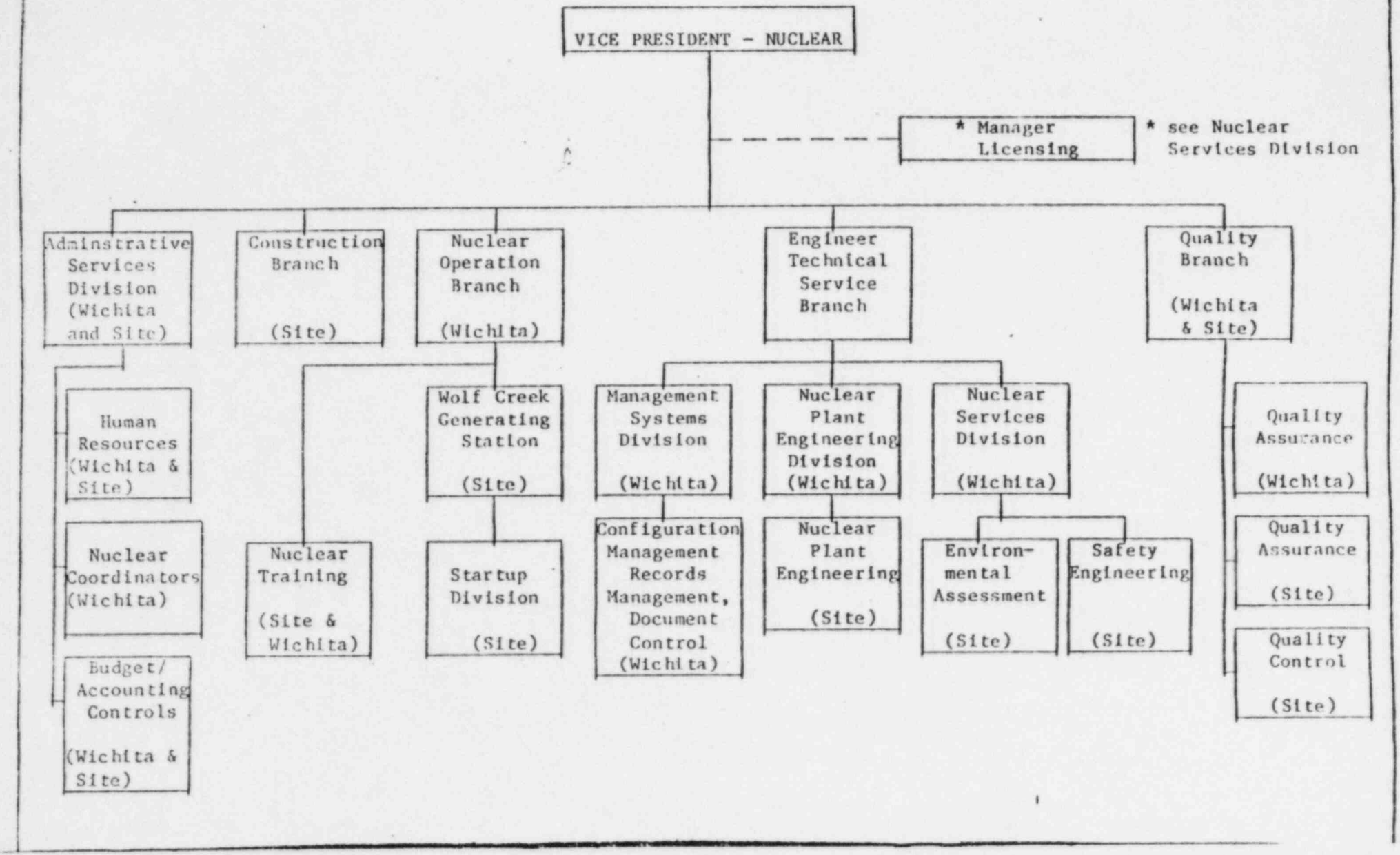
January 15, 1985

Nuclear Department Organization	Glenn Koester (Vice-President - KG&E)
Plant Organization, Training, & Experience	Forrest Rhodes (Plant Manager)
Preventive Maintenance Philosophy	Forrest Rhodes (Plant Manager)
Technical Specifications	Forrest Rhodes (Plant Manager)
Callaway Lessons Learned	Forrest Rhodes (Plant Manager)
Structural Steel Welding	John Berra (Vice-President - Daniel)
Construction Appraisals	Dick Grant (Director - Quality)
Quality First	Kent Brown (Group Vice-President - KG&E)
Fire Protection Modifications	John Bailey (Director Engineering & Technical Services)
Operational Readiness Assessment	Chuck Mason (Site Director - Director Nuclear Operations)

NUCLEAR DEPARTMENT ORGANIZATION

Glenn Koester

NUCLEAR DEPARTMENT ORGANIZATION



LOCATION OF

"HOME OFFICE" DIVISIONS SUPPORT PERSONNEL

DEPARTMENT HQ	WICHITA	- -
ADMIN SERV	WICHITA	WOLF CREEK
NUC OPNS HQ	WICHITA	WOLF CREEK
NUC TRAINING	WICHITA	WOLF CREEK
TECH & ENGR SERV	WICHITA	WOLF CREEK
MGMT SYS	WICHITA	WOLF CREEK
NUC PLT ENGR	WICHITA	WOLF CREEK
NUC SERV	WICHITA	WOLF CREEK
QUALITY ASSUR	WICHITA	WOLF CREEK

PROFESSIONAL "HOME OFFICE" DIVISION
EMPLOYEES LOCATION

	WICHITA PROF & TECH	SITE PROF & TECH
DEPT HQ.....	2	-
ADMIN SERV.....	4	4
NUC OPNS HQ.....	10	18
NUC TRNG.....	1	25
TECH & ENGR SERV HQ..	0	1
MGMT SYS.....	7	2
NUC PLT ENGR.....	57	7
NUC SERV.....	38	11
QUALITY ASSUR.....	11	44
LOCATION TOTALS...	130	112
TOTAL (HO DIVS).....	242	

HOME OFFICE EMPLOYEE
EXPERIENCE BASE SUMMARY

DIVISION	COMMER'L NUC OPR	MILITARY NUC OPR	JOB RELATED	WOLF CREEK	TOTAL
NUCLEAR OPERATIONS	40 (7.5)	16.5	18.5	3	78
TECH & ENGR SERV					
NUC PLT ENGR	108	25	215.5	152	500.5
NUC SERV	62.5 (6.5)	29	101	121	313.5
MGMT SYSTEMS	44.5	---	56	22.5	123
QUALITY	54 (11)	42	544	139.5	779.5
ADMIN SERV	1	---	102	28.5	131.5

( ) Denotes years of SRO or RO license Experience

***** TOTAL HO DIVISIONS EXPERIENCE = 1926 years *****

YEARS OF EXPERIENCE

	COMM'L NUCLEAR	MILITARY NUCLEAR	JOB RELATED	WOLF CREEK
DIR NUC OPNS	17	3	4	.25
MGR OPNS SUPT	10 (2.5)	7.5	.5	2
DIR ENGR & TEC SER	4	4	2	9
MGR NUC ENGR	17	-	2	11
MGR NUC SERV	-	4	9	10
MGR NUC TRNG	6.5	5.0	2	.8
DIR QUALITY	-	-	10	1
MGR QA (SITE)	-	2	3	3
MGR ADMIN SERV	-	-	20	2
MGR MGMT SYS	-	-	-	11
MGR FAC & ANAL	4.5	-	3	3
MGR RAD & LIC SERV	3 (2)	-	5	7
MGR LICENSING	2 (.5)	-	-	2

PLANT ORGANIZATION, TRAINING & EXPERIENCE

PREVENTIVE MAINTENANCE PHILOSOPHY

TECHNICAL SPECIFICATIONS

CALLAWAY LESSONS LEARNED

Forrest Rhodes

Plant Organization

- Plant Manager-1
  - Secretary-1

- Supt of Maint-1
  - General Clerk-1
  - Maint Svcs Supvr-1
    - Maint Engr-6
    - Maint Tech-4
    - Mat Cont Supvr-1
      - Mat Coord Sup-1
      - Storeroom Sup-1
        - Warehouse Att-7
    - Utility Supvr-1
      - Utility Mech-3
      - Lead Bldg Svman-3
      - Bldg Serviceman-12
  - Maint Supp Supvr-1
    - Mech Supvr-2
      - Welder-3
      - Machinist-3
      - Lead Mechanic-3
      - Mechanic-22
      - Utility Hlpr-14
    - Electrical Supv-2
      - Lead Electrician-1
      - Electrician-13
      - Utility Hlpr-7
    - HVAC Supervisor-1
      - HVAC Mechanic-5

  TOTAL 119

- Supt of Operations-1
  - General Clerk-1
  - Ops Coord - Ops-1
    - Shift Supervisor-7
      - Supervising Opr-6
      - Reactor Opr
      - Station Opr 50
      - Utility Helper
  - Ops Coord - Planning and Projects-1
    - Engineer/Spec-0
    - Surv Coord-1
      - System Analyst-1

  TOTAL 69

- Supt of Tech Supp-1
  - General Clerk-1
  - Reactor Eng Supvr-1
    - Reactor Engineer-2
  - I&C Supervisor-1
    - Engineer/Spec-4
    - I&C Coordinator-2
      - I&C Spec-5
      - I&C Tech-46
      - Utility Helper-6
    - Lead Comp Eng-1
      - Comp Eng/Spec-4
      - App Prog Trn-6
  - Site Chemist-1
    - Chemistry Supvr-4
      - HP/Chem Tech-14
      - Utility Helper-6
  - Site Health Phys*-1
    - HP Supervisor-5
      - HP/Chem Tech 25
      - Utility Helper

  TOTAL 136

- Supt of Plant Supp-1
  - General Clerk-1
  - Fire Prot Spec*-1
    - Training Spec-1
  - Chief of Security*
    - Security Staff
  - Results Eng Supvr-1
    - Results Eng-22

  TOTAL 27

- Supt of Regulatory-1 Quality and Admin Services
  - General Clerk-1
  - Engineering Spec-1
  - Safety Specialist-1
  - Nuc Medical Spec-1
  - Site Emerg Planning Administrator-1
  - DocumentContSupv-1
    - Doc Cont Clerk-14
    - Analy&Film Opr-16
  - Admin Supvr-1
    - Clerk-30

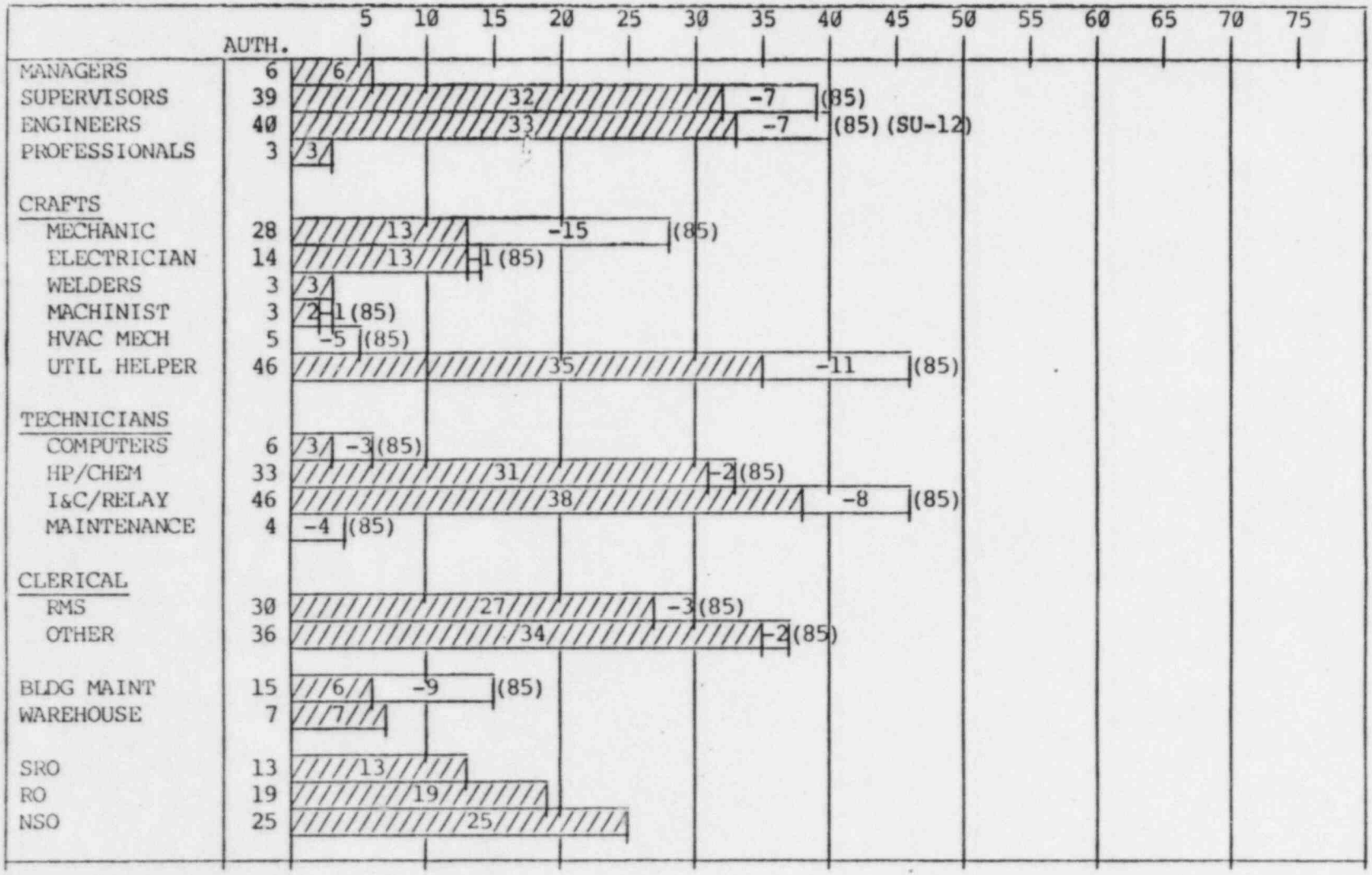
  TOTAL 68

TOTAL PLANT 421

*For technical matters of an immediate nature the respective individual reports directly to the Plant Manager.

Wolf Creek Generating Station
Revised Organization Chart 1-09-85
Supersedes Chart dated 12-06-84

STAFFING REQUIREMENT BY 12/85 — WOLF CREEK - OPERATIONS — DATE: 1/09/85



TOTAL AUTH- 421 TOTAL ON THE JOB- 343

OPENINGS 1985- 78 STARTUP- 12

▨ - EMPLOYED

□ - OPENINGS

SUMMARY OF EXPERIENCE BASE

	Commercial* Nuclear Experience	Military Nuclear Experience	Job Related Experience	Wolf Creek Experience	Total
Operations	70.0 (30.5)	230.5	26.5	126.0	453.0
Maintenance	11.0 (5.0)	25.1	417.2	116.2	569.5
Administration	34.5 (24.0)	17.0	17.5	29.0	98.0
Technical Support	116.7	99.5	170.5	182.45	569.15
Plant Support	6.0 (1.5)	13.5	76.5	49.5	145.5
Training	17.0 (4.0)	14.5	27.5	15.5	74.5
TOTALS	255.2 (65.0)	400.1	735.7	518.65	1909.65

*Numbers in parenthesis are years experience with SRO or RO license.

STRUCTURAL STEEL WELDING

John Berra

PG&E QA CORRECTIVE ACTION REQUEST #19

PROGRAM OBJECTIVES

- DOCUMENT A CONSOLIDATED PROJECT PLAN

- ASSURE BY OBJECTIVE EVIDENCE, THAT AWS D1.1 SAFETY RELATED STRUCTURAL STEEL WELDING COMPLIES WITH ALL QUALITY CRITERIA.

- ASSURE THAT INSPECTION DOCUMENTATION IS:

  AVAILABLE
  COMPLETE
  REFLECTS APPROPRIATE INFORMATION
  TRACEABLE

- EVALUATE OTHER AWS D1.1 SAFETY RELATED WELDING ACTIVITIES.

TOTAL JOINTS - 11,150

(Shop Welded, Field Bolted, or Field Welded)

FIELD WELDED JOINTS - 2,669 (24% of Total Joints)

TOTAL AWS WELDING

INSPECTIONS AND ENGINEERING EVALUATIONS

BUILDING	TOTAL JOINTS	JOINTS EVALUATED	SIGNIFICANTLY DEFICIENT JOINTS	JOINTS REQUIRING REWORK (1)	ADDITIONAL JOINTS TO BE REWORKED (2)
AUXILIARY	693	693	0	7	37
REACTOR	1300	1300	0	69	15
CONTROL	265	265	0	3	13
DIESEL GENERATOR	98	98	0	2	2
FUEL	277	277	0	0	6
ESWS PUMPHOUSE	36	36	0	0	0
TOTAL	2669	2669	0	81*	73

(1) DESIGN ALLOWABLE STRESSES ARE EXCEEDED IN THE AS-BUILT CONDITION

(2) DESIGN ALLOWABLE STRESSES ARE NOT EXCEEDED IN THE AS-BUILT CONDITION. THESE JOINTS ARE BEING REWORKED IN ACCORDANCE WITH KG&E MANAGEMENT DIRECTION TO INSTALL MISSING AND UNDERLENGTH WELDS.

*60 of these joints are polar crane radial stops installed to one typical detail.

CONSTRUCTION APPRAISALS

Dick Grant

CONSTRUCTION APPRAISAL
KG&E

ACTIONS IN ADDITION TO
WCGS QUALITY PROGRAM

- April '83
  - Initiated Combined Review Group (CRG) and Walkdown Teams for S/U turnover. (Combined KG&E & Contractor)
  - Quality Assurance Dept. Walkdown Team formed to measure effectiveness of the above program.
- May-July '83 — MAC conducted for KG&E: **"OVERALL STATUS & ADEQUACY OF WCGS QA ACTIVITIES"**
- Oct.-Feb. '84 — INPO: **"CONSTRUCTION PROJECT EVALUATION"**
- May-Aug. '84 — Delian Corp. conducted for KG&E: **"CONSTRUCTION SELF ASSESSMENT"**
- Nov. '84 — NRC performed an assessment of KG&E's CSA: **"SPECIAL CONSTRUCTION VERIFICATION INSPECTION"**
- Bechtel performed **"79-14 Walkdown"**
- KG&E QA Dept. has performed extensive Audits (103-'84) & Surveillances (207-'84)
- March '84
  - KG&E established **"QUALITY 1ST PROGRAM"** to address quality concerns of individuals onsite & exit interviews.

QUALITY FIRST

Kent Brown

QUALITY FIRST

PRIMARY OBJECTIVES

I. PROVIDE A SYSTEM WHEREBY ALL KG&E EMPLOYEES AND WCGS ONSITE CONTRACTORS MAY PRESENT QUALITY CONCERNS TO AN APPROPRIATE ORGANIZATION FOR RESOLUTION WITHOUT THREAT OF RETALIATION TO THOSE PERSONS EXPRESSING THE CONCERNS.

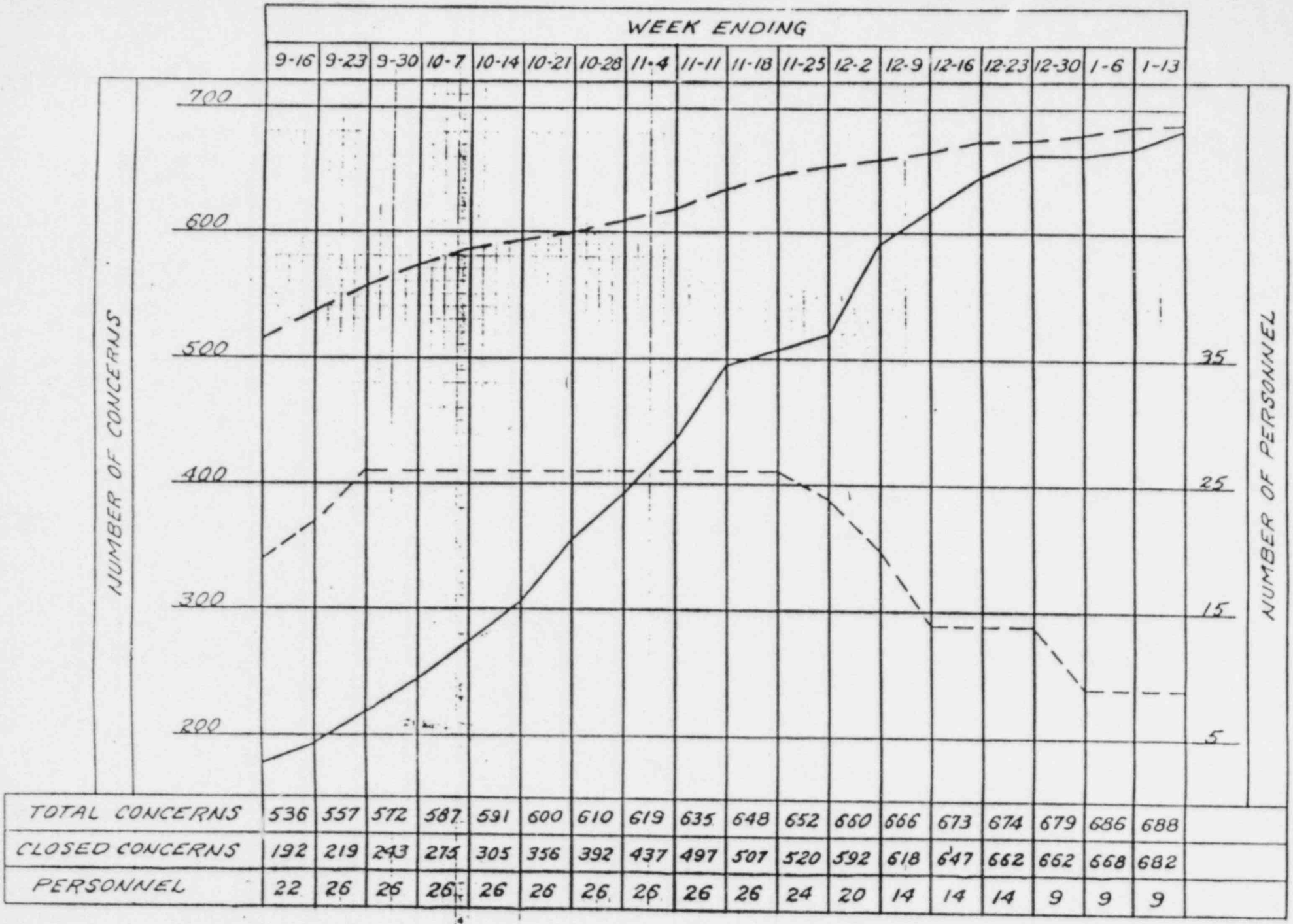
II. ESTABLISH THE NECESSARY ADMINISTRATIVE AND INVESTIGATIVE MEASURES TO ENSURE THAT QUALITY CONCERNS RELATED TO THE SAFE OPERATIONS, QUALITY OF WORK, COMPLIANCES WITH REQUIREMENTS OR MANAGEMENT ARE APPROPRIATELY EVALUATED, INVESTIGATED, DISPOSITIONED, VERIFIED AND DOCUMENTED.

QUALITY FIRST SUMMARY

TOTAL NUMBER OF PERSONNEL INTERVIEWED WITHOUT CONCERNS	4,314
TOTAL NUMBER OF PERSONNEL INTERVIEWED WITH CONCERNS	239
TOTAL NUMBER OF PERSONNEL INTERVIEWED	4,553

QUALITY FIRST SUMMARY

TOTAL NUMBER OF CONCERNS	686
TOTAL NUMBER OF QUALITY RELATED CONCERNS SUBSTANTIATED	178
NUMBER OF OPEN CONCERNS RESTRAINING FUEL LOAD	Ø
NUMBER OF PENDING CONCERNS (NOT RELATED TO FUEL LOAD)	3



	9-16	9-23	9-30	10-7	10-14	10-21	10-28	11-4	11-11	11-18	11-25	12-2	12-9	12-16	12-23	12-30	1-6	1-13
TOTAL CONCERNS	536	557	572	587	591	600	610	619	635	648	652	660	666	673	674	679	686	688
CLOSED CONCERNS	192	219	243	275	305	356	392	437	497	507	520	592	618	647	662	662	668	682
PERSONNEL	22	26	26	26	26	26	26	26	26	26	24	20	14	14	14	9	9	9

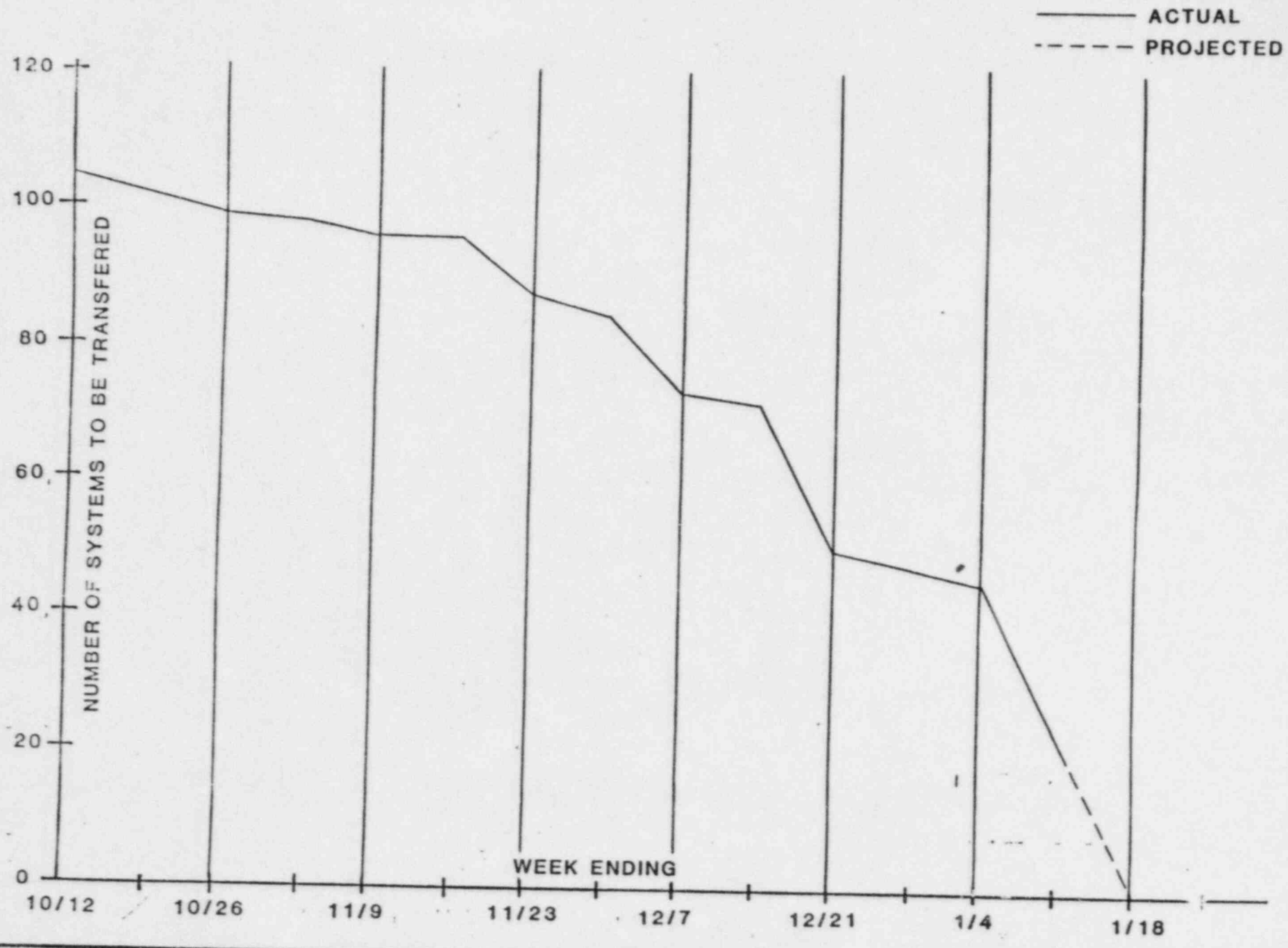
FIRE PROTECTION MODIFICATIONS

John Bailey

OPERATIONAL READINESS ASSESSMENT

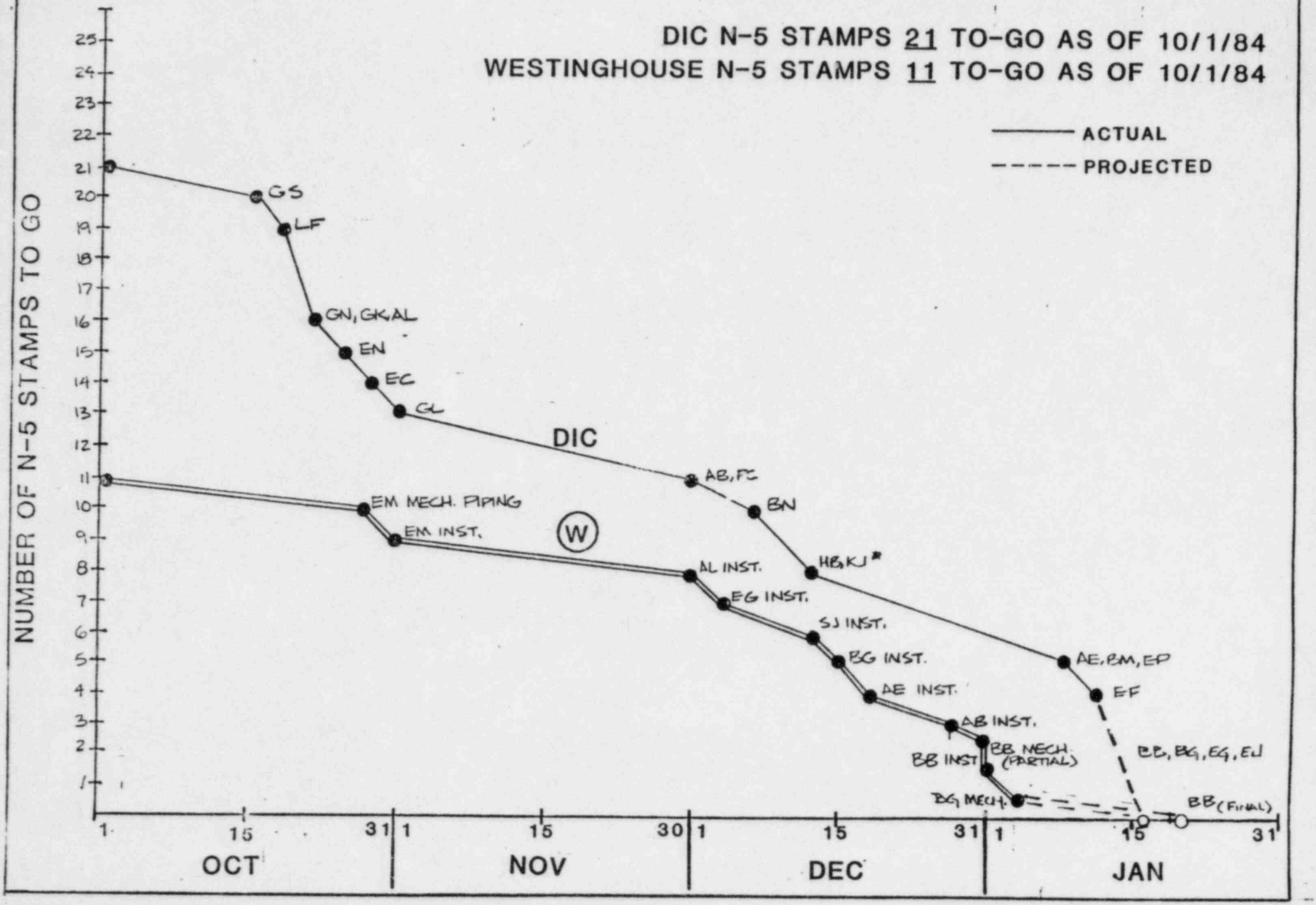
Chuck Mason

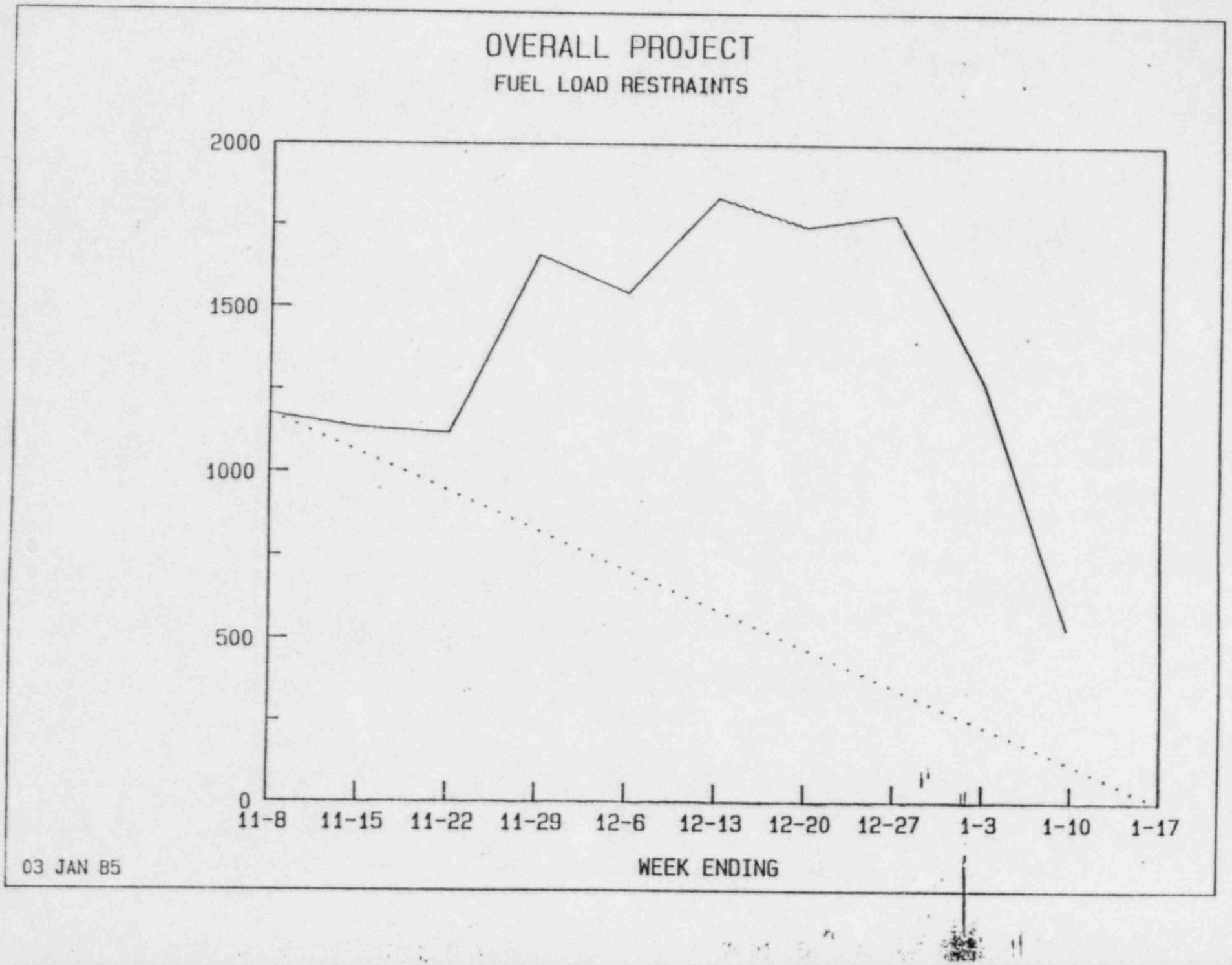
SYSTEM TRANSFER TO OPERATION
10/12/84-1/18/85



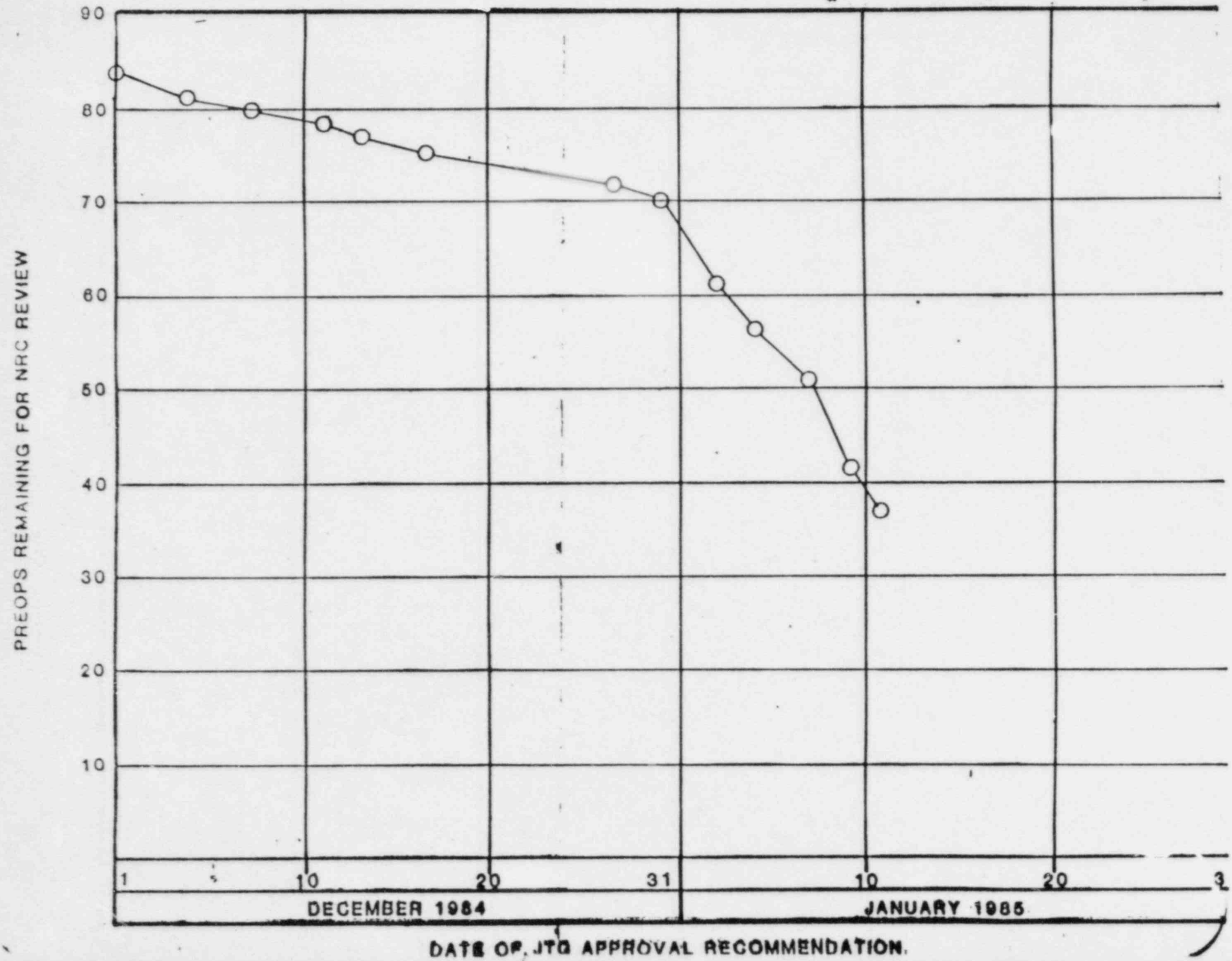
N-5 STAMP PROGRAM COMPLETION

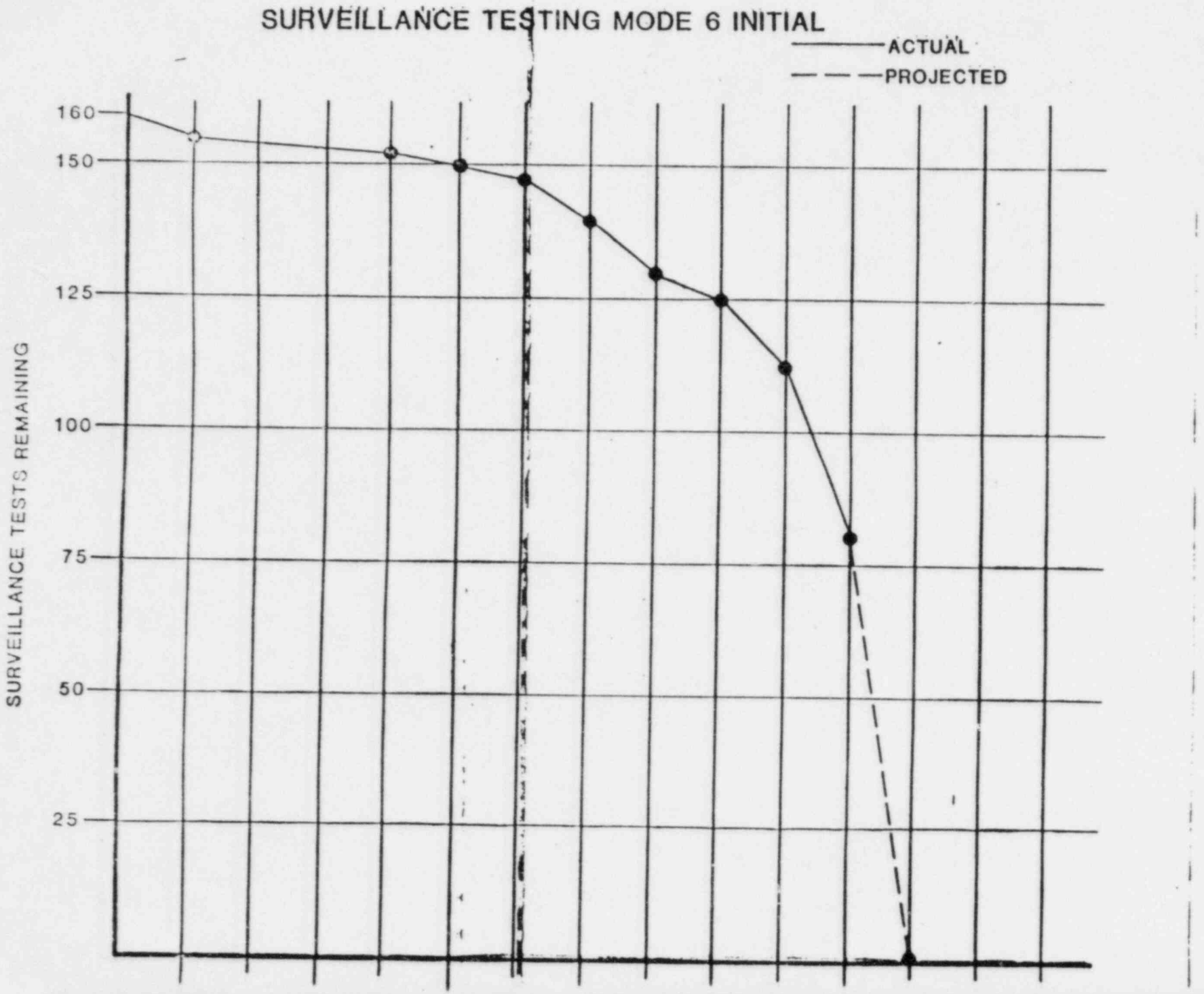
DIC N-5 STAMPS 21 TO-GO AS OF 10/1/84
WESTINGHOUSE N-5 STAMPS 11 TO-GO AS OF 10/1/84




OVERALL PROJECT
FUEL LOAD RESTRAINTS
2000
1500
1000
500
0
11-8
11-15
11-22
11-29
12-6
12-13
12-20
12-27
1-3
1-10
1-17
WEEK ENDING
03 JAN 85

PREOPERATIONAL TEST RESULTS APPROVAL




SURVEILLANCE TESTING MODE 6 INITIAL
ACTUAL
PROJECTED
160
150
125
100
75
50
25
SURVEILLANCE TESTS REMAINING

MAR 26 1985

MEETING SUMMARY DISTRIBUTION

Docket File
NRC PDR
L PDR
NSIC
PRC System
LB#1 Reading File
Project Manager P. O'Connor
M. Rushbrook
Attorney, OELD
R. Hartfield*
OPA*

NRC Participants

P. O'Connor
B. J. Youngblood
R. Bernero
D. Ziemann
J. Collins
R. Denise, RIV
Robert Smith, RIV
J. Knight

OTHERS

bcc: Applicant & Service List

*Caseload Forecast Panel Visits

NRR Release D-2

FORM 1177 REV. 1-67

FOIA 85-101

KGE THE ELECTRIC COMPANY

INTEROFFICE CORRESPONDENCE

TO: R. M. Grant

FROM: G. L. Fouts KWCLKQ-84-010

DATE: December 27, 1984

SUBJECT: Wolf Creek Generating Station
Corrective Action Request No. 19 Final Report

Attached is the Corrective Action Request (CAR) No. 19 - Final Report which provides documented evidence of implementation of the KG&E Management Plan for the Resolution of CAR 19. Please note that Management Plan Item 1a3 concerning welder qualification, remains as an open item.

Gary L. Fouts
Construction Manager

GLF/JEF/nw

Attachment: Corrective Action Request No. 19 - Final Report

cc: J. Berra w/a
J. H. Smith w/a
O. Maynard w/a

D-5

KANSAS GAS AND ELECTRIC COMPANY

FINAL REPORT

CORRECTIVE ACTION REQUEST NO. 19

FINAL REPORT

KG&E CORRECTIVE ACTION REQUEST NO. 19

TABLE OF CONTENTS

II. Introduction

I. CAR-19 EXECUTIVE SUMMARY

Because of deficiencies (i.e., undersize, undercut,...) previously found in fillet welds on ASME and Special Scope hangers, DIC performed a random reinspection of structural steel fillet welds in February, 1983 in all "Q" designated buildings in the Powerblock. This reinspection indicated that an unacceptable percentage of structural steel fillet welds were deficient in the Auxiliary, Control and Fuel Buildings. A Corrective Action Report (CAR 1-W-0029) was initiated by DIC to implement reinspection, and nonconformance reports were generated to document and disposition deficiencies noted.

Subsequent to the issuance of CAR 1-W-0029 it was determined, during the course of document reviews in the Building turnover process, that Miscellaneous Structural Steel Weld Records (MSSWR's) could not be located as procedurally required for all structural steel welds in "Q" designated buildings. These missing MSSWR's resulted in DIC issuance of CAR 1-C-0031.

The concerns addressed in CAR's 1-W-0029 and 1-C-0031 as well as other items listed in the "Introduction" section of this report caused KG&E Construction Quality Control to initiate a limited inspection verification program. Through this inspection program additional concerns were raised as a result of the inspection verification results. These results identified instances of missing welds which had no inspection records, two missing welds which had inspection records, and welds with inspection records that did not completely comply with project inspection and documentation criteria. The results of the verifications combined with the missing weld inspection records identified the need for a formalized action plan to fully investigate the concerns and formulate corrective action as necessary. To accomplish this KG&E QA initiated Corrective Action Request 19, describing the concerns and recommending corrective action on October 17, 1984. Based on the corrective actions recommended by CAR-19 and additional actions deemed warranted in support of the investigations, a Management Plan was developed to designate the nature and extent of the investigations.

The Management Plan covered three basic categories of investigation and evaluation. One category was a process of reinspection to identify and evaluate actual hardware conditions in the field. A second category addressed the programmatic aspects of Structural Steel erection through evaluation of both construction and quality program procedures. A third category addressed related considerations such as other AWS D1.1 applications, evaluation of missing welds identified during the reinspections, evaluation of acceptable inspection records completed for welds found to be missing, and review and evaluation of surveillances, audits, and reports pertinent to AWS welding. Although not initially in the scope of KG&E CAR-19, non-welding related quality programs were reviewed for comparable programmatic deficiencies. In accomplishing this KG&E and DIC conducted an extensive program assessment of the Piping, Hanger, Mechanical, Electrical and Civil disciplines to ascertain the adequacy of the construction and quality programs instituted. This program assessment was conducted by KG&E and DIC Management representatives, and concluded that a satisfactory level of confidence exists to assure compliance of these to 10CFR50, the FSAR, ANSI N45.2, and design and procedural requirements.

The intent of the program evaluation was to evaluate the various construction and quality programs/procedures to determine their compliance to the AWS D1.1 Welding Code and FSAR commitments. This evaluation included

relevant aspects of the various related programs from the initiation of purchase orders for procurement of structural steel and welding materials, to final installation and quality acceptance. The procedures for receiving, storage and handling of materials were evaluated, as well as compliance of procedures for training and certification of inspectors to ANSI N45.2.6 and welder qualification to AWS requirements. The procedure reviews included a thorough evaluation from their origination through subsequent revisions, including an analysis to assure current conformance to design document requirements. No findings were noted that were determined to be contributing factors to inadequacies in AWS D1.1 applications, although some procedural inadequacies were discovered and reconciled.

All other safety-related programs utilizing AWS welding were analyzed to ensure that the root cause identified as the reason for previous acceptance of deficient structural steel welds was not inherent, or impactive, to these programs as well. The method of documenting weld inspections, control of this documentation, and accountability to assure all required documentation was retrievable was researched for AWS D1.1 welding applications in raceway supports, electrical equipment, mechanical equipment, fire dampers, safety-related HVAC ductwork and supports, miscellaneous steel and embed fabrication, and pipe whip restraints for assurance that problems similar to those encountered in structural steel did not exist. Previously compiled information including Construction Self Assessment Reports, KG&E QA Reports and Surveillances, DIC QA Reports, DIC Project Monitoring Program Audits, and DIC Corrective Action Reports were reviewed to determine if the results of previous investigations indicated other potential problem areas relevant to AWS D1.1 welding. No findings were noted that could be considered to be contributing factors to inadequacies in AWS D1.1 programmatic applications. An analysis of hardware installations for other project applications of AWS D1.1 welding identified one other area to be investigated for AWS welding problems. This is in the area of electrical equipment installations where the method of permanent installation is by welding the equipment mounting frame to foundation embeds. DIC is addressing this potential problem on Corrective Action Report No. 1-EW-0046.

Reinspection of field welds was conducted utilizing AWS Certified Welding Inspectors who were also certified to the DIC Quality Program requirements of ANSI N45.2.6. Inspections were performed in strict compliance to the Inspection Verification Plan which established inspection criteria and documentation requirements, and was incorporated into an existing DIC Quality Procedure, QCP-VII-200, and approved by DIC, Bechtel, and KG&E.

DIC and Bechtel research substantiated that all welders and welding procedures applicable to AWS D1.1-1975 welding of structural steel installations were qualified in accordance with AWS requirements. Research by DIC and Bechtel resulted in assurance that the programs and procedures for the purchase and control of weld filler materials used in AWS D1.1 applications were in compliance with AWS requirements, and were properly implemented on site.

The retrievability and control of Miscellaneous Structural Steel Weld Records was thoroughly researched, and a determination made that inadequate implementation of DIC Construction procedures was the primary contributing factor relative to retrievability and accountability problems in this area.

An evaluation of the DIC Quality inspection training program demonstrated that this program and related procedures were in compliance to ANSI N45.2.6. Further investigation concluded that Quality inspection training was appropriate and adequate during the structural steel installation time frame.

An evaluation of DIC Quality inspection procedures and criteria applicable to the original structural steel installation/inspection period revealed several procedural inadequacies. A thorough analysis of the omission of each inspection criterion of AWS D1.1 structural steel applications was accomplished, with the conclusion that no adverse impact had resulted from these procedural inadequacies relative to AWS D1.1 welding inspection.

Inspection criteria to be used in the structural steel reinspection activities was procedurally defined and training of all personnel completed prior to reinspection initiation. Sufficient technical justification was established by Bechtel to validate inspection of welds through a predetermined maximum thickness of paint. An analysis of reinspection results determined the root cause of the previous acceptance of deficient structural welds to be due to DIC inspection implementation differences relative to inspection vs. reinspection techniques, and inadequate implementation of applicable DIC procedures during original inspection efforts. These inspection implementation differences are discussed elsewhere in this report, referencing the Reedy, Herbert, Gibbons documentary included in the Appendix, section VI.G.

Two joints (each missing one weld) of the two thousand six hundred sixty-nine (2,669) reinspected (representing more than 11,000 welds) had documentation reflecting the installation of these welds when in reality they were not installed.

Research revealed no evidence to indicate that either was a case of deliberate falsification. Additional investigations did indicate that human error was the cause of incorrectly documenting these nonexistent installations.

Reinspection found that approximately two (2) percent of the inspected welds were not installed as required by design documents. These errors were primarily due to craft/engineering confusion relative to installation drawing details and requirements. Failure to install these welds and materials, although in some cases determined to be significant in impact to stress allowable calculations, would not have resulted in material or structural failure if left uncorrected.

The total number of joints subjected to the reinspection program was two thousand six hundred sixty-nine (2,669). These joints were selected by Bechtel as structurally significant (See Appendix IV. D) with the distribution being: 693 in the Auxiliary Building, 1300 in the Reactor Building, 265 in the Control Building, 98 in the Diesel Generator Building, 36 in the ESWS Pumphouse, and 277 in the Fuel Building. The reinspection documented an as found condition regardless of the weld acceptability. All results were forwarded to Bechtel in the form of inspection data sheets for evaluation. This evaluation was based upon Bechtel's review of reinspection data accumulated and nonconformance reports (NCR's) generated. The evaluation for structural adequacy was made based upon this cumulative data that

reflected the as-built condition of the structurally significant joints prior to any rework or repairs. No deficiencies were identified, which if left uncorrected, would have adversely affected the safe operation of the plant. The results of this evaluation provides assurance that Safety Related AWS D1.1 structural steel welding complies with all Quality criteria as specified in the related design documents, and is within the tolerances of acceptable deviation as determined by the Architect/Engineer.

Joints that in the as-built condition were determined to exceed the design allowable stresses were all reworked. In addition joints in which the design allowable stresses were not exceeded in the as-built condition but were missing welds, were also reworked.

III. Objective

II. INTRODUCTION TO CAR-19

A series of activities as identified below pertaining to weld inspection at Wolf Creek ultimately led to the issuance of KG&E CAR-19 addressing AWS D1.1 Structural Steel welding concerns.

In September, 1980, DIC initiated Corrective Action Report 1-M-0007 due to improper inspection technique application, which required 100% reinspection of all socket welds on small bore piping installed prior to June, 1980. Subsequent to this reinspection effort, DIC generated Corrective Action Report 1-W-0019 on August 17, 1982, due to a significant quantity of fillet weld discrepancies being identified, which required 100% reinspection of all fillet welds on ASME and Special Scope piping hangers made prior to April 1, 1981. DIC performed a random reinspection of structural steel fillet welds in February, 1983, in all "Q" designated buildings in the Powerblock to determine whether structural steel welds may have been deficient as a result of the same root cause relative to CAR 1-W-0019. It was determined from these reinspection results that an unacceptable percentage of structural steel welds were deficient in the Auxiliary, Control, and Fuel Buildings. Thus CAR 1-W-0029 was initiated by DIC to implement reinspections, and nonconformance reports were generated to document and disposition the deficiencies noted.

As a result of documentation review prior to building turnovers DIC initiated CAR 1-C-0031 in August, 1983, to document that Miscellaneous Structural Steel Weld Records (MSSWR) could not be located as required by procedures for all structural steel welds in "Q" designated buildings. Nonconformance Reports were generated to document missing MSSWR's in each of these buildings.

KG&E and DIC site management held meetings in May, 1984, to further discuss retrievability of MSSWR's and the problems that had been identified to date. Concerns were expressed through KG&E Quality First to KG&E Construction Management regarding the acceptability of "Use-As-Is" dispositions given to NCR's written as part of CAR 1-C-0031's corrective action in July, 1984, and KG&E Management requested DIC to generate a revision to CAR 1-C-0031 in letter KWCLC 84-814 of July 30, 1984, in response to some concerns noted. Revision 6 to CAR 1-C-0031 was generated by DIC in response to KG&E's concerns.

KG&E Quality Assurance performed a detailed review of DIC CAR 1-W-0029 and 1-C-0031 in August, 1984, identifying numerous concerns to KG&E Construction. In response KG&E Construction began a documentation reconciliation task on August 13, 1984, to determine which safety-related structural steel welds did not have supportive MSSWR's.

On August 17, 1984, KG&E Construction Quality Control initiated an Inspection Verification Plan to provide an accurate assessment of the "as-built" conditions of safety-related structural steel welds without MSSWR's. DIC and KG&E Management discussed revision of this inspection program on August 30, 1984.

KG&E, DIC and Bechtel made a joint presentation to an NRC Task Force on September 10, 1984, which identified the belief at that time that the problem was one of document retrieval, and not a hardware problem. The NRC Task

Force discussed the problems with KG&E again on September 13, 1984, during which KG&E Management agreed to perform a sample hardware inspection of six (6) randomly selected structurally significant joints in the Reactor, Fuel, Control, Auxiliary, Essential Service Water, and Diesel Generator Buildings. This inspection resulted in the discovery of missing welds and missing structural members, which were reported to the NRC by KG&E under 10CFR50.55(e) on September 18, 1984. Subsequent meetings were held with NRC Representatives on September 25, 1984, and September 28, 1984, to status inspection efforts and provide information updates. An AWS Welding meeting was held with the NRC on October 19, 1984, on site relative to structural steel welding, with a follow-up meeting on October 22, 1984, in which KG&E Management discussed AWS structural steel welding concerns with the NRC.

On October 17, 1984, KG&E Quality Assurance issued CAR-19 to KG&E Construction to obtain corrective actions associated with AWS D1.1 structural steel welding. The findings addressed in CAR-19 included missing MSSWR's for safety-related structural steel welds; deficiencies being identified in previously accepted structural steel welds, missing structural welds or missing structural material; and documentation that a weld was inspected and accepted, but no weld was installed.

KG&E and DIC Management representatives subsequently developed a logic chart to organize resolutions relative to CAR-19's concerns, a Management Plan to implement corrective actions, and published a CAR-19 Corrective Action Schedule to provide a means for tracking corrective action progress.

In addition, KG&E Management contracted Lehigh University to review the problems associated with the structural welds in the structures at Wolf Creek Generating Station. The results of their review is included in Appendix VI.F of this report.

IV. Findings / Corrective Actions

III. CAR-19 OBJECTIVES

To document a consolidated project plan for the identification, evaluation and resolution of problems associated with Safety-Related AWS D1.1 Welding.

To provide assurance, based on objective evidence, that AWS D1.1 Welding of Safety-Related Structural Steel complies with all Quality Criteria as specified in the related design documents and is within the tolerances of acceptable deviations as determined by the Architect/Engineer.

To provide assurance that the documentation which supports the inspection of safety related structural steel welds is:

- Available - Complete - Reflects appropriate information - Traceable to the item or activity

To evaluate supporting elements of the DIC Quality Assurance Program to ensure that those elements were adequately and effectively implemented to demonstrate that the DIC welding of Safety Related Structural Steel, HVAC Supports, Electrical Supports, Pipe Whip Restraints and any other AWS D1.1 safety related welding activities were in compliance with the FSAR (i.e. AWS D1.1 - 1975) and the Design and Construction QA Program Manual, Section 17.1.B.

To evaluate DIC Construction/Quality programs in areas other than AWS D1.1 welding to determine the potential of programmatic deficiencies.

VI. Conclusions

IV. CAR-19, DISCUSSION OF FINDINGS AND CORRECTIVE ACTIONS

The KG&E Management Plan for the resolution of CAR-19 was developed by DIC and KG&E Management personnel to document a consolidated project plan for the identification, evaluation and resolution of problems associated with safety-related AWS D1.1 welding. The intent of this plan is to verify that both the hardware and programmatic aspects of all safety-related activities utilizing AWS D1.1 welding are in compliance with the FSAR and the Design and Construction Program Manual.

The logic chart for the resolution of CAR-19 was developed to illustrate the approach to be used in providing the verifications needed for implementation of satisfactory corrective action. The Corrective Actions as described in the KG&E Management Plan are identified in the flow of activities as designated on the logic chart. The logic chart is included as an attachment to this report in the Appendix, section VI.B.

Five (5) findings were included in CAR-19. The detailed activities and investigative actions required to implement each Corrective Action are delineated in the KG&E Management Plan. The process of corrective action for each finding generated by CAR-19 entails multiple activities. Each finding and it's respective corrective actions are discussed in detail in the following. Supportive and/or investigatory documentation for each finding as discussed in this section is delineated in the Appendix, section VI.I.

Finding #1 of KG&E CAR-19 stated, "The results of the Document Reconciliation Task Force indicated that 1509 of 6816 MSSWR's for Safety Related Structural Steel Welds are missing".

Six (6) corrective actions were prescribed as appropriate for the resolution of this finding and related concerns. These corrective actions were focused toward programmatic evaluations, procedural criteria evaluations, and a reinspection program utilizing certified inspectors. Following is each of the six (6) corrective actions for Finding #1 with an analysis of the investigative actions taken and a summarization of each corrective action's results in accordance with the KG&E Management Plan's directions.

Corrective Action 1a)

"Based on DIC program requirements assure that all of the welders and welding procedures were qualified to AWS D1.1."

This activity was subdivided into three elements of research. These elements included development of an AWS D1.1-75 Attribute Checklist analyzing individual attributes relative to the welding process. The checklist lists all AWS requirements and compares those requirements with DIC Construction Welding Procedure requirements, in each case citing explicitly how the corresponding DIC procedure addresses separate AWS criteria. This checklist is conclusive data that provides evidence of all AWS D1.1-75 criteria being adequately addressed by DIC Construction Welding Procedure, CWP-506, "Welding of Carbon Steel". An attachment to this checklist documents the procedure review cycle for CWP-506, showing that each revision from 09/14/78 through the current revision dated 05/21/81 was consistently reviewed and approved by the individuals designated that responsibility.

A second element of this activity was the statistical sampling of AWS Welder qualifications in accordance with MIL-STD-105D. The total quantity of retrievable Miscellaneous Structural Steel Weld Records (MSSWR) applicable to AWS welding was initially identified to define the total population to be used in selecting a sample size. A "Single Sampling Plan for Normal Inspection" was utilized, randomly selecting MSSWR's for review of welders' qualifications. This sample included a variety of welders, a variety of AWS welding procedures, a representative sample of welders during the 1978-1984 time frame, and sampling from welders working in all Powerblock buildings. Identification of welders was taken from the MSSWR's and welder qualification records (W-105). These were then reviewed to assure that each welder was qualified to the weld procedure entered on the MSSWR at the time of weld installation.

A sample size of two hundred (200) was selected as being most representative, given the previous considerations. Based upon Table II-A of MIL-STD-105D, DIC desired a ninety-six percent (96%) Acceptable Quality Level (AQL). This AQL accepts fourteen (14) rejectable units from a sample of two hundred (200), and rejects the entire population when the fifteenth (15) rejection of the sample is observed.

Research performed by DIC Welding Engineering revealed thirteen (13) incorrect entries on MSSWR's, with only four (4) of these considered "rejectable" due to the nature of the discrepancies. All thirteen discrepancies were due to incorrect entries being made on the MSSWR, with nine (9) of the thirteen having the weld technique entered as N-1-1-A-6 rather than N-1-1-A-6A. These two weld techniques were evaluated by DIC Welding Engineering by comparison of attributes and essential variables, and it was determined that no adverse impact existed. The four (4) entries considered rejectable were due to welders incorrectly entering a welding procedure number for which they were not qualified on an MSSWR.

A Nonconformance Report, 1SN 20984CW, was generated to document all thirteen (13) discrepancies noted, and was recommended for a "Use-As-Is" disposition by DIC Welding Engineering. This Nonconformance Report has been reviewed and disposition concurrence received from Bechtel, closing the NCR.

The third element of this activity was a review by Bechtel of DIC Welder Qualification Procedure and the DIC Welding Procedure Specifications to assure compliance to AWS D1.1-75.

Bechtel reviewed DIC Construction Welding Procedure, CWP-502, "Qualification of Welders", all revisions up to and including Revision 19. This review indicated full compliance with the AWS D1.1-75 for revisions 1 through 18. However, Revision 19 does not strictly comply with AWS D1.1-75 in the following areas.

1. CWP-502 Rev. 19, Paragraph 3.2 allows the DIC Project Welding Engineer to specify joint details not listed in Appendix II.

2. Joint designs for figures 5.2, 5.3 and 5.4 of Appendix II do not comply with AWS D1.1 joint designs for welder performance qualifications.

3. CWP-502 Rev. 19 does not specify the test positions for AWS D1.1 welder performance qualifications.

4. CWP-502 Rev. 19 does not specify the radiographic or mechanical testing requirements for AWS D1.1 welder performance qualifications.

Nonconformance Report 1SN21472MW has been generated to document these deviations and is awaiting disposition.

Bechtel randomly selected Welding Procedure Specifications (WPS) from MSSWR's applicable to structural welds in the 1978-1984 time frame. The review of the WPS' indicated full compliance with AWS D1.1-75 with one exception, undercut criteria, which was allowed by the Wolf Creek Final Safety Analysis Report, Revision 0, October, 1979. Three of the WPS' permitted undercut to be acceptable provided the depth did not exceed 1/32 inch, which is a relaxation of AWS D1.1-1975 undercut criteria.

The exception to the AWS D1.1-75 undercut criteria exists in Revision 0 of the Wolf Creek Final Safety Analysis Report, Section 3.8.3.6.3.3, dated October, 1979, and was also added by a revision to Bechtel Civil Specification C-122 and C-132, the design specifications applicable to the structural steel connections in the CAR-19 reinspection program. Based upon these facts the Bechtel Material and Quality Services Department (M&QS) determined that the WPS' used during erection/installation of structural steel members did comply with AWS D1.1-75. Paragraph 1.1.2 of AWS D1.1 defines the "Engineer" as the duly designated authority who acts for and in behalf of the Owner, and the exception to AWS undercut criteria was documented in the FSAR to comply with this paragraph.

It is Bechtel M&QS' conclusion that the review of the DIC WPS' and supportive documentation demonstrates that the welding procedures used by DIC during structural steel installation did comply with the AWS D1.1-1975 Structural Welding Code Edition when used concurrently with supportive design documents and the revisions to the FSAR.

In conclusion, the three elements of analysis included in the research performed on Activity 1a offer assurance that all DIC welding procedures were qualified in accordance with AWS D1.1-75 requirements.

Corrective Action 1b)

"Review the DIC Program for the purchase and control of filler material to ensure that only acceptable filler material was used in safety related welds. Assure that both safety related and non-safety related filler materials were properly controlled to preclude improper applications."

This activity was divided into two elements of research, those being; the DIC review of procedures for the purchase and control of filler and base materials, and Bechtel's review for the purchase and control of filler materials.

DIC Civil Engineering performed an in-depth review of the DIC Program for purchase of structural and miscellaneous steel and found the DIC Program to be in accordance with the requirements of Bechtel Specifications 10466-C-121 (Purchase of Structural Steel), and 10466-C-131 (Purchase of Miscellaneous Steel). These specifications and their respective DIC

procedures were found to adequately address applicable requirements for assuring correct material specification, grade, marking, traceability and other Quality Assurance requirements. In addition these specifications and procedures provide for buyer verification of any or all of the established specification requirements.

The DIC procedures applicable to procurement activities are as follows:

AP-VII-01 Development and Approval of Bidders List

AP-VII-02 Requisitioning of Daniel Procured Materials, Equipment and Service

AP-VII-03 Bid Requests

AP-VII-04 Receiving and Processing Bid Proposals

AP-VII-05 Issuing Purchase Orders and Change Orders .

During a self-initiated KG&E review of safety-related procurement records in January, 1984, several cases were identified in which DIC purchase orders did not comply with all A/E specification requirements. As a result of these findings, DIC initiated a Corrective Action Report (CAR) 1-G-0036, to perform a complete review of all purchase orders to verify compliance to specification requirements. This investigation encompassed the review of five hundred thirty-six (536) safety-related purchase orders to assure hardware and documentation to be in compliance with specifications. Any discrepancies identified during this review were documented on Nonconformance Reports for resolution by DIC, KG&E and the A/E. Those nonconformances identified relative to structural steel were determined to be all documentation related with no hardware impact. All corrective actions were completed, all Nonconformance Reports resolved and closed, and Corrective Action Report 1-G-0036 was closed on 05/24/84.

DIC Civil Engineering accomplished a detailed study of the control and issuance of base materials applicable to structural steel installations. This review was based upon a thorough analysis of material control requirements for this application in the following DIC procedures:

AP-VIII-02	Material and Equipment Receiving
AP-VIII-03	Identification, Marking and Inspection
AP-VIII-04	Receiving Discrepancies
AP-VIII-05	Material Storage and Control
AP-VIII-07	Material Issue
QCP-IV-111	Erection of Structural Steel and Pipe Whip Restraints
WP-IV-111	Structural Steel and Pipe Whip Restraint Erection

This review investigated such areas as the use of Structural Steel Fabrication Requests, requisitioning and issuance of the material to craft for erection, maintenance of traceability through heat number transfer for material that is divided, and documentation of this heat number on permanent plant records. DIC Civil Engineering's research concluded that acceptable control and utilization of base materials is maintained through DIC programs and procedures.

Bechtel's Materials and Quality Services Group furnished information based on their research to ensure that the DIC Procurement program had in fact resulted in the proper filler material being purchased and subsequently utilized in structural steel installation activities. This review was documented in attachments to a letter from B. W. Bain of Bechtel Materials and Quality Services to Gary Stanley on 10/16/84. This analysis entailed the following activities: (1) A review of purchase orders/certified material test reports for conformance to AWS D1.1 requirements to verify that all heat numbers for welding filler material are acceptable for structural steel installations, (2) A comparison of all E7018 weld rod heat numbers issued to the DIC Rod Room during the time frame of structural steel installation/ erection to verify that correct filler material was used, (3) A review of the DIC weld filler material issuance control procedure/program to ascertain that welders were only issued filler material for the welding procedures to which they were qualified, and applicable to the work being performed.

The results of these investigations were positive, with no discrepancies being found. This effort further substantiates that correct weld filler material was utilized in structural steel erection.
DIC Welding Engineering reviewed the procedural details relative to issue of weld filler materials, identifying the control of filler materials explicitly for field issue as well as test shop issue. This review indicates that control is adequate, with supportive documentation, thereby assuring proper filler material issue. DIC Welding Engineering also noted that Quality Inspection performed, as required by DIC Construction Procedure QCP-VII-200, Inspection of Welding Process, random surveillances of welding process attributes. Among the attributes covered by this surveillance are that filler material control is implemented according to applicable welding procedures, and that the welder is currently qualified to the weld technique to be employed.

DIC Welding Engineering performed a review of the specification and procedural requirements relative to the purchase, issue and control of filler materials. It was determined that only E7018 electrodes have been used in AWS D1.1 applications, as required by all site AWS D1.1 welding techniques. All E7018 electrodes purchased by DIC are required to conform to AWS A5.1 (Specification for Mild Steel Covered Arc Welding Electrodes). To substantiate this fact DIC Welding Engineering performed a review of all purchase orders that involved E7018 electrodes. All these purchase orders were proven to have adequate documentation to justify that the electrodes conform to AWS specification A5.1.

Based upon procedural requirements, weld filler material issue controls, and random Quality Inspection surveillances, assurance has been provided that only acceptable filler materials have been utilized and that control has been as required for all AWS D1.1 applications.

Corrective Action 1c)

"Evaluate the adequacy of the DIC inspection criteria and procedures to determine if these elements could have adversely impacted the inspection results. Document and provide this evaluation to KG&E QA for review prior to inspection implementation. Any changes in inspection criteria and procedures shall be provided to KG&E QA for review prior to implementation."

This activity was divided into two elements. The first element was a review of DIC weld inspection criteria contained in QCP-VII-200. The inspection criteria was reviewed to determine compliance with AWS D1.1-75 and Bechtel Specifications 10466-C-132. The second element was to evaluate the results and determine if these elements could have adversely impacted the inspection results.

An AWS D1.1-75 and Bechtel Specification attribute checklist was developed by DIC Quality Engineering. Inspection criteria defined in QCP-VII-200, Appendix II was reviewed in accordance with the checklist. The review indicated that currently QCP-VII-200, Revision 20, meets or exceeds the inspection criteria as delineated in AWS D1.1-75 and the Bechtel specifications. The review of the QCP-VII-200 procedural history revealed most criteria was presented verbatim from AWS or the Bechtel specification. Other criteria, although not verbatim, was interpreted as being in compliance with AWS and the Bechtel specification. The review did indicate four (4) areas of inadequacy. The following is a list of these areas and the time frame affected:

1) Oversized Welds - 4/18/78 - 5/2/84 (Revisions 2 - 19)

   Inspection criteria for oversized welds was not delineated in QCP-VII-200 during this time frame.

2) Convexity - 3/30/77 - 1/18/83 (Revisions 0 - 15)

   During the time frame 3/30/77 through 12/15/81, QCP-VII-200 required the Quality Inspector to utilize the Weld Technique Sheet for compliance. During the time frame 12/15/81 through 1/18/83, QCP-VII-200 required: "Fillet welds may be slightly convex/concave." During the entire period, the following criteria was not delineated in QCP-VII-200 or the Weld Technique Sheets. "Except at outside corner joints, the convexity shall not exceed the value of 0.1S plus (+) 0.03 inches where S is the actual size of the fillet weld in inches."

3) Cracks - 12/15/81 - 5/26/82 (Revisions 9 - 11)

   Inspection criteria for cracks was not delineated in QCP-VII-200 during this time frame.

4) Lack of Fusion - 12/15/81 - 09/22/83 (Revisions 9-16)

   Inspection criteria for lack of fusion was not delineated in QCP-VII-200 during this time frame.

An evaluation was performed to determine if these procedural inadequacies could have adversely impacted the inspection results. The following is the results of the evaluation:

1) Oversized welds: Bechtel Specifications 10466-C-122 and 10466-C-132 were revised 4/18/78. This revision required oversized welds not to exceed 100% or 3/8" greater than specified, whichever is less. During a civil retrofit review of Bechtel specifications and DIC procedures, this procedural inadequacy was identified. Nonconformance Report ISN 16988CW documented this deficiency and resulted in a recommended disposition of "Use-As-Is". Based on Bechtel's concurrence with this disposition, the omission of this item is considered to have no adverse impact to inspection results.

2) Convexity - Bechtel specifications required welds to meet convexity limits as delineated by AWS D1.1 until 12/08/82. After this date, Bechtel specifications altered the convexity requirement by stating that fillet welds need not satisfy convexity limits of AWS D.1.1. DIC Procedures have delineated criteria as "welds may be slightly concave/convex". Based on procedural control and the relaxed specification criteria, this item is considered to have no adverse impact to inspection results.

3 & 4) Cracks and Lack of Fusion - Inspection criteria for cracks and lack of fusion were inadvertently omitted during general revision from DIC inspection procedures on 12/15/81. The criteria was reinstated in site procedures on 5/26/82 for cracks and 9/22/83 for lack of fusion. The absence of this criteria occurred after the completion of main frame structural steel erection (5/81). However, to establish that there was no impact in other AWS D1.1 applications due to the omission of these items, twenty-six (26) DIC welding inspectors were interviewed. These interviews were used to determine the following:

   1) Procedures used for training and inspection.

   2) Inspection attributes addressed during training.

   3) Inspectors' awareness that cracks/lack of fusion criteria was omitted from procedures for a period of time.

   4) Did inspectors inspect/reject welds for cracks and lack of fusion?

The inspectors interviewed had inspected structural steel welds as well as HVAC and electrical support welds during the time frame in which the procedural deficiencies occurred. In all cases inspectors indicated that they had inspected/rejected welds for cracks and lack of fusion. Inspectors were aware of the procedural deficiencies, however, they continued to inspect/reject for cracks and lack of fusion. This is further substantiated based on re-inspection results conducted on structural steel. The rejection rate for cracks and lack of fusion is minimal when compared to the total number of welds inspected.

In conclusion, the review of weld inspection criteria utilized during the history of this project did indicate areas of procedural deficiencies. However, based on the above information, it has been determined that these inadequacies did not result in generic inadequacies in AWS D1.1 welding.

Corrective Action 1d)

"Obtain a documented evaluation to determine the validity of inspections performed with the presence of paint on the weld."

This activity was divided into three elements: obtain information from other utility/AE's that have developed a validation plan, with a subsequent review by DIC Welding Engineering and Bechtel and the addition of site specific requirements and justification, and Bechtel's submittal of a 'position letter' to KG&E for approval.

DIC Management obtained information from Carolina Power & Light Co., and Ebasco Services Incorporated relative to the validity of inspections performed with paint on the welds. This information was utilized by Bechtel in conjunction with their additional research to establish an A/E's position to KG&E. In summary, this position, more explicitly defined in letter BLKES-1348 from C. M. Herbst to G. L. Fouts, is: "With the exception of a number of attributes, fillet welds which have been coated with up to four (4) mils of primer and in some cases, up to an additional ten (10) mils of topcoat can be visually inspected to the AWS D1.1 acceptance criteria. Those attributes which cannot be fully evaluated are of little or no concern on the structural steel at WCGS."

This letter was submitted to KG&E, and subsequently KG&E discussed the validity of inspections performed with paint on welds with NRC representatives. KG&E Nuclear Plant Engineering reviewed letter BLKES-1348, concurring with the position stated by Bechtel in their letter KNPLKWC 84-065 of November 13, 1984.

Corrective Action 1e)

"Utilize personnel certified to ANSI N45.2.6-1978 for the inspection of safety related structural steel welds. Inspections shall be performed in accordance with the DIC Quality Program and training shall be performed and documented to assure that inspectors are cognizant of the DIC Quality program requirements."

This activity was divided into three elements. The first element required incorporation of the CAR-19 Inspection Verification Plan into DIC Construction Procedure QCP-VII-200, "Inspection of Welding Process". The second element required inspection personnel to be certified in accordance with the DIC certification program and ANSI N45.2.6-1978. The third element defined that the inspectors' site specific qualifications would be limited to the reinspection of structural steel welds in accordance with QCP-VII-200.

The Inspection Verification Plan was developed through the combined efforts of DIC, KG&E, and BPC personnel. Revision 0 was reviewed and approved by KG&E Quality Assurance on 10/19/84. Although Revision 0 to the Inspection Verification Plan in QCP-VII-200 was not issued until 10/19/84, some inspections were performed prior to this date by personnel qualified to accomplish these inspections. The same inspection criteria was utilized in these efforts, and all personnel performing these inspection functions were evaluated to ascertain their qualifications to be concurrent with the later certification requirements for KG&E CAR-19. Further discussion of these personnel is included in this discussion of Corrective Action 1e) on the

following pages. A meeting was held with the Quality Inspection personnel on 10/20/84 to discuss the impact of the Inspection Verification Plan on their activities and to ensure their understanding of the plan. As a result of this meeting, a new revision, Revision 1, was issued to incorporate inspector feedback and KG&E Quality Assurance comments. Revision 1 of the Inspection Verification Plan was then incorporated into DIC Quality Procedure QCP-VII-200 with Procedure Change Notice 014. On 11/2/84 KG&E Quality Assurance, DIC, and BPC personnel held a meeting to address KG&E Quality Assurance concerns on gouges. Subsequently Revision 1 to PCN-014 was issued to incorporate these concerns into the Inspection Verification Plan.

It was decided that all personnel performing inspection verifications under the CAR-19 Inspection Verification Plan should not only be AWS Certified Welding Inspectors, but also be site certified under ANSI N45.2.6-1978.

ANSI N45.2.6-1978, Section 3.5.2 makes the following recommendations for education and experience when certifying Level II personnel:

1. One year of satisfactory performance as a Level I in the corresponding inspection, examination or test category or class, or

2. High School graduation plus three years of related experience in equivalent inspection, examination, or testing activities, or

3. Completion of college level work leading to an Associate Degree in a related discipline plus one year related experience in equivalent inspection, examination, or testing activities, or

4. Four year college graduation plus six months of related experience in equivalent inspection, examination, or testing activities.

When considering the certifiability of candidates, DIC management ensured that all personnel met the recommendations of section 3.5.2, ANSI N45.2.6-1978.

A training program for inspectors was established on 10/17/84. The program consisted of self study material covering the following subjects:

1. Quality Orientation

2. DIC Administrative Procedure AP-VI-02, "Nonconformance Control and Reporting"

3. The KG&E CAR-19 Inspection Verification Plan (PCN-014 to QCP-VII-200)

Additionally, a meeting was held on 10/20/84 with the inspectors to explain the contents of the Inspection Verification Plan, and to answer any questions they might have about the program. In order to ensure the capability of each candidate, a Field Practical Examination was also administered.

Certification files were compiled on each inspection candidate and are available for review in DIC Quality Training. Each file contains a copy of the inspectors resume', a signed copy of the Education/Experience evaluation form, a copy of the inspector's eye examination, the document of certification, the field practical examination, and the letter of recommendation. Additionally there is a training summary documenting the completion of required training and the training conducted on DIC Quality Procedure QCP-VII-200, PCN-14, Revision 0 and Revision 1.

Each certification file was reviewed by the DIC Quality Training Supervisor to ensure all candidates met the recommendations of ANSI N45.2.6-1978. Each file was again reviewed by the DIC Project Quality Manager (DIC's Certifying Authority) prior to the signing of the Document of Certification. The completed certification files were audited by KG&E Quality Assurance with no findings.

Eleven (11) personnel (Inspectors A through K) were involved in Structural Steel Inspection Verification prior to the issuance of KG&E CAR-19. These personnel were attached to DIC Engineering and were qualified, but not certified prior to the issuance of KG&E CAR-19.

In addition to the eleven (11) personnel above, an additional eleven (11) personnel (Inspectors L through V) were involved in Structural Steel Inspection Verification after the issuance of KG&E CAR-19. The certification status is given below:

	INSPECTOR	STATUS
(1)	A	Certified
(2)	B	Certified
(3)	C	Certified
(4)	D	Certified
(5)	E	Certified
(6)	F	Qualified*
(7)	G	Qualified*
(8)	H	Certified
(9)	I	Certified
(10)	J	Certified
(11)	K	Certified
(12)	L	Certified
(13)	M	Certified
(14)	N	Certified
(15)	O	Certified
(16)	P	Certified
(17)	Q	Certified
(18)	R	Certified
(19)	S	Certified
(20)	T	Not Qualified**
(21)	U	Certified
(22)	V	Certified

NOTES:

* Personnel who were involved in Structural Steel Inspection Verification prior to the issuance of KG&E CAR-19, but were not involved in Inspection Verifications after the issuance of KG&E CAR-19 were investigated and qualified, but were not certified as they had already left the site or were assigned to other non-inspection related activities.

** Several attempts were made to verify Inspector T's experience after he left site. DIC Quality Training was unable to verify enough experience to qualify Inspector T's to ANSI N45.2.6-1978. All of Inspector T's work was reinspected by certified personnel.

Corrective Action 1f)

"Perform a 100% reinspection of all structurally significant safety related structural steel welds. The identification of "structurally significant" welds shall be made by the Architect - Engineer."

"Structurally significant" joints were defined by Bechtel as all field welded joints which support or potentially support safety related equipment and building components for the purpose of this Corrective Action activity. This basically included all field welds on structural and miscellaneous steel with the exception of handrail, toeplates, grating, checkered plate, stairs, ladders and monorail supports. These are non-Q items which typically see significant service loads during the construction process. Some are designated as II/I, however, II/I seismic loads are considered to be less severe than service loads. Monorails have been load tested as part of startup procedures, and were therefore not included in the scope of structurally significant items requiring reinspection. The joints were selected by Bechtel based on a review of erection drawings prepared by the structural and miscellaneous steel fabricators and a review of Field Change Request (FCR's), Nonconformance Reports (NCR's), Construction Variance Requests (CVR's) and Structural Steel Fabrication Requests determined applicable.

The DIC Nonconformance program, as defined in DIC Construction Procedure AP-VI-02, "Nonconformance Control and Reporting", was utilized to obtain and document a suitability for service evaluation of welds that were inaccessible due to physical location or embedment in concrete. All deficiencies identified during reinspection activities performed in accordance with Procedure Change Notice - 014 to DIC Construction Procedure QCP-VII-200 were identified on nonconformance reports for further dispositioning and resolution.

Bechtel performed a case by case evaluation of each structurally significant joint inspected according to the data furnished on Inspection Data Sheets and nonconformance reports. Their evaluation provided a determination of whether each structurally significant joint's as-built condition met design allowables, whether the as-built condition was a significant deficiency in accordance with 10 CFR 50.55(e), and whether any rework or repair to each joint was required.

The following is a statistical summary of the evaluation completed by Bechtel on all structurally significant joints:

TOTAL AWS WELDING

INSPECTIONS AND ENGINEERING EVALUATIONS

BUILDING	TOTAL JOINTS	JOINTS INSPECTED	JOINTS EVALUATED	JOINTS REQUIRING REWORK (1)	ADDITIONAL JOINTS TO BE REWORKED (2)	SIGNIFICANTLY DEFICIENT JOINTS (10CFR50.55(e))
AUXILIARY	693	693	693	7	42	0
REACTOR	1300	1300	1300	69	15	0
CONTROL	265	265	265	3	18	0
DIESEL GENERATOR	98	98	98	2	2	0
FUEL	277	277	277	0	6	0
ESWS PUMPHOUSE	36	36	36	0	0	0
TOTAL	2669	2669	2669	81	83	0

(1) DESIGN ALLOWABLE STRESSES ARE EXCEEDED IN THE AS-BUILT CONDITION

(2) DESIGN ALLOWABLE STRESSES ARE NOT EXCEEDED IN THE AS-BUILT CONDITION. THESE JOINTS ARE BEING REWORKED PER KG&E MANAGEMENT DIRECTION TO INSTALL MISSING AND UNDERLENGTH WELDS.

Finding #2 of KG&E CAR-19 stated, "An Inspection Verification effort of safety related structural steel welding, undertaken by AWS certified weld inspectors identified several areas of deficiencies. These deficiencies are categorized as: undersized welds, weld defects, incorrect configuration, weld underrun, and weld undercut."

One (1) corrective action was determined to be appropriate for resolution of this finding, although this primary corrective action was subdivided into seven (7) research/data accumulation activities.

Corrective Action 2a)

"Determine and document the "root cause" of the previous acceptance of deficient structural welds. Analyze the HVAC Support, Electrical Support, Pipe-Whip Restraint and any other safety-related program utilizing AWS D1.1 Welding to ensure that the same "root causes" inherent in the structural steel welding program were not generic to other programs."

This summary reviews activities 2a-1 through 2a-7 of CAR-19 to determine the root cause of the previous acceptance of deficient structural welds and analyzes those root causes to determine if they were inherent to other safety-related programs utilizing AWS D1.1 welding.

A review of DIC Quality procedures was performed by Quality Engineering to determine if any historical procedural inadequacies could have been a contributor to "root cause". Although some historical deficiencies in inspection criteria were found to have existed, research demonstrated that some of the procedural inadequacies occurred after the vast majority of structural steel erection activities had been completed. Interviews with a sample of Quality Inspectors revealed that inspectors were cognizant of the omission of two other criterion (lack of fusion and cracks) during an applicable time frame, but inspected for these deficiencies in spite of their omission. Based upon this cumulative research procedural weld inspection inadequacies are not considered to be contributors to "root cause" of previous acceptance of deficient structural welds.

DIC Inspection training and certification procedure AP-VI-01 was used to train and certify Quality inspection personnel during the structural steel erection time frame. This procedure was analyzed to verify compliance to ANSI N45.2.6-1978, and was found to be in accordance with ANSI requirements. An evaluation of ANSI N45.2.6 requirements revealed that DIC procedure AP-VI-01 was in full compliance to ANSI requirements for the structural steel erection time frame and through all subsequent revisions to date.

The "root cause" of the previous acceptance of deficient structural welds has been determined to be due to inspection implementation and inadequate implementation of related procedures. Each of these contributing factors has several facets that are considered to be partial reasons for "root cause".

Differences in inspection techniques and consideration of inspection attributes for the original inspection time frame vs. the CAR-19 reinspection time frame are definite root cause contributors. The differences indicated are common to the nuclear construction industry and have been recognized as prevalent at many projects. A white paper documentary prepared by recognized nuclear construction consultants Reedy, Herbert, Gibbons and Associates, Inc. dated August 11, 1983, clearly defines the subject differences during their in-depth analysis of weld inspection on nuclear sites. (See Appendix IV.G)

The differences cited, inspection technique and inspection attributes, are addressed in section I of this white paper, "Continuous Measurement of Fillet Welds". The paper states that until about 1980 accepted inspection practice did not entail 100% physical measurement of each inch of welding, but rather depended upon individual inspector's evaluation of the weld's acceptability. Around 1980 QA/QC Inspectors began using fillet weld gauges to measure each inch of fillet weld to verify that the specified minimum weld size was met for the continuous length of weld. This physical measurement gradually replaced the previous accepted practice of visual judgement. The paper concludes that there has been a progression of the practice of physically measuring each inch of weld to a serious extreme.

The documentary cites that there is no requirement either in the ASME Section III Code or AWS D1.1 Standard to continuously measure the full length of fillet welds. Both ASME and AWS permit deviations from minimum size fillets as documented in ASME NB/NC/ND - 4427 and paragraphs 8.15.1.7 and 9.25.1.7 of AWS D1.1. The paper further contends that inspections can and should be made on a random basis to determine nominal sizes with no detriment to safety. Additional sections of this documentary address "Undercut Provisions of AWS D1.1" and "Encroachment on Minimum Thickness" with similar conclusions.

DIC research has shown that the inspection technique implemented during erection/inspection of structural steel at Wolf Creek was in accordance with common industry practice as stated in the previously referenced documentary. Inspectors were of the understanding that visual judgement was acceptable as an inspection technique in checking for nominal weld size, and that visual evaluation rather than 100% physical measurement of fillet welds was acceptable for assuring that welds met visual inspection attributes.

Given these considerations, one should expect a reinspection program using current applicable techniques to find deficiencies in welds previously accepted. The reinspection technique is one of 100% physical measurement of all attributes applicable rather than the visual judgement initially employed as acceptable during the structural steel erection time frame.

With the previous considerations in mind, an examination of the weld deficiencies identified during reinspection and their relative significance to the overall integrity of the initial inspection effort is in order.

The scope of the CAR-19 reinspection effort identified two thousand six hundred sixty-nine (2,669) joints requiring reinspection. Of the two thousand six hundred sixty-nine (2,669) total joints, two thousand eight hundred seventy (2,870) welds exhibited discrepancies of the more than eleven thousand (11,000) welds reinspected according to procedure QCP-VII-200, Procedure Change Notice 14. Each weld reinspected could have potentially contained five (5) categories of deficiencies according to the method utilized for tracking during the CAR-19 program, those being: undersize, defects (cracks, lack of fusion, incomplete penetration, overlap, slag inclusions, porosity, craters), underrun, undercut and configuration. Of the two thousand six hundred sixty-nine (2,669) structural joints inspected, the following quantities of weld deficiencies were noted by category: 1,061 undersize, 330 defects, 476 underrun, 107 undercut, and 1,562 configuration.

The quantities of deficiencies noted for the three categories following are minor based upon a percentage comparison to the total number of welds reinspected. The approximate percentages for each of these three categories are, underrun 4%, undercut 1%, defects 3%. These percentages are within expectations considering reinspection emphasis and the previously noted differences in inspection technique and accepted inspection practice. Further statistical analysis revealed a majority (more than 60%) of the welds rejected for undercut discrepancies to be in excess of the 1/32" allowable undercut criterion by less than 1/16". A majority (approximately 60%) of the welds found to be underrun were underrun by less than 1/2". An analysis of the attributes contained within the 'defect' category revealed only small quantities in each. Based on the above statistical analysis , the discrepancies identified in the categories of underrun, undercut and defects are not considered to be contributors to the root cause that previously accepted welds were found deficient upon reinspection.

The quantity of welds rejected that did not meet the minimum leg size as specified on the design document, or exceeded the code allowable 1/16 inch undersize for less than 10% of the length of the weld, represents a percentage of 9% deficiencies for the total welds inspected. Discussions with DIC inspection personnel and Quality Management aware of approved inspection practices utilized during the structural steel erection time frame indicated that inspection methods were similar for this period to

those described in the previously addressed documentary by Reedy, Herbert, Gibbons and Associates, Inc. Of the welds identified as being undersize, more than 90% were undersize by less than 1/8", further substantiating that inspection methods were as previously described. Based on the above evaluation, the quantity of deficient welds identified as being undersize is considered an indicator that previously accepted inspection techniques was the root cause of previously accepted welds being found deficient upon reinspection.

The quantity of welds indentified during reinspection exhibiting configuration deficiencies represented 13% of all deficiencies for the total welds inspected. Of the total number of deficiencies, more than 80% were revealed by research to be directly attributable to one design change implemented in February, 1978. This Design Change Notice C0011, Rev. 7, dated February 23, 1978, changed detail 10 on drawing C0011 to limit the length of the return welds on beam clip angle to embed plate welds. The significant number of discrepancies identified in this category indicates that the design change was not given sufficient emphasis by DIC Engineering, craft, and Quality Inspection to enable deviations from this requirement to be adequately controlled. This category is the largest single contributor to "root cause" of previously accepted deficient structural welds. Bechtel, as the Architect Engineer, performed an evaluation of all welds reinspected to determine which welds were acceptable from a technical viewpoint relative to allowable stress calculations and which welds would require rework in order to meet this criterion. From this evaluation 2589 joints were determined to be technically acceptable whereas 81 required rework. These statistics, revealing that 97% of the joints reinspected were technically acceptable, are indicative that the relative degree of significance of the deficiencies identified due to reinspection is minor.

Those areas utilizing AWS D1.1 welding other than structural steel were identified as: Pipe whip restraints; miscellaneous steel and embedment fabrications; fire dampers and safety-related ductwork and supports; electrical raceway supports; electrical equipment installation; and stud welding.

Previously compiled information including Construction Self Assessment Reports, KG&E QA Reports and Surveillances, DIC QA Reports, DIC Project Monitoring Program audits, DIC Corrective Action Reports and correspondence was reviewed to determine results of previous investigations of AWS D1.1 welding. No findings were noted during this review that could be considered contributing factors to root cause. Electrical II/I support welds were reinspected by Bechtel (ELKC: 009) through the "Sampling and Inspection Program for Electrical Support Welds" (7/84). Three hundred nine (309) were inspected and found acceptable. Electrical Quality Welding Inspectors performed inspections on Class IE support welds raceway (8/82). Pipe whip restraint welds were 100% nondestructively tested. HVAC ductwork support welds were 100% reinspected through implementation of DIC Corrective Action Report CAR-1-M-0012 and a traveler system was initiated to maintain better control and accountability (3/82-1/83).

Programmatic elements utilized in the inspection and documentation of the various applications of AWS D1.1 welding differed depending upon the Quality discipline responsible for inspection activities. The following methods were utilized in the applications noted to provide inspection documentation:

a) Raceway Supports - Raceway Support Checklist

b) Electrical Equipment - Quality Equipment Mounting Checklist in addition to MSSWR's

c) Fire dampers and safety-related ductwork and supports - Mechanical Travelers

d) Miscellaneous steel and embed fabrication - MSSWR's

e) Stud welding to embeds - Surveillance Reports

f) Pipe Whip Restraints - MSSWR's in addition to Nondestructive Examination Reports

All the methods utilized above were effective in providing inspection assurance and documentation of the respective activities when properly implemented. The travelers utilized as well as the other checklists noted provided a closed loop system where individual accountability for a weld was required, controlled, and documentation verified accurate and complete by Quality personnel. Conversely Miscellaneous Structural Steel Weld Records (MSSWR's) were used in an open-ended system for Main Frame Structural Steel Installations where craft construction personnel were responsible for control, maintenance and processing of this record following its completion. This system proved less than satisfactory in some applications, resulting in document retrievability problems that have been addressed by DIC and KG&E Corrective Action Reports.

In summary the programmatic elements as described in DIC procedures for each application of AWS D1.1 welding are adequate when properly implemented by the persons responsible for those activities. MSSWR's utilized in documenting structural steel weld connections were the subject of inadequate implementation of procedural requirements, resulting in the problems being addressed in this report. The research accomplished in completion of this activity revealed no inherent "root cause" generic to all programs utilizing AWS D1.1 welding, but rather indicates that the root cause of the previous acceptance of deficient structural welds was as delineated earlier in this section.

Finding #3 to CAR-19 stated, "A small number of safety related structural steel welds were not made or had missing material."

Corrective Action 3a)

"Forward the "as-built" information to the Architect/Engineer via an NCR to obtain an engineering evaluation and disposition".

All missing welds or missing material detected in the reinspections performed were documented on nonconformance reports reflecting the as-built condition found by inspectors. Of the two thousand six hundred sixty-nine (2,669) joints reinspected (more than 11,000 welds) only two hundred seventy-three (273) welds were identified as missing where the applicable design drawing required their installation. Of the two hundred seventy-three

welds not installed, one hundred twenty (120) were applicable to the polar crane girder radial stops (44%), ninety-seven (97) were due to beam seats not installed (36%), eighteen (18) were due to missing welds on six (6) pressurizer support welds (7.0%), and the remainder (38) due to missing welds on clip to beam or plate installations (13%).

Under the purview of KG&E Construction, a detailed investigation was undertaken by DIC Engineering and Management personnel to determine the root causes of missing welds and materials in each case. Significant points of that investigation included: grouping of missing welds/materials into categories to aid in research; compilation of factual data and analysis for trends/patterns; a thorough review of all applicable design change documents that may have deleted some of the items in question; visual examinations of the areas where installations should have been made; and interviews with craftsmen, craft supervision, DIC Engineering and Quality personnel for information that may have added to root causes.

Missing welds and materials were grouped into categories based on similarities that could be determined to exist in function or construction sequence. Five groups were defined, those being: beam seats and attachment welds, pressurizer support welds, Polar Crane girder radial stop welds, miscellaneous materials and associated welds, and beam to channel clip welds (for one application only). Each of these groups is discussed in detail in the following paragraphs in presenting the respective data accumulated and the conclusions drawn.

Beam seat installation welds accounted for ninety-seven (97) of the missing welds identified. Upon investigation several reasons were found as contributing factors to the root cause of failure to install beam seats as required. All beam seat connections in question were relevant to installation detail 10 on drawing C0011, which gave no required weld size, but referenced note 14. Note 14 stated, "When end reaction exceeds maximum weld size capacity provide seat angle." Discussions with personnel available who were involved with structural steel installations revealed that this note may have been incorrectly interpreted as an 'option' for beam seat installation. This resulted in a craft opinion that the beam seat was intended as a construction aid to be used only during the erection process and then removed. This contention is supported by the fact that ninety-three percent (93%) of the areas/records examined pertaining to beam seat installation revealed that the beam seats were installed prior to the beam's installation. Seventy-two percent (72%) of the embed plates investigated showed evidence of temporary welds made to attach a beam seat as a construction aid during the erection sequence, but the beam seats were not found installed upon field investigation. A majority of the beam seat associated welds missing were the beam seat to beam welds, which further indicates the questionable beam seats were tack-welded to the embed, used as a construction aid, then removed prior to welding to the beam. These above factors substantiate that the root cause of missing beam seat welds (i.e., beam seats not installed) was due to a misunderstanding of the beam seats' intended application as a permanent installation. This root cause conclusion is supported by the data accumulated and discussed in the preceding paragraphs. All missing beam seats and their respective required welds were installed as a part of KG&E and DIC Management's direction.

The missing pressurizer support welds totaled eighteen (18) welds on six (6) supports. The six (6) supports with missing welds are all of the upper supports for the pressurizer beam foundation, and all six (6) supports were found to be welded identically to each other. One inspector performed all final visual inspections of the pressurizer supports, indicating a possibility of human error being a contributor to root cause. Investigation results indicated a misinterpretation of erection details and requirements as the primary root cause of the eighteen (18) missing welds. Twenty-four (24) welds not detailed as required installations were added but not required by design drawings. The conclusion reached for root cause of the missing welds on the pressurizer supports is that DIC construction craft and Quality personnel misinterpreted the installation details and applied this misinterpretation consistently in the construction and inspection of all six supports. Nonconformance report 1SN 20509CW was generated to document these circumstances and all missing welds were installed as a part of the disposition.

The Polar Crane girder radial stops were the subject of one hundred twenty (120) missing welds. These missing welds are documented on nonconformance reports 1SN 21308CW, 1SN 21309CW, 1SN 21310CW and 1SN 21311CW. Facts gathered during the investigation of these missing welds indicate that a series of drawing revisions and misinterpretation of erection installation details resulted in DIC construction error in not making all required welds on sixty (60) radial stops. The appropriate facts are as follows:

American Bridge Drawing E117 (C-121-8360) was revised concerning the radial stop connection. Two of the three revisions to section A were attempts to clarify the desired weld configuration at the radial stops.

Revision B to American Bridge drawing E117 was produced to clarify where actual welds were expected.

Revision C of Drawing E117 in part added "one side only" to the inner "C" portion of the radial stop welds.

Bechtel Drawing C-OS2963 concerning the polar crane girder radial stop welds was altered at Revision 6 to note on Section A that the weld on the inner "C" indention was to be made on one side only.

The MSSWR's documenting the radial stop welds made indicate erection during 2/80-3/80, before American Bridge drawing E117 clarified the installation detail on Revision E, dated 12/80.

Upon reinspection NCR #1SN 21196CW was initiated describing the deficiency in nonexistent radial stop welds. The NCR was voided in-process by the CAR-19 Inspection Supervisor due to a misinterpretation of requirements according to details on the American Bridge drawing E117, that seemed to indicate a weld installation detail requirement concurrent with the actual welds found installed during reinspection. Based upon the preceding facts, it is concluded that the root cause of missing Polar Crane girder radial stop welds is due to unclear weld detail installation requirements as projected on the American Bridge drawing E-117, and subsequent incorrect interpretation of weld installation requirements by DIC personnel.

The missing welds identified for installations involving other miscellaneous materials and welds missing are of a smaller quantity. Thorough investigation revealed the root cause of these missing welds to be due to a lack of formal follow-up and inadequate statuses of completed work and the subsequent completion of unfinished work. The missing welds on the Incore tubing supports revealed that all investigatory information supports the hypothesis that these missing welds were not installed due to oversite. The four lateral support brackets, two at each of the vertical angle supports (Incore tubing supports) located 32' - 2 3/4" north of the Reactor Center Line and 4' 10" east and west (one each direction) of Reactor Center Line on Drawing GOS2919 were added by revision to drawing GOS2924 after the supports had been presumed completed.

Nonconformance report 1SN 21273CW documents missing welds on channel clips to beam attachments. The channels that American Bridge Drawing #C121-10675 shows welded to a beam web along A2 at Elevation 2042' are bolted instead. The channel clips are bolted to the web using the same bolts as removable beams on the opposite side of the web. Research found that the installation of the channel and removable beam was late in the construction sequence of this area, also. Since the channel clips and removable beam clips are bolted through a beam web with the same bolts, the channel clip attachment welds were probably assumed to be unnecessary by the construction personnel responsible for installation.

If the removable beams had been disconnected for the purpose of construction, it would have become necessary to weld the channel clips to the beam web at that time. The beams and channel in question were installed late in the construction sequence of the area, removal of the beams never became mandatory, the welds were not a recognized priority and were never installed as required. The root cause of these missing welds is due to DIC error in assuming the bolted connections were acceptable rather than the required welds. In the miscellaneous group, investigations revealed that welds or material found missing were those welds or materials that would not impede construction progress related to that connection.

Finding #4 to CAR-19 stated, "One (1) weld was documented as having been inspected when in reality the weld was not made. (Ref. NCR 1SN 20495CW)."

Corrective Action 4a)

"Investigate the concern to determine the root cause of the error. Immediately notify KG&E Quality Assurance if any other problems of this nature are identified. Document the investigative actions. The notification of KG&E QA shall not preclude the issuance of an NCR."

The results of the CAR-19 inspection effort were tracked and each case where a missing weld or missing material was identified was researched thoroughly by DIC Engineering to determine whether documentation existed pertinent to the installation of the missing weld/material. Miscellaneous Structural Steel Weld Records (MSSWR's) were reviewed to determine if a trend or pattern existed. Nonconformance reports identifying missing welds were compared to MSSWR's to determine if there were repetitive occurrences.

Applicable drawings were reviewed for similarities in beam numbers, floor layout and beams at similar locations in an attempt to further identify possible sources of confusion. As a result of the investigations conducted only two (2) cases were identified where inspection documentation existed for welds not installed.

The first case is the installation of beam No. 524B2 and its connection to an embed in the Auxiliary Building. All available information indicates that DIC Quality Inspector W made a human error when documenting the inspection of this beam connection. A review of the drawings shows that the beam configuration and floor layout in the area (elevator shaft and equipment hatch) directly beneath the beam connection in question are very similar. In addition, the beam below beam 524B2 connects at the same building coordinates.

It is possible that Inspector W could have been one elevation beneath where he should have been when inspecting the connection. Out of the multiple welds inspected by Inspector W this problem occurred only once. If actions which would result in other conclusions had occurred, it would be reasonable to assume that they would have occurred repeatedly. Inspector W's signature appears on over eight hundred (800) MSSWR's. Each MSSWR could document multiple weld inspections, therefore, Inspector W very likely inspected over one thousand (1,000) structural steel welds, with the result that this type of problem occurred once. A telephone conversation between Inspector W and DIC management personnel concerning this incident revealed no information that Inspector W could offer, since he could not recall the specific connection from the more than eight hundred (800) he inspected. The root cause conclusion in this case is human error.

The second case is the installation of beam No. 95B5 to an embed in the Control Building. All available information suggests that DIC Quality Inspector X made a human error when documenting the inspection of this beam connection. The MSSWR documenting this connection shows Inspector X's confusion in that he entered the joint number incorrectly when filling out this portion of the MSSWR, then lined through, initialed and dated his error, and entered what he thought was a correct entry. Drawing K6711-XI-I-E13 details this connection, but is unclear in that it does not designate the connection number for the beam clip to embed weld, and only lists the beam seat number (91M1).

Further research revealed that Inspector X completed one hundred eighty-three (183) MSSWR's during his tenure on site, but only six (6) of these MSSWR's were related to structural steel weld inspections. This is indicative that Inspector X was possibly confused by the details on the erection drawing. It is probable that Inspector X attempted to document the welds attaching the beam clips to beam 95B5, since no retrievable MSSWR is on file for these welds. These circumstances are documented on nonconformance report 1SN 20798CW for disposition and resolution. The root cause conclusion in this case is human error.

Finding #5 of CAR-19 stated, "Objective evidence that the mechanical and structural inspection/documentation problems identified in KG&E QA Surveillance Report S-372 were rectified has not been provided."

Corrective Action 5a)

"Provide objective evidence that the mechanical and structural support welding inspection/documentation problems identified in Surveillance Report S-372 have been corrected. If such evidence is not available, research the extent of the problem and take the appropriate remedial actions." Activity 5a was broken down into two categories. 5a-1 was to review and provide objective evidence that Mechanical Deficiency Reports identified in S-372 have been correctly closed out. 5a-2 was to review and provide objective evidence that Civil Deficiency Reports identified in S-372 have been correctly closed out.

A total of forty-two deficiency reports were reviewed encompassing the departments of Civil, Civil/Welding, Mechanical, and Mechanical/Welding which are identified in S-372. Below is a brief description of the closure to each Deficiency Report (DR). (Deficiency Reports underlined.)

1. 6451 was upgraded to an NCR (1NN 4969CW) because all welds were encapsulated in concrete and deemed structurally acceptable by the A/E.

2. 6536 and 6538 were "Close in Process" because the hangers were "VOIDED"; hangers were removed mechanically, and Quality inspected the area to insure soundness of the affected structure.

3. 6559, 6557, 6560, 6568 pertained to electrical raceway hangers. DIC Mechanical/Welding inspectors performed inspections to ensure the soundness of the removal area after cut down, according to DR disposition. The reinstallation of these hangers was inspected by DIC Electrical Quality Inspectors and documented on Electrical Quality Raceway Support Checklists.

4. 6535, 6537, 6539, 6576, 6575, had dispositions calling for cut down of hangers only, therefore only the verification for the inspection of the soundness of the removal area was required.

5. 6585 disposition was "Close in Process" because no hanger could be located in the area called for by the Deficiency Report. The two closest hangers have the required documentation and their respective documentation is attached to the Deficiency Report.

6. 6249, 6250, and 6349 have MSSWR's to reflect proper closure, but the hangers are now voided. Based on this research an inspection of the applicable Building, Location, and Area (BLA) for these hangers was initiated and the hangers were verified as cut down.

7. The remaining Deficiency Reports have MSSWR's attached to reflect the proper documentation for the safety-related attachment welds. This group of Deficiency Reports numbers 26 total.

No violations of 10 CFR 50 Appendix B exist in Items 1 thru 5 as defined in the criteria of KG&E Surveillance S-372. The violations listed in S-372 pertained to welding documentation on Structural Steel. The dispositions for the deficiency reports in items 2 thru 4 require the removal of deficient welds. In some cases MSSWR's were used to document the removal so these MSSWR's show blanks (or as non-applicable) for W-100, weld technique, filler material, etc. These should not be mistaken for incomplete MSSWR's for required welding, since MSSWR's are not required for this activity.

In summary, all deficiency reports in KG&E Surveillance S-372, have been reviewed and proper closure verified. All the deficiency reports were closed properly according to the results of our investigation.

DEFICIENCY REPORT #

6248	6454	6557	6568
6249	6455	6558	6569
6250	6456	6559	6570
6280	6457	6560	6571
6349	6535	6561	6572
6449	6536	6562	6573
6450	6537	6564	6574
6451	6538	6565	6575
6452	6539	6566	6576
6453	6556	6567	6577
			6585
			6588

VI. Appendix

V. Conclusions

The technical evaluation of WCGS structural steel significant joints, which was performed by Bechtel based upon reinspection data accumulated, established that safety related AWS D1.1 structural steel welding complies with all Quality criteria as specified in the related design documents, and is within the tolerances of acceptable deviation as determined by the Architect/Engineer. This evaluation for structural integrity was based upon this cumulative data that reflected the as-built condition of Bechtel identified structurally significant joints prior to any rework or repairs.

Two thousand six hundred sixty-nine (2,669) structurally significant joints were identified by Bechtel and were subsequently reinspected by DIC Certified Quality Inspectors who were all also AWS certified Welding Inspectors. Eighty one (81) of these significant joints required rework due to design allowable stresses being exceeded in the as-built condition. None of the structurally significant joints where discrepancies were identified would have failed if left uncorrected.

Research accomplished by DIC and Bechtel personnel substantiated that all DIC welders and welding procedures applicable to AWS D1.1-1975 welding of structural steel installations were qualified in accordance with AWS requirements. Additional research resulted in assurance that programs and procedures applicable to the purchase and control of weld filler materials used in AWS D1.1 applications were in compliance to AWS requirements. Investigations into site implementation of these requirements and procedures provided assurance that implementation had been effective and properly controlled by DIC during project construction activities.

The retrievability and control of Miscellaneous Structural Steel Weld Records (MSSWR's) was investigated, and a determination made that inadequate implementation of DIC construction procedures was a contributing factor to retrievability and accountability problems with MSSWR's relative to structural steel applications. Thorough analysis of each applicable program was undertaken by DIC Quality Engineerning to determine if similar programmatic or procedural requirements existed, and whether inadequate implementation had resulted in similar deficiencies. The results of these assessments determined that no programmatic problems existed in any other AWS D1.1 application relative to inspection documentation required for weld inspections. Evaluations of each application identified that more efficient documentation methods were utilized, and in each case there was more effective control of the required documentation through its initiation and processing cycles. Review of Quality Assurance historical audits and surveillances and an evaluation of procedural implementation adequacy further assured no problems existed in any other AWS D1.1 application similar to the MSSWR retrievability problem on structural steel welding.

Hardware applications of AWS D1.1-1975 requirements were also analyzed to determine if the root causes applicable to the previous acceptance of deficient structural steel welds were of potential impact in applications other than structural steel. Reinspection and Corrective Action reports existed in every case to ensure the acceptability of installed hardware where AWS D1.1 welding was utilized except in Electrical Equipment foundation welds. DIC Management determined that a subsequent investigatory effort was necessary to provide data to ascertain the possible existence of deficiencies in welding and shimming in these installations. DIC Corrective Action Report 1-EW-0046 was initiated to document and accomplish these activities.

DIC Corrective Action Reports (CAR) 1-W-0029 and 1-C-0031 were evaluated to determine why neither of these documents resulted in the appropriate identification and effective resolution of structural steel welding and documentation problems prior to KG&E Corrective Action Request 19. CAR 1-W-0029 was found to be effective for the scope of welds identified. A conclusion was reached, however, that if a larger sample size had been utilized for CAR 1-W-0029's scope of inspection activities, that corrective action concurrent with that identified for KG&E CAR-19 may have been decided appropriate as resolution for the identified problems.

With the generation of DIC CAR 1-C-0031 DIC Management recognized that documentation did not exist for all structural steel welds as procedurally required, and nonconformance reports were generated to document these inadequacies. 'Use-As-Is' dispositions were assigned to these nonconformance reports based upon the existence of defined programs and procedures that required 100% inspection and documentation of structural steel welding activities. An assumption was made that although required documentation was not 100% retrievable, the programs in place during structural steel installation/inspection activities did result in all installations being completed and inspected.

Neither CAR 1-W-0029 nor CAR 1-C-0031 required matching of MSSWR's to structural steel welds or welded connections. If this had been a required corrective action for either CAR, the problems identified in portions of KG&E CAR-19 would have been realized.

The findings addressed in CAR-19 in addition to missing MSSWR's included deficiencies identified in previously accepted structural steel welds, missing structural welds or missing structural material, and documentation that a weld was inspected and accepted, but no weld was installed.

An evaluation of the DIC Quality inspection training program demonstrated that this program and related procedures were in compliance to ANSI N45.2.6. Further investigation concluded that Quality inspection training was appropriate and adequate during the structural steel installation time frame. An evaluation of DIC Quality inspection procedures and criteria applicable to the original structural steel installation/inspection period revealed several procedural inadequacies. A thorough analysis of the omission of each inspection criterion of AWS D1.1 structural steel applications was accomplished, with the conclusion that no adverse impact had resulted from these procedural inadequacies relative to AWS D1.1 welding inspection.

Inspection criteria to be used in the structural steel reinspection activities was procedurally defined and training of all personnel completed prior to reinspection initiation. Sufficient technical justification was established by Bechtel to validate inspection of welds through a predetermined maximum thickness of paint. An analysis of reinspection results determined the root cause of the previous acceptance of deficient structural welds to be due to DIC inspection implementation differences relative to inspection vs. reinspection techniques, and inadequate implementation of applicable DIC procedures.

Two (2) of the welds on joints reinspected were initially thought to be documented as being installed when in reality they were not installed. Research revealed no evidence to indicate that either was a case of deliberate falsification. Additional investigations resulted in a conclusion that human error was the cause of incorrectly documenting these nonexistent installations.

Reinspection found that some welds and materials were not installed as required by design documents. These errors were primarily due to craft/engineering errors relative to misunderstanding of installation drawing details and requirements. Failure to install these welds and materials, although in some cases determined to be significant in impact to design stress allowable calculations, would not have resulted in material or structural failure if left uncorrected. All missing welds will be installed in accordance with a KG&E Management directive.

As a result of those concerns identified in KG&E CAR-19, DIC conducted an assessment of the programmatic aspects of the Piping, Hanger, Mechanical, Electrical and Civil disciplines to ascertain the adequacy of those programs instituted in the construction of Wolf Creek Generating Station. Other than the concern identified in DIC CAR 1-EW-0046 the program assessment has established a high degree of confidence in the adequacy of the overall DIC Construction program to assure compliance with 10CFR50, ANSI N45.2, FSAR, design and procedural requirements. The cause of the adverse conditions identified in KG&E CAR-19 and DIC CAR 1-EW-0046 is limited to these areas in that all other areas of work which would have been rendered inadequate or suspect due to the identified root cause have been adequately addressed through subsequent means such as retrofit or reinspection programs.

After completion of the program assessment, which addresses all aspects of the DIC Construction programs in total, and as they might have been affected by the identified root cause of deficient structural steel welds, it is the conclusion of this assessment that all significant problems have been identified and are being adequately addressed and resolved through appropriate corrective actions.

This program assessment is included in the Appendix, section VI.H of the KG&E CAR-19 Final Report, and has concluded that a satisfactory level of confidence exists to assure compliance with 10CFR50, ANSI N45.2, the FSAR, and Design and Procedural requirements.

The objective of KG&E CAR-19 was to establish by review of Construction and Quality programs, as-built conditions, nonconformance identification and correction and by design evaluation and/or rework, that all structural steel erection commitments in the Wolf Creek Final Safety Analysis Report were satisfied. Through the cumulative efforts in the resolution of CAR-19 assurance was obtained that all significant Quality criteria as specified in the related design documents were satisfied, within the tolerances of acceptable deviations as determined by the Architect/Engineer.

VI A KG+E CAR-19

Form 1177 REV 1-67

INTEROFFICE CORRESPONDENCE

TO: G.L. Fouts KCLRWC 84-002

FROM: R.M. Grant

DATE: October 17, 1984

SUBJECT: Corrective Action Request (CAR) No. 19

Attached is Corrective Action Request (CAR) #19 which is being issued to obtain corrective actions to problems associated with safety-related AWS D1.1 structural steel welding.

Please respond to this Corrective Action Request by completing Section 5 of the subject CAR. Your schedule for implementing corrective actions and an explanation of any actions you have already taken should be submitted to me by October 24, 1984.

RMG/dkb

cc: K.R. Brown
G.L. Koester
F.J. Duddy
W.J. Rudolph II
C.E. Parry
C.G. Patrick

KGF-60 Rev. 2/84

III 5353

WOLF CREEK GENERATING STATION

CORRECTIVE ACTION REQUEST

CAR NO. 19

1. CONDITION DESCRIPTION:

See Attached.

2. RESPONSIBLE ORGANIZATION:

KG&E Construction

3. CAUSE OF CONDITION:

QA Program breakdown associated with safety-related AWS D1.1 structural steel welding.

4. RECOMMENDED CORRECTIVE ACTION:

See Attached.

Reviewer 10-17-84 Date

Quality Branch Representative 10-17-84 Date

5. SCHEDULE FOR IMPLEMENTATION OF ACTION:

Responsible Supervisor Date

6. NRC REPORTABLE: (Yes) No
9/18/84 See Attached Telephone Call Record

7. STOP WORK ACTION TAKEN: Yes (No)
If Yes, Report # _____

8. CORRECTIVE ACTION VERIFIED - Method of Verification:

Quality Branch Representative Date

Supervisor Date

9. CAR CLOSED: Yes

Quality Branch Representative Date

Supervisor Date

10. APPROVAL _____ DATE _____
Director - Quality

I. CONDITION DESCRIPTION

A. Objectives

- To document a consolidated project plan for the identification, evaluation and resolution of problems associated with Safety-Related AWS D1.1 Welding.

- To provide assurance, based on objective evidence, that AWS D1.1 Welding of Safety-Related Structural Steel complies with all Quality Criteria as specificed in the related design documents and is within the tolerances of acceptable deviations as determined by the Architect - Engineer.

- To provide assurance that the documentation which supports the inspection of safety related structural steel welds is:

  - Available
  - Complete
  - Reflects appropriate information
  - Traceable to the item or activity

- To evaluate supporting elements of the DIC Quality Assurance Program to ensure that those elements were adequately and effectively implemented to demonstrate that the DIC welding of safety related structural steel, HVAC Supports, Electrical Supports, Pipe Whip Restraints and any other AWS D1.1 safety related welding activities were in compliance with the FSAR (i.e. AWS D1.1 - 1975) and the Design and Construction QA Program Manual, Section 17.1.B.

B. Definitions

Joint - A structural steel welded connection. A joint may consist of numerous welds. A joint may also be referred to as a connection.

Weld - A continuous length of weld material with only one start and one stop.

MSSWR - Miscellaneous Structural Steel Weld Record; a form used by DIC to document installation and inspection data for welds made to structural steel.

AWS D1.1 - American Welding Society's Structural Welding Code. This code covers welding requirements applicable to welded structures. It is to be used in conjunction with any complementary code or specification for the design and construction of steel structures.

Miscellaneous Structural Steel - See Attachment B for Complete Definition.

Structurally Significant Welds - See Attachment B for Complete Definition.

C. Background Information

- KG&E Surveillance Report S-372 (October, 1981) identified a Quality Program breakdown due to the following deficiencies:

  - Missing inspection documentation
  - Incomplete/improper resolution of identified electrical, mechanical and structural weld documentation deficiencies.

  The Surveillance Report resulted in the issuance of DIC CAR #9. CAR #9 pertained exclusively to the major finding of the Surveillance Report, that being electrical support weld inspection documentation. An agreement between KG&E and DIC Quality Management was reached that required KG&E to issue a CAR if the DIC resolution was unsatisfactory to KG&E.

- DIC CAR No. 1-E-009 (October, 1981) was subsequently issued to address the electrical support weld inspection documentation concerns identified in the KG&E Surveillance Report. The root causes of the problems identified in the KG&E Surveillance Report were determined by DIC to be:

  - The lack of notification by the responsible craft to Quality inspectors that welding activity was scheduled to commence.
  - Improper processing and filing of weld records.
  - The existance of a single part document as opposed to a triplicate type form to record inspections.

  The corrective measures taken by DIC involved the retraining of construction engineering personnel and the placement of limitations on the authorization level required to initiate the dispositions to Deficiency Reports. The CAR was closed in November, 1982.

- DIC CAR 1-W-0029 (March, 1983) was initiated to address some weld inspection inconsistancies in the Auxiliary, Control and Fuel Buildings. To investigate the extent of the problem 241 welds were inspected of which 147 were identified by the inspectors as deficient. To resolve the condition identified on the CAR, NCR 1SN10381PW was generated. The evaluation of the NCR involved another inspection by Welding Engineering which resulted in the determination that only 22 welds exhibited potentially significant conditions and were subsequently evaluated by the Architect - Engineer and dispositioned "use-as-is". Based on the NCR and its closure, DIC closed CAR 1-W-0029 in October, 1983.

- DIC CAR 1-C-0031 (August, 1983) states in part:

  "MSSWRs used to document safety related structural steel welded connections through out "Q" designated areas is inadequate. A sample survey made by (DIC) Q.E. has shown 16.4% of the required MSSWRs cannot be located for all "Q" welds in the Fuel Bldg. A survey of 6 erection/design drawings in the Reactor Bldg revealed 24% of the welds are missing documentation. In addition, M/W Quality has initiated a NCR (1SN11957CW) to document 42 missing MSSWRs for welds in the ESWS Pumphouse."

The CAR was dispositioned to write an NCR for each safety related building to address the missing MSSWR's. Although the CAR remains open, the proposed justification for closure is based in part on the closure of DIC CAR 1-84-0029.

- Current Project Actions

  - Document Reconciliation Task: On August 13, 1984, a document reconciliation effort was initiated at the direction of project management to determine which safety related structural steel welds identified on design drawings were lacking inspection documentation in the form of MSSWRs.

  - Inspection Verification Plan: On August 17, 1984, an inspection verification effort was initiated at the direction of project management to provide an accurate assessment of the "as-built" conditions of safety related structural steel welded connections with unretrievable MSSWR's. These activities are being performed by a combined team of DIC and Architect - Engineer AWS Certified Welding Inspectors under direct supervision of KG&E Construction QC. These activities are being performed in accordance with written instructions issued by KG&E Construction QC which reflect the criteria of AWS D1.1-1975 and the applicable Architect - Engineer design documents. The results of these verifications and the review of Surveillance Report S-372 have caused the findings in Section E of this report to be issued.

D. Requirements

The welding of safety related structural steel connections at WCGS is governed by welding code AWS D1.1-1975. The WCGS FSAR invokes this code for each safety related structure. In addition, SNUPPS project specification 10466-C-122 (Q) Rev. 0 through 14 entitled "Technical Specification for Contract for Erection of Structural Steel for the (SNUPPS) Power Plant" and specification 10466-C-132(Q), Rev. 0 through 8 titled "Technical Specification for Erecting Miscellaneous Metal for the Standardized Nuclear Unit Power Plant System (SNUPPS)" requires structural steel welds to be performed in accordance with AWS D1.1-1975, with exceptions in the criteria for undercut (para. 8.5.2) and weld convexity (para. 8.5.3).

E. Findings - Impacts - Recommended Corrective Actions

The five findings listed below were identified during the two WCGS management assessments described in the 'Background Information' section of this report and a review of Surveillance Report S-372 by KG&E QA. Collectively, these represent a breakdown of the constructor's Quality Assurance program. This condition was caused by an apparent inconsistent application of weld inspection criteria, failure to implement procedural requirements for documenting inspections, and failure to implement effective corrective actions for identified deficiencies.

Finding #1: The results of the Document Reconciliation Task indicated that 1539 of 6816 MSSWRs for safety related structural steel welds are missing. (See Attachment B)

Impact: Without the documentation for the structural welds, the following areas are indeterminate:

- Welder identification and qualification
- Filler metal traceability
- Visual inspection results
- Qualified weld procedures specification used

Recommended Corrective Actions: Actions 1a through 1h below will adequately address all of the concerns identified in Finding #1 and the "root cause" concerns associated with Finding #2.

1a. Based on DIC program requirements, assure that all of the welders and welding procedure specifications were qualified to AWS D1.1 - 1975.

1b. Review the DIC program for the purchase and control of filler material to ensure that only acceptable filler material was used in safety related structural steel welds.

1c. Evaluate the adequacy of the DIC inspection criteria and procedures to determine if these elements could have adversely impacted either the results of the initial inspections or the results of the verification plan. Document and provide this evaluation to KG&E QA for review prior to any additional inspection implementation. Any changes in inspection criteria and procedures shall be provided to KG&E QA for review.

1d. Obtain a documented evaluation to determine the validity of inspections performed with the presence of paint on the weld.

1e. Utilize personnel certified to ANSI N45.2.6 - 1978 for the inspection of safety-related structural steel welds. Inspections shall be performed in accordance with the DIC Quality Program and training shall be performed and documented to assure that inspectors are cognizant of the DIC Quality Inspection program requirements.

1f. Perform a 100% reinspection of all structurally significant safety-related structural steel welds with missing MSSWR's. The identification of "structurally significant" welds shall be made by the Architect - Engineer (See Attachment B). Inspect the welds per recommendations 1c, 1d, 1e, 1g, 1h and 2a.

1g. Use an NCR to obtain and document a suitability for service evaluation of inaccessable welds.

1h. Report all identified deficiencies on an NCR.

* *

Finding #2: An inspection verification effort of safety-related structural steel welding, undertaken by AWS certifed weld inspectors identified several areas of deficiencies. These deficiencies have been catagorized below:

- Undersized welds
- Weld defects
- Incorrect configuration
- Weld underrun
- Weld undercut

Impact: These deficiencies could jeopardize the structural integrity of the connection.

Recommended Corrective Actions: Actions 2a through 2d below will adequately address all of the concerns identified in Finding #2 and the investigative actions required by Finding #5.

2a. Determine and document the "root cause" of the previous acceptance of deficient structural welds. Analyze the HVAC Support, Electrical Support, Pipe-Whip Restraint and any other safety-related program utilizing AWS D1.1 Welding to ensure that the same "root causes" inherent in the structural steel welding program were not generic to other programs.

2b. Perform a 100% reinspection of all structurally significant safety-related structural steel welds having NSSWR's. The identification of "structurally significant" welds shall be made by the Architect - Engineer (See Attachment B). Inspect the welds per recommendations 1c, 1d, 1e, 1g, 1h, and 2a.

2c. Evaluate the results of the completed Inspection Verification Plan against the acceptance criteria used in Action 1c.

2d. Any identified deficiencies shall be documented on an NCR.

* *

Finding #3: A small number of safety-related structural steel welds were not made or had missing material.

Impact: The structural integrity has possibly been jeopardized.

Recommended Corrective Action: The following action and the engineering disposition will adequately address Finding #3.

3a. Forward the "as-built" information to the Architect - Engineer via an NCR to obtain an engineering evaluation and disposition.

* *

Finding #4: One (1) weld was documented as having been inspected when in reality the weld was not made. (Ref. NCR 1SI23495C4)

Impact: The inspector who made the error could have improperly documented other welds. The structural integrity has possibly been jeopardized.

Recommended Corrective Action: The following action will adequately address Finding #4.

4a. Investigate the concern to determine the root cause of the error. Immediately notify KG&E Quality Assurance if any other problems of this nature are identified. Document the investigative actions. The notification of KG&E QA shall not preclude the issuance of an NCR.

* *

Finding #5: Objective evidence that the mechanical and structural welding inspection/documentation problems identified in KG&E QA Surveillance Report S-372 were rectified has not been provided.

Impact: There is a possibility that the mechanical and structural support welding inspection/documentation problems identified in the Surveillance Report were not corrected.

Recommended Corrective Action: The following action will adequately address Finding #5.

5a. Provide objective evidence that the mechanical and structural support welding inspection/documentation problems identified in Surveillance Report S-372 have been corrected. If such evidence is not available, research the extent of the problem and take the appropriate remedial actions.

F. Recommended Corrective Action Flow Diagrams

See Attachment C.

ATTACHMENT A

DATE: 9/19/84

TIME: 0100

LE: KELNRC

TE: 40678-K152

TE: 50564-152

TELEPHONE CALL RECORD

TO: Lawrence Martin

FROM: CMaynard, BRudolph, MLindsay, CParry

COMPANY: NRC-Region IV

ADDRESS: Arlington, Texas

TELEPHONE NO.: 817/860-8100

SUBJECT: Potential 10CFR50.55(a) Inspection of Welds. (use ink)

We informed Mr. Martin that during our re-inspection of welds for which we had no inspection records, we identified 4 welds on the containment cooler platfrom and 4 lateral supports for the incore instrumentation tubing that were not installed. We are investigating to determine whether or not the condition was documented and why they had not been installed.

ACTION REQUIRED AND DATE: Licensing coordinate 30-day report - due: 10/18/84

DISTRIBUTION:

G Koester		H Bundy/B Bartlett/W Guldamond
F Rhodes	F Duddy	R Pogue/F Zaval
M Williams	G Fouts	C Parry/M Lindsay
R Hagan	R Grant	J Bailey/D Prichard
J Johnson	W Rudolph	A Beat
G Rathbun	R Glover	S Saiken
L Stevens	G Baker	
F Field	B Meyer	

(signature)

ATTACHMENT B

1. Definition of Miscellaneous Structural Steel:

Miscellaneous Structural Steel is divided into two (2) parts for the purposes of this CAR.

A. Main Frame and Associated Members:

Main frame welds are those welds on structural steel connections which support the main building floors (concrete or grating) and roofs. For efficiency, these connections are identified on a "per drawing" basis rather than categorizing each piece of steel individually. Therefore, it is inevitable that this category will include certain "associated" connections, such as, welds other than those which support main building floors and roof, which are depicted on drawings primarily showing main building floor and roof steel.

B. Miscellaneous:

Miscellaneous welds connect steel which does not support main building floors or roofs (i.e., all structural steel welds not classified as main frame or associated welds). This does not include hand-rails, toe-plates, and similar items.

2. Definition of Structurally Significant Welds:

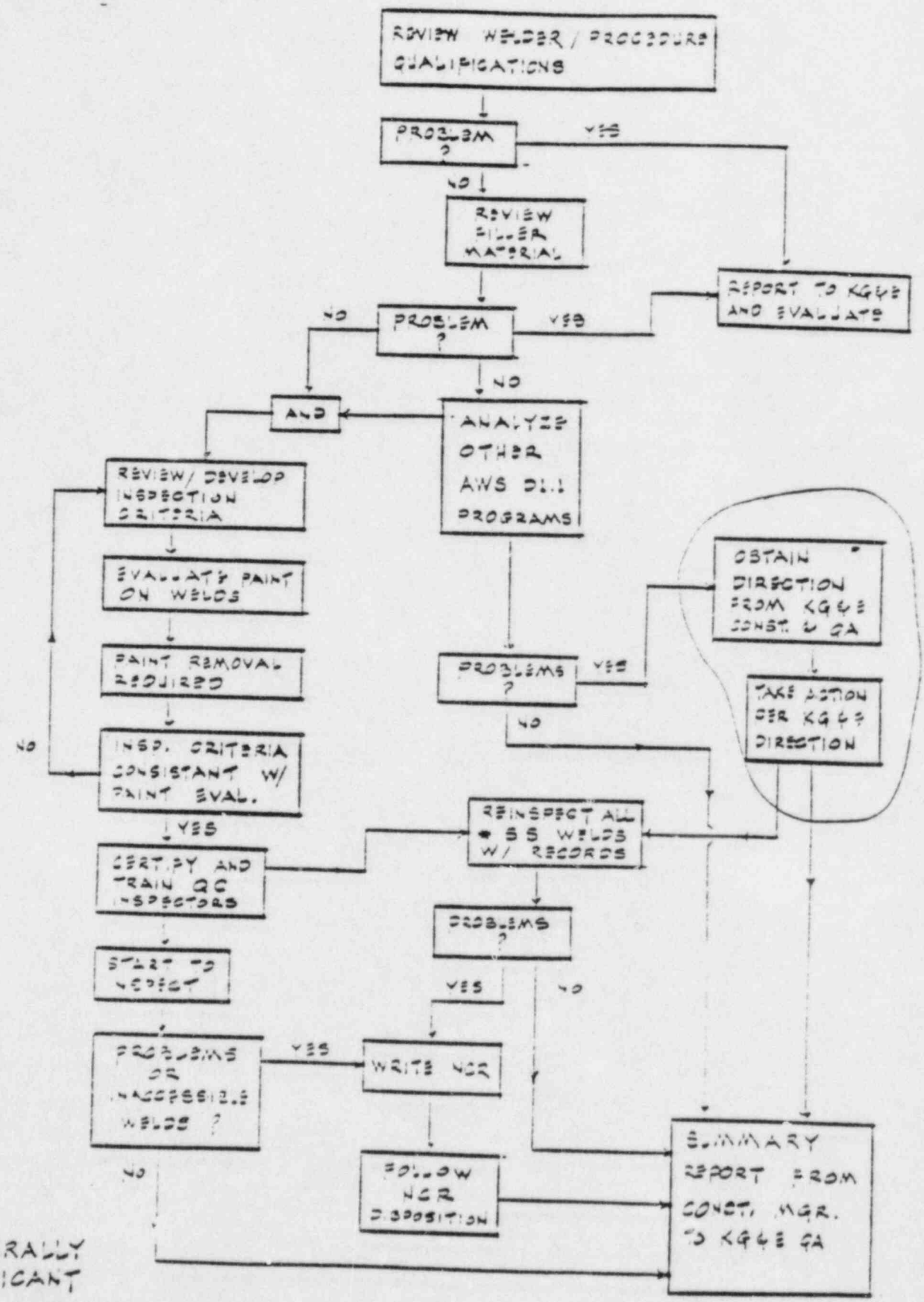
Those welds which are required in the completed building structure to support and protect safety related equipment and building components. Welds for temporary supports, non-safety related supports, hand-rails, toe-plates, and similar items are not considered to be structurally significant by this definition.

KG&E CAR 1?

RECOMMENDED CORRECTIVE ACTION FLOW DIAGRAM

ATTACHMENT C-1

FINDING #1 & 2



* : STRUCTURALLY SIGNIFICANT

KG&E CAR 19

ATTACHMENT C-2

RECOMMENDED CORRECTIVE ACTION FLOW DIAGRAM