Naidu

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION III
799 ROOSEVELT ROAD
GLEN ELLYN, ILLINOIS 60137

December 22, 1982

MEMORANDUM FOR: Director, DPRP
Director, DETP
Director, DEPOS
Director, DRMA

FROM: Region III FOIA Coordinator

SUBJECT: FOIA REQUEST 82-616 - Bechtel/Midland/~~Zimmer~~

The attached FOIA request has been received in RIII and the material requested must be submitted to the Director, DRMA by January 3, 1983.

Please check the applicable block and return this form to me by December 28.

1. /__/ The Division of _____ has no documents relating to this request; however further information may be available from _____ (List other Division, Region(s) or person(s).)

2. /X/ The Division of DETP has documents relating to this request and the search time is expected to be /__/ less than /X/ more than two (2) hours, and the material requested /__/ will /X/ will not be submitted by 1/3/83.

Other Comments: Because of vacation schedules we cannot respond by 1/3/83, will try for 1/10/83.

12/23/82
Date

C. E. Norelius
Signature - Division Director or Designee

Thank you for your cooperation.

Pearl T. Smidth
RIII FOIA Coordinator

Attachment: As stated

cc w/att:
A. B. Davis
Steve Lewis

NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

December 22, 1982

Fax to: Pearl Smidth, RIII

MEMORANDUM FOR: Camille Kime
IE

Pearl Smidth
RIII

4-Pages

Hollis Bowers
OIA

Roger Fortuna
OI

FROM: John C. Carr, Chief
Freedom of Information and Privacy Acts Branch

SUBJECT: FOIA REQUEST FROM BILLIE GARDE, ON BEHALF OF E. EARL KENT, FOR DOCUMENTS REGARDING A 11/21/80 REPORT BY RIII, NOS. 50-329/80-30 AND 50-330/80-31 (FOIA-82-616)

Please find enclosed a copy of the subject FOIA request. Please advise me by December 30, 1982, of your response to the following:

(1) Does your office have documents subject to this request? If yes: How much search time will be required? NOTE: If expected search time exceeds two hours, do not begin search until first talking to FOIA Branch staff contact.

(2) Approximately how many documents do you anticipate will be withheld from public disclosure? What is their nature?

(3) Do you anticipate any problems in processing this request and responding in the allotted time?

(4) Which other offices might have documents subject to this request?

Please provide DRR with all documents subject to this request no later than NOON, January 6, 1983.

Also enclosed is a copy of the FOIA time record form which should be completed by the staff in your office and returned to DRR with your response.

John C. Carr

Enclosures: As stated

CONTACT: John C. Carr
492-8133

8306160301

GOVERNMENT ACCOUNTABILITY PROJECT
Institute for Policy Studies
1901 Que Street, N.W. Washington, D.C. 20009
(202) 234-9382

December 14, 1982

FREEDOM OF INFORMATION ACT REQUEST
FOIA-82-616
Rec 12-22-82

Director
Office of Administration
Nuclear Regulatory Commission
Washington, D. C. 20555

To Whom It May Concern:

On behalf of our client, Mr. E. Earl Kent, and pursuant to both the Freedom of Information Act (5 U.S.C. §552) and the Privacy Act (5 U.S.C. §552a), we request copies of all notes, memoranda, telephone logs, tapes, diaries and/or other records prepared by U.S. government employees in connection with a November 21, 1980 report conducted by Region III Office of Inspection and Enforcement ("IE"), report Nos. 50-329/80-30 and 50-330/80-31. In particular, Mr. Kent requests the notes, correspondence, reports or other records of Mr. R. N. Sutphin and/or Mr. K. R. Naider in relation to a meeting they attended at Bechtel Corporation offices in Ann Arbor, Michigan with Consumers Power Company personnel to identify and plan action on resolving certain matters detailed in the report; their review notes of a February 13, 1978 "Training Session on Undersize Fillet Welds", a March 16, 1978 Consumers Power Company instruction to PFQCE, two April 16, 1978 training sessions; all notes relating to NCR 987, ACIR C-304-1545W, Log 62820 dated February 28, 1980.

If any material covered by this request has been destroyed and/or removed, please provide all surrounding documentation, including but not limited to a description of the action(s) taken, relevant date(s), and justification for the action(s).

Mr. Kent requests that fees be waived, because "finding the information can be considered as primarily benefitting the general public." 5 U.S.C. §552(a)(4)(A). The Government Accountability Project is a non-profit, non-partisan public interest organization concerned with honest and open government. Through legal representation, advice, national conferences, films, publications and public outreach, the Project promotes whistleblowers as agents of accountable government. We are requesting the above information on behalf of our client for a monitoring project on the adequacy of the NRC's efforts to protect public safety and health at nuclear power plants.

For any documents or portions of documents that you deny due to specific exemption, please provide an index itemizing and describing the documents or portions withheld. The index should

8302240368

2pp

provide a detailed justification of your grounds for claiming each exemption, explaining why each exemption is relevant to the document or portion withheld. This index is required under Vaughn v. Rosen (I), 484 F.2d 820 (D.C.Cir. 1973), cert. denied, 415 U.S. 977 (1974).

We look forward to your response to this request within ten working days.

Yours truly,

BILLIE GARDE
Director, GAP Citizens Clinic
for Accountable Government

BG/mcy

RECORD OF FOIA REQUEST TIME

INSTRUCTIONS: Complete this form to establish the time associated with the processing of this FOIA request. Record the time in man-hours, rounded to the nearest 15 minutes, for all actions taken. Include the number of pages reproduced.

Your clerical overhead factor will be added by the FOIA/PA Branch.

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RETURN FORM TO: Director, Division of Rules and Records, Room MNBB-4210.

Form Date _____

Name of Requester BILLIE GARDE

FOIA Request Number FOIA-82-616

ORGANIZATION	DIRECT TIME FOR SEARCH Clerical 1/	Professional	ALL OTHER ACTIVITY 2/

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ORGANIZATION	NUMBER OF PAGES REPRODUCED

COMPUTER SEARCH

Report actual machine time and applicable cost rate for machine used.

1/ Includes only the time actually spent in searching for or locating documents

2/ Includes the time spent reviewing documents for exempt information, conferri with the staff, reproduction, etc

Vandel

JUL 18 1978

Docket No. 50-329
Docket No. 50-330

78-03 original response complete

Consumers Power Company
ATTN: Mr. Stephen H. Howell
Vice President
1945 West Parnall Road
Jackson, MI 49201

Gentlemen:

Thank you for your letter dated June 7, 1978, informing us of the steps you have taken to correct the noncompliance identified in our letter dated May 4, 1978. In regard to noncompliance 2, we are reviewing your position and will inform you of the results of this review upon completion.

Your cooperation with us is appreciated.

Sincerely,

R. F. Heishman, Chief
Reactor Construction and
Engineering Support Branch

cc w/ltr dtd 6/7/78:
Central Files
Reproduction Unit NRC 20b
PDR
Local PDR
NSIC
TIC
Ronald Callen, Michigan Public
Service Commission
Dr. Wayne E. North
Myron M. Cherry, Chicago

8006120553

OFFICE ▶	RIII	RIII	RIII	RIII	RIII	RIII
SURNAME ▶	Vandel/bk	Hayes	for Naidu	Heishman	Norelius	Keppler
DATE ▶	7/18/78	7/17/78	Danielson 7/18	7/18	7/17	

NRC Form 318A (RIII) (5-76) NRCM 0240 *U. S. GOVERNMENT PRINTING OFFICE: 1978-253-818

Stephen H. Howell
Vice President

Consumers Power Company

General Offices: 212 West Michigan Avenue, Jackson, Michigan 49201 • Area Code 517 788-0550

June 7, 1978
Howe-89-78

Mr J. G. Keppler, Regional Director
Office of Inspection and Enforcement
US Nuclear Regulatory Commission
Region III
799 Roosevelt Road
Glen Ellyn, IL 60137

MIDLAND NUCLEAR PLANT - NRC ITEMS OF NONCOMPLIANCE
INSPECTION REPORT NO. 50-329/78-03 AND NO. 50-330/78-03

This letter, with its enclosures, is in response to your letter of May 4, 1978 which transmitted the results of your inspection of the Midland construction site on March 21-23, 1978 and which requested our written statement on the items of noncompliance.

8006120558 36pp.

Enclosure 1
Howe-89-78

CONSUMERS POWER COMPANY RESPONSE
TO THE ITEMS OF NONCOMPLIANCE
DESCRIBED IN NRC INSPECTION REPORT
NO. 50-329/78-03 AND NO. 50-330/78-03

I. ERRONEOUS DOCUMENTED INSPECTION RESULTS

A. Descriptions of Noncompliance

Paragraph 1 of Appendix A, and paragraph 6 of Section II, of Report No. 50-329/78-03 and No. 50-330/78-03 provide the following:

"Contrary to the requirements of 10 CFR 50, Appendix B, Criterion IX, and Paragraph 5.2 of the Consumers Power Company Quality Assurance Program for Design and Construction, Procedure No. 9-1 it was determined that the documented inspection results, asserting that the welds on cable tray supports in the lower cable spreading room were acceptable, were erroneous." ...

"The inspector observed the welds on the seismic Class 1 cable tray supports in the lower cable spreading room at elevation 646' in the auxiliary building and noted that several welds were inadequate in size. At the request of the RIII inspector welds on Column 19, which were documented as inspected and acceptable in QCIR-C304-244W, were reinspected and the results documented as follows in Bechtel Discrepancy Log W097:

Welds on Column 19 where attachment is made to structural steel are required to be 5/16" size with a 5/8" return, by Detail 3 of Drawing E740(Q). Reinspection by the Bechtel QC inspector indicated the following as welded conditions:

(1) Weld Southwest Side

Leg 1/4" x 5/16"
one end return undersize
one end return short

(2) Weld Northwest Side

Undersize throat, complete length of the weld
one end return short

(3) Weld Southeast Side

Legs 1/4" x 5/16"
one end return short
one end return undersize

(4) Weld Northeast Side

Undersize throat, complete length of the weld

The inspector stated that QCIR-C304-244W was in error in that the reinspection results established that the welds did not meet the criteria established in Drawing E 740 (Q). The Inspector further stated that this is considered an item of noncompliance and is contrary to 10 CFR 50, Appendix B, Criterion IX and Paragraph 5.2 of the Consumers Power Company Quality Assurance Program Procedure for Design and Construction Procedure 9-1. The inspector recommended that corrective action to correct the above noncompliance should include a complete reinspection of all the welds in the lower cable spreading room to determine compliance with the relevant drawings. (50-329/78-03-03; 50-330/78-03-03)"

B. Corrective Action

NCR #1287 was issued by Bechtel QC on March 23, 1978. This report contained the reinspection report of 10 vertical columns consisting of 40 welds in the lower spreading room at elevation 646'. Undersized welds were detected in all 10 columns. NCR #1306, issued on April 13, 1978 reported 550 weld discrepancies out of 2,058 inspected welds. The discrepancies consisted of oversize, undersize and weld defects in the lower cable spreading room. Bechtel wrote a Quality Assurance Program Management Corrective Action Report (MCAR-1, Report No. 23, dated April 17, 1978) to address the nonconforming conditions at a management level. This report was provided to you as an attachment to the 50.55(e) report provided by letter Howe-75-78; subject, Midland Nuclear Plant - Unit No. 1 Docket No. 50-329, Unit No. 2 Docket No. 50-330, Seismic Cable Tray Supports, dated May 12, 1978.

Engineering's evaluation effort examined the adequacy of the actual reported weld size to the specified design load at each connection. Problems related to oversize, weld defect and violation of AISC minimum weld size were evaluated by Bechtel welding engineers.

Evaluation of the undersized weld was performed by examining the maximum load-carrying capacity of an undersized weld connection to the minimum required load-carrying capacity from structural analysis of the support system.

NCRs #1287 and 1306 were dispositioned "use-as-is" on May 18, 1978, and it was concluded that the project design stress requirements had been met and no safety implications were involved. Deviations pertaining to minimum weld size and oversize welds were reviewed and found acceptable.

To evaluate welding adequacy in the areas other than those welds in the lower cable spreading room, Bechtel Project Engineering selected a sample of 53 welded support connections from installed cable tray supports in the auxiliary building on April 25, 1978. Field welding engineers conducted a detailed inspection of the selected connections and transmitted the summary results to Project Engineering on May 19, 1978. Project Engineering is currently evaluating the weld connections results transmitted by field engineering. The results of this evaluation will be presented in a final report to MCAR-23 scheduled for July 1, 1978.

The final report will also document those actions taken to prevent recurrence, namely the instruction to crafts, supervision and field engineering personnel and any necessary instruction and training for Quality Control engineers to assure proper inspection, including any requirement for inspection of cable tray support welds prior to the installation of the cable tray.

All of the required actions to make the project in compliance with requirements should be completed by July 1, 1978. Consumers Power will advise you of the completed corrective actions and the date when full compliance was achieved through submittal of the final 50.55(e) report on the Seismic Cable Tray Supports.

II. UNSPECIFIED VOLTAGE IN BECHTEL WPS NO. P1-A-LH

A. Descriptions of Noncompliance

Paragraph 2 of Appendix A, and paragraph 5 of Section II, of Report No. 50-329/78-03 and No. 50-330/78-03 provide the following:

"Contrary to the requirements of 10 CFR 50, Appendix B, Criterion IX and Paragraph 5.2 of the Consumers Power Company (CPCo) Quality Assurance Program Procedure for Design and Construction, Procedure 9-1, CPCo failed to assure that Bechtel Welding Procedure Specification No. P1-A-LH Structural specified the welding voltage requirements." ...

"The inspector reviewed Bechtel Welding Procedure Specification (WPS) P1-A-LH Structural which was being used to weld structural steel and determined that the welding voltage requirements were not specified. The above WPS referenced a General Welding Procedure (GWP) which was to be used in conjunction with the WPS P1-A-LH Structural. Paragraph 4.2.1, on Sheet 3 of 18, of the GWP Revision 2, dated September 1, 1977, states "Electrical process variables shall be specified in the applicable WPS." The Bechtel personnel informed the inspector that the welding voltage was never measured and recorded. American Welding Society (AWS) D1.1-1972 Code which was referenced in the WPS in Section 4, Paragraph 4.10.2, states "The classification and

size of the electrode, arc length, voltage, and amperage shall be suited to the thickness of the material. . . ."

Also, in Section 5, Paragraph 5.5.2.1(4), the AWS Code states "A change of more than 15% above or below the specified mean arc voltage and amperage for each size electrode used is considered a change in the essential variable and requires establishing a procedure qualification." The inspector stated that the control of welding was considered inadequate in that the welding voltage was not specified in the WPS and that this was contrary to 10 CFR 50, Appendix B, Criterion IX and Paragraph 5.2 of the Consumers Power Company Quality Assurance Program Procedure for Design and Construction Procedure 9-1.

This is an item of noncompliance identified in Appendix A. (50-329/78-03-02; 50-330/78-03-02)"

B. Corrective Action

In response to the item of noncompliance stated above, Consumers Power takes the position that we can only be considered in noncompliance with the AWS D1.1-72 Code by not listing, for information only as is implied in the Code, a useable voltage range on the prequalified welding procedure specification. The AWS D1.1-72 Code does not consider arc voltage an essential variable for prequalified welding procedure specifications. The Code only implies that this information should be provided on the WPS form provided in Appendix E. To comply, welding procedure specifications for shielded metal arc welding will be provided with an arc voltage range. It is anticipated that this activity will take approximately 90 days (September 7, 1978) to complete. Arc voltage control will continue to be provided through arc length control by qualified welders.

Enclosure 2 provides more detailed arguments in support of the above stated position.

III. DEFICIENT DOCUMENTATION ON PURCHASED MATERIAL

A. Description of Noncompliance

Paragraph 3 of Appendix A, and page 5 of Report No. 50-329/78-03 and No. 50-330/78-03 provide the following:

"Contrary to the requirements of 10 CFR 50, Appendix B, Criterion VII and Paragraph 5.3 of the CPC EPPQASD, Procedure No. 7, CPCo failed to assure that the documentary evidence on purchased material was sufficient to identify that the purchased material met the specification requirements." ...

"Unresolved Item (50-329/77-12-04; 50-330/77-15-04): It was identified that Shop Welding Inspection Reports of Haven Busch

did not document whether root passes which were repaired were reinspected after repair. Bechtel visited the vendor's facility to determine whether any additional records were available. During the visit, it was reported that examination of the available records indicated only in some instances the reexamination was documented on the reverse side of the report. The reverse side was not copied and sent to the site. There appeared to be a misuse of the documentation of the inspection results; consequently there was not documentation on reinspections. Bechtel is awaiting an assessment by Haven Busch as to the extent of inadequate documentation, including a reasonable rationale to justify the inadequate documentation. This information is expected to be reviewed by the Bechtel Project Engineering personnel through the Project Supplier Quality Supervisor. It should be noted that in the meantime some of these embeds would be buried under concrete precluding further inspections.

This item has been escalated to an item of noncompliance contrary to 10 CFR 50, Appendix B, Criterion VII and Paragraph 5.3 of the Consumers Power Company EPPQASD Procedure No. 7. (50-329/78-03-01; 50-330/78-03-01)"

B. Corrective Action

Two Bechtel Quality Action Requests, QAR-SD-59 (12/28/77) and QAR-SD-60 (12/28/77), had been issued to obtain the required corrective actions. As a result of the review of the Haven Busch documentation, two NCRs, #1345 and 1346, were written against the miscellaneous metal items from Haven Busch which had incomplete or inadequate documentation for welding inspection. NCR #1345, dated May 17, 1978, covers all embeds which are not yet installed. NCR #1346, dated May 17, 1978, covers those embeds that are installed, some of which are embedded in concrete.

NCR #1345 will be field dispositioned in the following manner:

1. Haven Busch will revise its QA manual to allow reconstruction of welding documents to correct errors in the use of their inspection form. This revision is subject to Project Engineering approval.

2. Where reconstruction of documentation is not feasible, the embeds will be reinspected to verify the integrity of the welds in question.

3. Some items which are no longer necessary, due to redesign, will be scrapped.

NCR #1346 will also be partially dispositioned by reconstruction of documentation. Items which cannot be dispositioned by document

reconstruction will be referred to Project Engineering for disposition in one of the following ways:

1. Perform a design stress analysis to determine if the embed could function safely if the nonconforming weld, or welds, were non-existent.

2. Accept the welds by statistical analysis after re-inspection of available embeds.

3. Load test a percentage of the embedded items.

NCR #1345 should be closed out by June 30, 1978. NCR #1346 should be at Project Engineering for disposition recommendations by June 30, 1978. CPCo will provide to you by August 30, 1978 the final results of the disposition to the two subject nonconformance reports and the date that corrective actions will cause full compliance to be achieved.

Enclosure 2
Howe - 89-78

Response
To NRC Item of Noncompliance
(50-329/78-03-02; 50-330/78-03-02)
Nonspecification of Welding Arc Voltage in
Bechtel Welding Procedure Specification P1-A-LH

Prepared by
John W Walvoord
Engineering Services
Consumers Power Company
June 5, 1978

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Response
To NRC Item of Noncompliance
(50-329/78-03-02; 50-330/78-03-02)
Nonspecification of Welding Arc Voltage in
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Introduction

The following is a response to the NRC item of noncompliance (50-329/78-03-02; 50-330/78-03-02) by Mr K R Naidu which resulted from his review of Bechtel Welding Procedure Specification (WPS) P1-A-LH Structural (Attachment 2).

Restatement of NRC Viewpoint

From Item 5 of the NRC inspection report (Attachment 1), the NRC has taken the position that Consumers Power through Bechtel has violated the AWS Structural Welding Code by failing to state the arc voltage required for proper electrode operation. The statement of noncompliance is based on three references. These are:

1. The NRC report quotes a Bechtel General Welding Standard as stating, "Electrical process variables shall be specified in the applicable WPS."

2. The NRC report quotes the AWS D1.1-72 Code[1] as stating in Paragraph 4.10.2 (Attachment 4), "The classification and size of electrode, arc length, voltage, and amperage shall be suited to the thickness of the material . . . ."

3. The NRC report quotes the AWS D1.1-72 Code[2] as stating in Paragraph 5.5.2.1(4) (Attachment 5), "A change of more than 15% above or below the specified mean arc voltage and amperage for each size electrode used is considered a change in the essential variable and requires establishing a procedure qualification."

These three references are the basis for the NRC's issuance of noncompliance concerning the lack of control of the welding voltage.

Consumers Power Position

In response to the citation of noncompliance stated above, Consumers Power takes the position that we can only be considered in noncompliance with the AWS D1.1-72 Code by not listing a useable voltage range on the prequalified welding procedure specification for information only as is implied in the Code. The AWS D1.1-72 Code does not consider arc voltage an essential

(1) Structural Welding Code, AWS D1.1-72, American Welding Society, Miami, Florida, 1972, p 25

(2) Ibid, p 40

variable for prequalified welding procedure specifications. The Code only implies that this information should be provided on the WPS form provided in Appendix E. To comply, welding procedure specifications for shielded metal arc welding will be provided with an arc voltage range. Arc voltage control will continue to be provided through arc length control by qualified welders.

In response to the specific arguments provided in the NRC finding we offer the following arguments:

1. The measurement and monitoring of arc voltage for the shielded metal arc welding process are unnecessary since arc voltage is a direct function of arc length and the control of arc length is a natural function of the process. Arc voltage is made up of three separate voltage drops as shown in Figure 2.6[3], below.

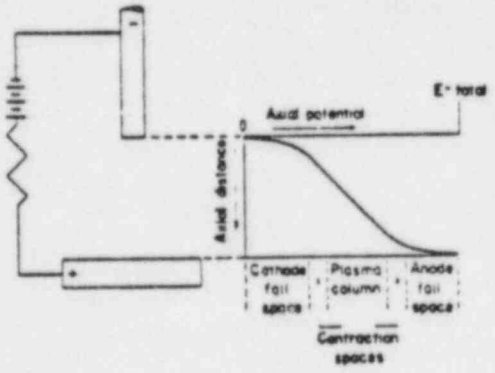


Fig. 2.6 — Arc potential (volts) distribution between electrode and work.

These voltage drops are the anode voltage, cathode voltage, and plasma voltage. Only the plasma voltage is affected by arc length changes. Since the plasma voltage is a small portion of the total arc voltage, acceptable changes in arc length have small effects on arc voltage. Arc length bounds are established by the process itself without external control or monitoring. The minimum arc length is established as the minimum arc length which will support an arc without sticking the electrode. The maximum arc length is established as that arc length which will support a stable arc or prevent gas entrapment. Beyond that maximum arc length, the arc is unstable and metal transfer is haphazard or porosity results. Both the minimum and maximum useable arc lengths are obvious characteristics to a qualified welder. Since we are controlling the useable arc length with qualified welders and arc voltage is a

(3) Welding Handbook, Volume One, Seventh Edition, American Welding Society, Miami, Florida, 1976, p 55

function of this arc length, we are therefore controlling the voltage within useable limits.

In a discussion of energy input during welding, the following statement is made in Weldability of Steels:

> "In this expression [$E=d\frac{VI}{S}$, where E is energy input, d is a constant of proportionability, V is arc voltage, I is amperage, and S is the travel speed], E is the energy input to the weld. It includes all sources of heat; that transferred by superheated filler metal, that produced by the anode or cathode, and that radiated from the plasma. Although the plasma energy may be great, most is radiated to the atmosphere and little of the plasma heat is transferred to the work. Therefore, a voltage increase caused by a longer arc does not contribute proportionally more heat to the work but may, in fact, have no effect. However, with most arc-welding processes, the arc length is established on the basis of optimum weld contour and arc stability and, therefore, can be considered constant."[4]

The effects of some process variables are shown in Attachment 6[5]. For the purposes of construction and fabrication, we interpret optimum weld contours to be those which are acceptable under Paragraph 3.6 of the AWS D1.1 Structural Welding Code.[6] The required arc length (arc voltage) is that which provides acceptable bead contours. Since the welder is trained and qualified to use an appropriate arc length to produce a sound weld with acceptable contours, the measurement of arc voltage would represent an unnecessary duplication of effort which is costly and would not improve weld quality.

Furthermore, due to the operating characteristics of machines used for shielded metal arc welding (SMAW) the small changes in arc voltage which occur over a normal operating arc voltage range (usually about six volts) have very little effect on the heat input to the weld. Figure 1.18 from the Welding Handbook[7] shows some typical voltage/amperage curves for a constant current-type power source, the type of power source used for the SMAW process. If a particular curve is chosen which represents one machine current setting such as the "Range C, Max" setting, the voltage vs amperage curve illustrates that an increase in arc voltage (arc length) results in a slight decrease in current. This compensating feature has been designed into a SMAW power source to allow the welder some variation in arc length without variation in heat input.

(4) Weldability of Steels, R D Stout and W D Doty, Second Edition, Welding Research Council, New York, New York, 1971, p 42

(5) The Procedure Handbook of Arc Welding, Twelfth Edition, The Lincoln Electric Company, Cleveland, Ohio, 1973, p 6.2-17

(6) Structural Welding Code, AWS D1.1-72, American Welding Society, Miami, Florida, 1972, p 20

(7) Welding Handbook, Volume Two, Seventh Edition, American Welding Society, Miami, Florida, 1978, p 26

Again, the control of arc voltage is dependent on the welder's control of the arc length within reasonable limits as he was taught prior to qualification.

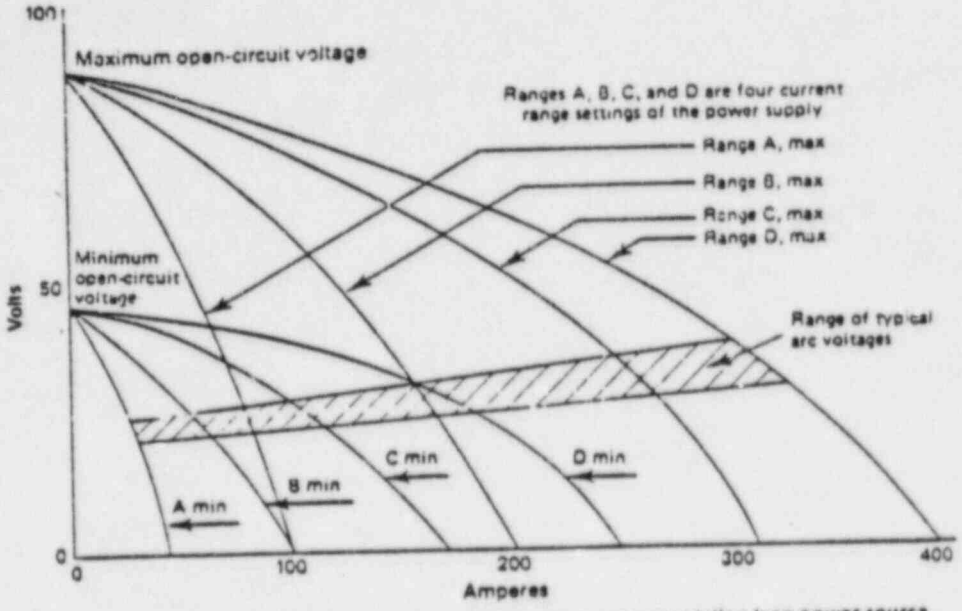


Fig. 1.18—Volt-ampere relationship for a typical constant-current rotating type power source

2. Few if any welding handbooks or other sources of information list arc voltage as a process variable for the shielded metal arc welding (SMAW) process.

The Welding Handbook[8] under the section on welding procedures for SMAW lists the following variables:

a. Electrode Diameter
b. Welding Current
   (1) Type and Polarity
   (2) Amplitude
c. Arc Length
d. Travel Speed

Arc voltage is mentioned peripherally in the paragraphs on arc length

(8) Ibid, pp 66-69

(Attachment 8) with the following two sentences:

> "Instantaneous arc voltage varies as droplets of molten metal are transferred across the arc, even with constant arc length. However, any variation in voltage will be minimal when welding is done with the proper amperage and arc length."

In The Procedure Handbook of Arc Welding[9], the sample procedures provided for SMAW (see Attachment 8) list the following variables:

a. Position
b. Weld Quality Level
c. Steel Weldability
d. Accessibility
e. Plate Thickness
f. Weld Pass
g. Electrode Class
h. Electrode Size
i. Current Including Type, Polarity and Amplitude
j. Travel Speed

For the above procedures, arc voltage is assumed to be controlled through proper arc length control by a qualified welder.

In the Metals Handbook,[10] the section on SMAW mentions arc voltage in the paragraphs on arc length (see Attachment 10). These paragraphs place the control of arc voltage in the hands of the qualified welder through his control of arc length.

3. As mentioned previously[8], arc voltage changes instantaneously. Although this has no effect on the SMAW process since the important control is that of arc length, the measurement of arc voltage is a difficult process. First, arc voltage is only truly measured between the end of the electrode and the point of contact on the work. Measurement of arc voltage from any other point such as at the machine terminals will be erroneous due to voltage losses in cables, contact points, etc. These losses are not important when kept within reasonable limits since the qualified welder and the power source will compensate for a slight change of heat input, but these voltage drops will have a menacing effect on any attempt to measure and monitor arc voltage.

   Second, arc voltage changes instantaneously with metal transfer through the arc.

(9) The Procedure Handbook of Arc Welding, Twelfth Edition, The Lincoln Electric Company, Cleveland, Ohio, 1973, p 6.2-30

(10) Metals Handbook, Volume 6, Welding and Brazing, Eighth Edition, American Society for Metals, Metals Park, Ohio, 1971, p 9

Third, violations of arc voltage ranges are guaranteed by the nature of the process. To start an arc with the SMAW process, the welder must strike the arc on the work and draw the electrode away as the arc is initiated. Striking an arc implies short circuiting the path between the electrode and work. A short circuit is defined as a path of essentially no resistance which will provide no arc voltage drop as the arc is being initiated. As the arc is extinguished, the welder will draw the electrode away from the molten puddle resulting in a long arc length and a corresponding high arc voltage. Both of these circumstances are normal characteristics of the shielded metal arc welding process and will occur every time an arc is started and stopped. It is not the intent of any construction or fabrication code to cause control of arc voltage for the SMAW process to be a QC problem because of these voltage excursions.

4. In response to the NRC argument which quotes the Bechtel welding standard, the Bechtel General Welding Standard GWS Structural, Revision 2, states in Paragraph 4.2.1 on electrical characteristics, "Process variables shall be as stated on the applicable WPS." This statement does not require these variables to be stated on the WPS nor does it require their measurement or monitoring.

5. In response to the NRC argument which quotes the AWS D1.1-72 Code, Paragraph 4.10.2 under "Procedures for Shielded Metal Arc Welding" which states, "The classification and size of electrode, arc length, voltage, and amperage shall be suited to the thickness of the material, type of groove, welding positions, and other circumstances attending the work;" as stated previously, we are controlling the arc length at Midland through welder qualification and, since arc voltage is a function of arc length, we are in effect controlling the arc voltage within a suitable range as required by this paragraph of the code.

6. In response to the NRC argument which quotes the AWS D1.1-72 Code, Paragraph 5.5.2.1(4), this paragraph is under the heading of "Procedure Qualification." Since the welding procedure in question (P1-A-LH Structural) is a prequalified welding procedure as specified in Paragraph 1.3.1 of the AWS D1.1-72 Code and does not require procedure qualifications, Section 5, Part II, on procedure qualification does not apply. As stated in Paragraph 5.5.1 of AWS D1.1-72:

> "When necessary to establish a welding procedure by qualification as required by 5.2 or contract specifications, the following rules apply . . . ."

The limitations of variables which are called out by Paragraph 5.5.1, such as those specified in Paragraph 5.5.2.1(4), apply to procedures which require qualification, not to prequalified procedures such as Bechtel Welding Procedure Specification P1-A-LH. Paragraph 5.5.2.1(4) does not apply for Bechtel WPS P1-A-LH.

Summary

The information provided above established that the Bechtel WPS in question should have listed an appropriate voltage range for information only. However, the Code does not limit this voltage range for prequalified procedures nor does it indicate that any form of voltage measurement or monitoring is required for the shielded metal arc welding process.

As has also been stated, control of arc voltage for the SMAW process is being maintained at Midland Units 1 and 2 through control of arc length within useable limits. This arc length control is provided by welders who are trained and qualified to utilize this welding process.

Action Required for Compliance

To comply with the AWS D1.1-72 Code and resolve this NRC finding, all welding procedures which fall under the AWS Structural Welding Code will be reviewed for arc voltage information. Welding procedure specifications which do not specify an arc voltage range will be revised to provide an arc voltage range for information only. It is anticipated that this work will require 90 days for completion.

Arc voltage will continue to be controlled through arc length control by qualified welders.

Welding procedure specifications which fall under other codes will also be reviewed to establish their compliance with the particular code.

ATTACHMENT 1

5. Review of Welding Procedure P1-A-LH Structural

The inspector reviewed Bechtel Welding Procedure Specification (WPS) P1-A-LH Structural which was being used to weld structural steel and determined that the welding voltage requirements were not specified. The above WPS referenced a General Welding Procedure (GWP) which was to be used in conjunction with the WPS P1-A-LH Structural. Paragraph 4.2.1, on Sheet 3 of 18, of the GWP Revision 2, dated September 1, 1977, states "Electrical process variables shall be specified in the applicable WPS." The Bechtel personnel informed the inspector that the welding voltage was never measured and recorded. American Welding Society (AWS) D1.1-1972 code which was referenced in the WPS in Section 4, Paragraph 4.10.2, states "The classification and size of the electrode, arc length, voltage, and amperage shall be suited to the thickness of the material. . . ."

Also, in Section 5, Paragraph 5.5.2.1(4), the AWS Code states "A change of more than 15% above or below the specified mean arc voltage and amperage for each size electrode used is considered a change in the essential variable and requires establishing a procedure qualification." The inspector stated that the control of welding was considered inadequate in that the welding voltage was not specified in the WPS and that this was contrary to 10 CFR 50, Appendix B, Criterion IX and Paragraph 5.2 of the Consumers Power Company Quality Assurance Program Procedure for Design and Construction Procedure 9-1.

This is an item of noncompliance identified in Appendix A. (50-329/78-03-02; 50-330/78-03-02)

Consumers Power Notes

1. Bechtel WPS P1-A-LH Structural is Revision 0.

2. The Bechtel GWP mentioned above is Bechtel General Welding Standard GWS Structural.

ATTACHMENT 2

J W Morrissey Vice President of Engineering	BECHTEL POWER CORPORATION WELDING STANDARD Welding Procedure Specification P1-A-Lh (Structural) Revision 0 Date 10-17-74	Materials, Fabrication & Quality Control Services Prepared R H Groves Reviewed B M Mayfield Approved W R Smith W. R. Smith, Sr.

Authorized for use only when signed by the Vice President of Engineering.

This welding procedure specification must be used in conjunction with the General Welding Standard(s) GWS - Structural

Scope: Manual shielded metal-arc welding of carbon steel structural materials using low hydrogen electrodes with or without backing strips. When used with the pre-qualified joint details shown in GWS-Structural no procedure qualification testing is required.

Base Metal: Carbon Steel

Welded to Carbon Steel

ASME Sect. IX: P# (Note 1) to P# (Note 1)

Welding Process: Shielded Metal-Arc

Filler Material AWS A5.1 E7018 or E7016

ASME Sect. IX: F# 4 A# 1

Position(s) Qualified: All positions

Thickness Range Qualified:

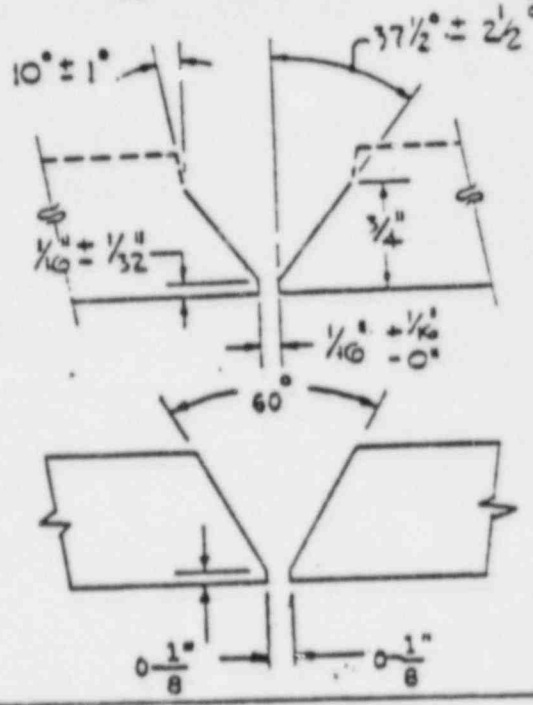
As-welded: min. 1/16" max. 3"

Postweld Heat Treated: min. 3/16" max. 4"

Backing Material Carbon Steel (when required)

Min. Preheat Temp. 32°F (Note 2)

Typical Joint Design



Postweld Heat Treat: When required 1175°F ± 75°F 1 hr/in.

Applicable Procedure Qualification Record(s) PQR 8, PQR 9 and PQR 10

Procedure Qualified to: AWS D1.1 - 74 (prequalified) and ASME Section IX

Welding Process	SMA	SMA	SMA		
Layer Number	All	All	All		
Travel Speed (in./min.)	-	-	-		
Amperage Range	100-165	140-220	180-275		
AC/DC Polarity	DCRP	DCRP	DCRP		
Voltage	-	-	-		
Torch Gas - cfh.	-	-	-		
Backing Gas - cfh.	-	-	-		
Electrode Diameter	1/8"	5/32"	3/16 (note 3)		
Tungsten Type	-	-	-		
Filler Wire Diameter	-	-	-		

Additional Instructions

Note 1: For prequalified welding under AWS D1.1-74 only those AWS materials listed in Table 1 of GWS-Structural (including A572 Gr. 42 thru 60 and A588) may be used. For other welding any ANSI/ASME P-1 materials may be used.

Additional Instructions (Continued from Page 1)

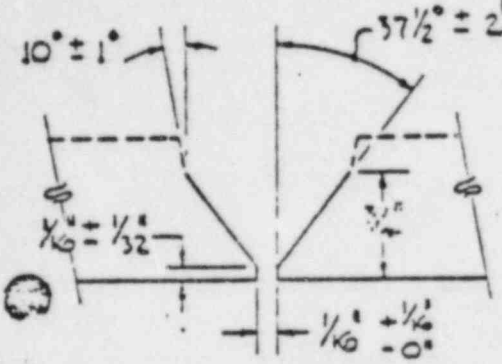
Note 2: See drawing GWS-Structural -1 for special circumstances where higher preheat temperatures are required.

Note 3: Use only for horizontal and flat positions.

BECHTEL POWER CORPORATION
WELDING PROCEDURE QUALIFICATION RECORD

PQR No. 8

Procedure Specification No. P1-A-Lh Date 2/20/69
Welding Process Shielded Metal Arc Location San Francisco, California
Material Specification: ASTM A155 Grade KCF 70 to Itself
Chemistry Carbon Steel (A516 Gr. 70)
ASME P-No. 1 to 1 Shape Pipe Thickness 1.50"
Thickness Range Qualified 3/16 thru 3"
Outside Diameter (O. D.) 24" O. D. Range Qualified All
Filler Metal Specification:
ASME SFA 5.1 AWS Classification E 7018 F-No. 4 A-No. 1
ASME -- AWS Classification -- F-No. -- A-No. --
Filler Metal Chemistry --
Wire/Electrode Diameter 3/32 & 1/8-inch Ø
Manufacturer and Trade Name Lincoln LH-70, Alloy Rods, Atom Arc
Shielding Gas None Flow Rate --
JOINT DESIGN:



Consumable Insert --
Position of groove 2G & 5G
Backing None
Backing Gas Flow Rate --
Polarity DCRP
Amperage 60 - 180
Voltage 22 - 28
Multiple pass per side Yes
Welding Direction up 5G
Travel Speed 2-11 IPM

HEAT TREATMENT:
Preheat Temp. Min. 150°F Postweld Heat Treatment Temp. None
Maximum Interpass Temp. -- Postweld Heat Treatment Time --
Minimum Interpass Temp. --

	Width (In.)	Thickness (In.)	Area ($In.^2$)	UTS, psi	UTS, psi	Position	Remarks
Reduced Section Tensile Tests	--	--	--	75,100	78,000	2G	std. "505" Spec.
	--	--	--	73,000	76,800	2G	"
	--	--	--	75,400	75,900	5G	"
	--	--	--	78,000	77,100	5G	"

	Type		Result	Type	Result
Guided Bend Tests	4 side 2G		180° ok		
	4 side 5G		180° ok		
Impacts	See Pg. 2	Other	--		

Mechanical Testing By Anamet Labs, Berkeley Lab No. 269.269 (WEK-365)
Welder's Name Oscarson, Miller and Keyser Symbol --
Test Conducted By W. B. Keyser

We certify that the statements in this record are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Code.

Note: Revised from AWS to ASME filler metal specifications 3/12/73

BECHTEL POWER CORPORATION
By B. M. Macleod
Materials & Fabrication
Quality Control Services Department

Recorded on New Form 3/26/73

WELDING PROCEDURE QUALIFICATION RECORD
IMPACT TEST RECORD

Procedure Specification No. P1-A-Lh Date February 20, 1969
Welding Process Shielded Metal Arc Location San Francisco, California
Thickness Range Qualified 3/16 inch through 3 in. Per ASME Sections III & IX

WELD SPECIMEN:
Parent Material ASTM A155 Grade KCF 70 (A 516 Gr. 70)
Filler Metal AWS A5.1 Classification E7018
Shape 24-inch Ø pipe Thickness 1-1/2 inches
Heat Treatment As welded

IMPACT TEST SPECIMENS:
Type Charpy V-Notch Size 10mm x 10mm x 55mm
Testing Temperature -30°F Lab. No. 269.269 (WBK-365)

TEST RESULTS:

Weld Position		Energy Absorbed (ft. lbs)	Ductile Fracture Area (per cent)	Laternal Expansion (inch)
2G	Weld	104 @ -30°F	65	0.077
2G	Weld	120 @ -30°F	No Fracture	0.100
2G	Weld	116 @ -30°F	65	0.082
2G	HAZ	28 @ -30°F	25	0.021
2G	HAZ	77 @ -30°F	55	0.054
2G	HAZ	39 @ -30°F	35	0.027
5G	Weld	87 @ -30°F	65	0.066
5G	Weld	111 @ -30°F	65	0.086
5G	Weld	86 @ -30°F	55	0.069
5G	HAZ	40 @ -30°F	35	0.040
5G	HAZ	37.5 @ -30°F	30	0.029
5G	HAZ	59 @ -30°F	40	0.049

Note: Ductile Fracture Area and Lateral Expansion are recorded for information only.

Mechanical Testing By Ananiet Labs, Berkeley, California
Welders Name Oscarson, Miller and Keyser Symbol --
Test Conducted by W. B. Keyser

We certify that the statements in this record are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Code, and Paragraph N-541 of ASME Section III

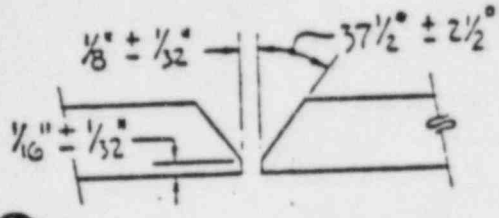
BECHTEL POWER CORPORATION

Date 2/20/69

By R. M. Madcor
Metallurgical & Quality Control

BECHTEL POWER CORPORATION
WELDING PROCEDURE QUALIFICATION RECORD

Procedure Specification No. P1-A-Lh Date 8/8/63
Welding Process Shielded Metal Arc Location San Francisco California
Material Specification: AST A 106 Grade B to itself
Chemistry Carbon steel
ASME P-No. 1 to 1 Shape Pipe Thickness 0.365"
Thickness Range Qualified 1/16" thru 0.730"
Outside Diameter (O. D.) 10-3/4" O. D. Range Qualified All
Filler Metal Specification:
ASME SFA 5.1 AWS Classification E7018 F-No. 4 A-No. 1
ASME --- AWS Classification --- F-No. --- A-No. ---
Filler Metal Chemistry ---
Wire/Electrode Diameter ---
Manufacturer and Trade Name P&H 170LA
Shielding Gas None Flow Rate ---
JOINT DESIGN:



Consumable Insert ---
Position of groove 2G & 5G
Backing None
Backing Gas Flow Rate ---
Polarity DCRP
Amperage ---
Voltage ---
Multiple pass per side Yes
Welding Direction up for 5G
Travel Speed ---

HEAT TREATMENT: (ambient 60° F)
Preheat Temp. Min. None Postweld Heat Treatment Temp. None
Maximum Interpass Temp. --- Postweld Heat Treatment Time ---
Minimum Interpass Temp. ---

	Width (In.)	Thickness (In.)	Area ($In.^2$)	Load, lbs.	UTS, psi	Position	Remarks
Reduced Section Tensile Tests	---	---	---	---	70,370	2G	---
	---	---	---	---	69,250	2G	---
	---	---	---	---	69,250	5G	---
	---	---	---	---	69,440	5G	---

	Type	Result	Type	Result
Guided Bend Tests	2 root 2G	180° OK	2 root 5G	180° OK
	2 face 2G	180° OK	2 face 5G	180° OK
Impacts	--- Other	---		

Mechanical Testing By Testing Engineers & Bechtel Lab No. ---
Welder's Name Burl Blalock Symbol ---
Test Conducted By E. H. Potter

We certify that the statements in this record are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Code.

e: Revised from AWS to ASME filler metal specifications 3/12/73

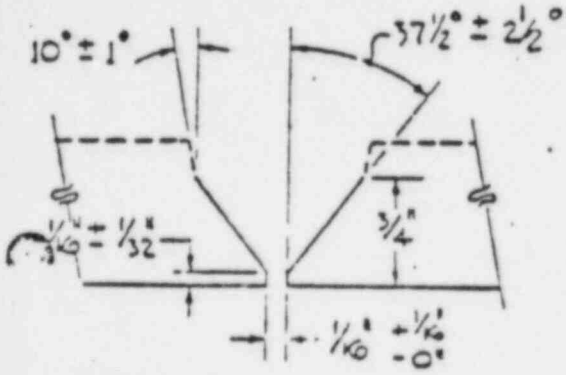
BECHTEL POWER CORPORATION
By B. M. Macleod

Recommended for Welding Procedure Qualification

BECHTEL POWER CORPORATION
WELDING PROCEDURE QUALIFICATION RECORD

Form WR-2A, Rev.
Page 1 of 1
PQR No. 10

Procedure Specification No. P1-A-Lb Date 3/3/65
Welding Process Shielded Metal Arc Location San Francisco California
Material Specification: ASTM A106 Grade B to itself
Chemistry Carbon steel
ASME P-No. 1 to 1 Shape Pipe Thickness 2"
Thickness Range Qualified 3/16" thru 4"
Outside Diameter (O. D.) 10-3/4" O. D. Range Qualified All
Filler Metal Specification:
ASME AWS 5.1 AWS Classification E7018 F-No. 4 A-No. 1
ASME AWS 5.1 AWS Classification E7016 F-No. 4 A-No. 1
Filler Metal Chemistry ---
Wire/Electrode Diameter --
Manufacturer and Trade Name Arcos (7016) Alloy Rods Atom Arc (7018)
Shielding Gas None Flow Rate ---
JOINT DESIGN:



Consumable Insert ---
Position of groove 2G and 5G
Backing None
Backing Gas Flow Rate ---
Polarity DCRP
Amperage ---
Voltage ---
Multiple pass per side Yes
Welding Direction Up for 5G
Travel Speed ---

HEAT TREATMENT:
Preheat Temp. Min. 200°F Postweld Heat Treatment Temp. 1150°F ± 25°F
Maximum Interpass Temp. --- Postweld Heat Treatment Time 2 hours
Minimum Interpass Temp. ---

	Width (In.)	Thickness (In.)	Area ($In.^2$)	Load, lbs.	UTS, psi	Position	Remarks
Reduced Section Tensile Tests	---	---	---	---	65,306	2G	---
	---	---	---	---	68,367	2G	---
	---	---	---	---	68,307	5G	---
	---	---	---	---	65,306	5G	---

	Type		Result	Type	Result
Guided Bend Tests	4 side 2G		180° OK	---	---
	4 side 5G		180° OK	---	---
Impacts	---	Other	---		

Mechanical Testing By PTI and Bechtel Lab Lab No. ---
Welder's Name W. B. Keyser Symbol ---
Test Conducted By W. B. Keyser

We certify that the statements in this record are correct and that the test welds were prepared, welded, and tested in accordance with the requirements of Section IX of the ASME Code.

(e): Revised from AWS to ASME filler metal specifications 3/12/73

BECHTEL POWER CORPORATION

By B. W. Moreland
Materials & Fabrication
Quality Control Engineering Division

Recorded on New Form 3/23/73

ATTACHMENT 3

Authorized for use By _____ Manager of Engineering TPO	BECHTEL POWER CORPORATION GENERAL WELDING STANDARD GWS-Structural Rev. 2	Materials & Quality Services Date September 1, 1977 Prepared _____ Reviewed _____ Approved _____ W.R. Smith, Sr.

Authorized for use only when signed by the Manager of Engineering-TPO.

1.0 SCOPE

1.1 This General Welding Standard is to be used in conjunction with the applicable Welding Procedure Specification (WPS) for general structural welding applications such as building steel or embedments. Other applications such as hoppers, tanks, fuel pool liners, and circulating water pipe may use this specification as a project requirement.

1.2 When required, each WPS has been qualified in accordance with the requirements of the applicable construction Code. Under AWS D1.1 Code, certain procedures are deemed "prequalified" and do not require qualification testing prior to use. Each WPS will indicate which qualification tests, if any, have been performed.

2.0 PROCESS

The welding process or combination of welding processes shall be as specified in the applicable WPS.

3.0 MATERIALS

▲3.1 Base Materials

Base materials used in conformance with this standard shall have chemical, mechanical and dimensional characteristics specified in ASME and/or ASTM Standards or in applicable job specification. For applications in which AWS D1.1 is mandatory, only those materials listed in AWS D1.1 and steels which have had weldability established as required shall be used. For applications where AWS D1.1 has been referenced as a convenience, the materials listed in AWS D1.1, in job specifications or those given an ASME P Number may be welded, and used in conjunction with prequalified procedures. For welding with other than prequalified procedures only materials listed in the WPS may be used.

3.1.1 If welding is required for any steel with minimum specified yield strength 60,000 psi or higher or a steel with minimum specified tensile strength over 71,000 psi, M&QS shall be consulted.

3.2 Backing Materials

3.2.1 Metallic backing material, if required, shall be similar in chemical composition to the base material and shall not cause harmful alloying or contamination of the weld metal. Alternatively, metallic and nonmetallic backing may be specified in the the WPS.

▲3.3 Weld Filler Material

3.3.1 Unless otherwise stated in the applicable WPS the weld filler materials to be used shall conform to the requirements of AWS specifications.

3.3.2 Covered electrodes that have wet or damaged coatings shall not be used.

3.3.3 Low hydrogen type (EXX16 and EXX18) electrodes and austenitic stainless steel electrodes shall be purchased in hermetically sealed containers. All covered electrodes shall be stored in a clean, dry area. Low hydrogen electrodes removed from sealed containers shall be stored as required by job specifications.

3.3.4 Flux-cored electrodes and other spooled electrodes (wire) shall be purchased in sealed containers. All bare electrodes, rods, flux-cored electrodes and flux shall be stored in a clean, dry area.

3.4 Miscellaneous Welding Materials

3.4.1 The composition and flow rate of shielding gases shall be as specified in the WPS. Gases shall be welding grade or better. Shielding gas manifold systems shall contain sufficient valves to permit purging and bleeding of lines and to prevent backfilling with air. The system should be drained or replaced if condensation accumulates in lines. All joints shall be tight to prevent aspiration of air.

3.4.2 The welding electrode to be used with the gas tungsten-arc welding (GTAW) process shall be an electrode per AWS A 5.12, as shown in the WPS.

4.0 WELDING REQUIREMENTS

4.1 Preparation of the Base Material

4.1.1 The methods permitted for weld end preparation are machining, grinding, flame cutting, and arc-air gouging. See drawing GWS-Structural-1 for the minimum preheating requirements prior to and during all thermal gouging, thermal cutting and welding. Flame cut weld end surfaces and repair cavities shall be ground to bright metal prior to welding.

4.1.2 The method of weld end preparation shall leave the surfaces reasonably smooth and free from notches or other harmful irregularities which could cause lack of fusion or slag entrapment.

4.1.3 The bevel angle, spacing and other details shall be in accordance with weld edge preparation drawings included in the job specification or referenced Codes Where weld symbols are used in lieu of weld end preparation drawings, these details shall be essentially in accordance with Drawings GWS-Structural-2 through -13 which are prequalified and may be detailed with the following tolerances:

Tolerance	Plus(+)	Minus(-)
Root Face (land)	1/16-inch	0-inch
Root Opening (gap)	1/16-inch	0-inch
Groove Angle	10 degrees	0 degrees
"U" or "J" Groove Radius	1/8-inch	0-inch

Additionally, the following workmanship tolerances may be applied to the prepared joint assembly:

Dimension	TOLERANCES			
	ROOT NOT GOUGED		ROOT GOUGED	
	Plus(+)	Minus(-)	Plus(+)	Minus(-)
Root Face (land)	1/16-inch	1/16-inch	No limit	
Root Opening (gap) open butt	1/16-inch	1/16-inch	1/16-inch	1/8-inch
Root Opening (gap) with backing	1/4-inch	1/16 inch	Not applicable	
Groove Angle	10 degrees	5 degrees	10 degrees	5 degrees
Alignment	T/10 or 1/8-inch whichever is less, where T equals the thickness of the thinner part.			

Two examples of the tolerances; of root opening (gap) and how they can accumulate

	Example #1	Example #2
Prequalified gap	1/4	1/4
Design tolerance	+ 1/16	- 0
Assembly tolerance	+ 1/4	-1/16
Total gap as welded	9/16	3/16

4.1.3.1 The gap between parts to be joined by fillet welding may exceed 1/16 inch only if the leg of the fillet is increased by the amount of the separation or it is demonstrated that the required effective throat has been obtained. The gap shall not exceed 3/16 inch except for material 3 inch or greater in thickness where fit-u

cannot close the gap to 3/16 inch or less. In such cases a maximum gap of 5/16 inch is acceptable provided a sealing weld or suitable backing material is used to prevent melting through.

4.1.3.2 Root openings wider than those permitted in 4.1.3, but not greater than twice the thickness of the thinner part or 3/4 in. (19 mm), whichever is less, may be corrected by welding to acceptable dimensions prior to joining the parts by welding.

4.1.3.3 Root openings wider than those permitted above should be referred to the Project Engineer.

4.1.3.4 Fillet welded T-joints are prequalified when the T is skewed to not less than 60 nor more than 135 degrees.

4.1.3.5 Joint dimensions and fit-up requirements for tubular structural members shall be referred to Project Engineering.

4.1.3.6 Groove preparation may be in either or both members to develop the included angle, unless noted otherwise.

4.1.4 Prior to fit-up and welding, the groove face and adjacent surfaces shall be cleaned to remove all grease and oil. Rust, scale or other foreign material shall be removed to clean metal by filing, brushing or grinding.

4.1.5 Deoxaluminite (rust inhibitor) may be used on ferrous materials to prevent rusting. If used, Bechtel's standard GWS-Deox must be followed. Deoxaluminite need not be removed prior to welding.

4.2 Electrical Characteristics

4.2.1 Process variables shall be as specified in the applicable WPS. These ranges will cover most applications but should not be construed as inflexible since individual circumstances may dictate operation out of the recommended range. For machine/automatic welding special requirements for the welding equipment will be specified in the applicable WPS.

4.3 Techniques

4.3.1 Welding shall not be performed when the surfaces of the parts to be welded are wet, or during periods of high wind, unless the welder and/or welding operator and work are properly shielded. See 4.1.5. If moisture is present, based on visual examination, the joint surfaces shall be dried by use of an approved solvent, by flame torch, by preheat equipment, or other engineering approved methods.

4.3.2 Clamps, welded clips, tack welds or other appropriate means shall be used to properly align the joint for welding. Welded attachments used for fit-up shall be similar in chemical composition to the base material. Preheat for welding attachments shall be in accordance with this standard. The attachments may be removed by any suitable means followed by grinding flush with the base material. When thermal cutting is used to remove attachments, at least 1/8-inch shall be left for final removal by grinding. The ground area shall then be visually examined for defects. Any defects found shall be removed by further grinding and/or rewelded and reexamined if necessary. Rewelding shall be performed with a WPS selected by the Lead Field Welding Engineer (LFWE). The area from which attachments have been removed shall be given nondestructive examination as required by the Code or job specifications.

4.3.3 Tack welds shall be welded in full compliance with this Welding Standard and if not removed shall be examined visually for defects prior to starting a permanent weld. Multiple pass tack welds shall have cascaded ends.

4.3.4 On all full penetration joints welded from both sides, the root of the first weld shall be gouged, chipped, ground or machined to sound metal prior to welding the other side. Oxy-fuel gouging may be used only for plain carbon steel materials.

4.3.5 Welding of critical joints or joints in restraint, which require preheat in excess of 150 F shall not be interrupted until at least one-fourth of the weld groove is filled or the weld thickness reaches 3/8-inch, whichever is less. Operations such as slag removal, lunch breaks, shift changes and nondestructive examinations are not considered as interruptions. During lunch break or shift change periods, the weld area shall be suitably protected with insulation.

4.3.5.1 If welding is interrupted for any reason, the joint shall be allowed to cool slowly. Before welding is resumed a visual examination shall be conducted. If defects are detected, repairs shall be in accordance with paragraph 4.5 of this standard. Preheat shall be reestablished before welding is resumed.

4.3.6 Each weld bead shall be cleaned essentially free of slag or other foreign material before depositing successive beads. Each weld layer shall be free of excessive irregularities, such as high spots, deep crevices and porosity.

4.3.7 The weld progression shall be upward for the 3G, 5G and 6G positions except where otherwise permitted in the WPS. For welding in the 2G position, the weld metal shall be deposited using the stringer bead technique.

4.3.8 In general each weld layer shall be completed before a subsequent layer is started.

4.3.8.1 For purposes of maintaining alignment or controlling distortion, it is permitted that one or more partial layers be welded without completing a layer. Partial layers may be applied in one or more joint segments.

4.3.8.2 Partial layers may be welded to correct underfill conditions.

4.3.8.3 A weld joint or layer may be started at any location. Either direct progression, or back step technique may be used.

4.4 Repair of Defects

4.4.1 Cracks and other defects in excess of acceptance criteria that are detected during welding shall be removed by grinding, chipping, machining or air carbon-arc gouging. When air carbon-arc gouging is used, the gouged area shall be ground to bright clean metal. After removal of cracks, other than crater cracks, the area shall be examined by liquid penetrant or magnetic particle methods to determine that the defect has been removed. For other defects, including crater cracks, the areas shall be examined visually to determine that the defects have been removed.

4.4.2 After welding has been completed, defects in excess of the applicable acceptance standards required in the job specification shall be removed and repaired in accordance with the following sequence:

4.4.2.1 The repair cavity shall be prepared by air carbon-arc gouging, chipping or grinding. Dross, scale and slag shall be removed by grinding, filing or machining.

4.4.2.2 The method of preparation shall leave the cavity with reasonably smooth surfaces free from excessive notches or other harmful irregularities which could trap slag or cause lack of fusion.

4.4.2.3 Prior to welding, the surface to be welded shall be cleaned to bright metal. Dirt, oil or grease shall be removed by wiping with a clean rag and a solvent such as acetone or alcohol as necessary.

4.4.2.4 Preheat temperature, postweld heat treatment and nondestructive examination for the repair shall be the same as required for the original weld joint unless otherwise permitted by the Code or job specifications.

4.4.3 The repair shall be made with a WPS selected by the LFWE.

5.0 PREHEAT TEMPERATURE

5.1 The minimum preheat temperature specified in Table I shall be maintained during all welding (See Drawing GWS-Structural-1). If the welding operation is interrupted, the weld joint shall be heated to the required preheat temperature before welding is resumed.

5.2 Preheating may be performed using electrical resistance, induction units, or torches which provide uniform heating over the entire preheat area.

5.3 Preheat temperatures shall be checked approximately three inches from the bevel edge with temperature indicating crayons or contact pyrometers. Preheat shall be maintained on the material being welded at a distance equal to the thickness of the weld, but not less than three inches, in all directions from the point of welding.

5.4 When the ambient air temperature in the vicinity of the weld is in the range of 32 F - 150 F and the minimum preheat specified in Table I is in the same range, verification of the minimum preheat temperature by determining the actual metal temperature is not required. For ambient temperatures below 32 F, contact pyrometers may be used to verify that the metal temperature is not below the specified minimum preheat temperature. Alternatively, to avoid measurement of metal temperature the weld joint may be preheated until warm to touch.

6.0 POSTWELD HEAT TREATMENT

6.1 The requirements for postweld heat treatment shall be as specified in the WPS or as otherwise required by the applicable job specifications. When required, the postweld heat treatment shall be performed in accordance with the applicable Code requirements.

7.0 WELDER PERFORMANCE QUALIFICATION

7.1 Welders who are required to weld materials under this standard shall be qualified in accordance with a WPS and Bechtel Performance Specification, WQ-2.

NO.	DATE	REVISION	BY
2	9/01/77	General Revision	FEB
1	2/12/75	General Revision	RWS
0	4/09/75	Issued for Construction	RWS

TABLE I

GENERAL PREHEATING REQUIREMENTS

Electrode Type	Thickness Ranges (inches)			
	To 3/4	Over 3/4 through 1-1/2	Over 1-1/2 through 2-1/2	Over 2-1/2
E6011 E6010 E7010 - A1	None	150°F	225°F	300°F
E7016,18,28 E70S E70T	None	70°F	150°F	225°F

Note 1: Welding shall not be done when the ambient temperature is lower than 0°F.

Note 2: When the base metal temperature is below 32°F, the base metal shall be preheated to at least 70°F and the temperature maintained during welding.

▲ Note 3: This table applies to steel with minimum specified yield strength less than 60,000 psi, and with minimum specified tensile strength 71,000 psi and less. Preheat for higher strength steels shall be referred to M&QS.

Drawing Number	Rev.
▲ GWS-Structural-1	2

ATTACHMENT 4[1]

AWS D1.1-72, "Procedures for Manual Shielded Metal Arc Welding

4.10.2 The classification and size of electrode, arc length, voltage, and amperage shall be suited to the thickness of the material, type of groove, welding positions, and other circumstances attending the work.

[1]Structural Welding Code, AWS D1.1-72, American Welding Society, Miami, Florida, 1972, p 25

ATTACHMENT 5[2]

Part II Procedure Qualification[34]

5.5 Limitation of Variables

5.5.1 When necessary to establish a welding procedure by qualification as required by 5.2 or contract specifications, the following rules apply and the procedure shall be recorded by the manufacturer or contractor as a Procedure Specification.

5.5.1.1 Qualification of a welding procedure established with a base metal included in 10.2 and not listed in 5.5.1.2, having a minimum specified yield point less than 50,000 psi, shall qualify the procedure for welding any other base metal or combination of those base metals included in 10.2 having a minimum specified yield point equal to or less than that of the base metal used in the test.

5.5.1.2 Qualification of a welding procedure established with ASTM A242, A441, A537 Gr. A, A572 Gr. 50, A588, API 5LX Gr. 42, or ABS Gr. AH, DH, or EH shall be considered as procedure qualification for welding the other steels of this group, combinations of them, or with steels included in 10.2 having a lower minimum specified yield point.

5.5.1.3 Qualification of a welding procedure established with a base metal included in 10.2 having a minimum specified yield strength greater than 50,000 psi shall qualify the procedure for welding only base metals of the same Material Specification and Grade or Type having the same minimum specified yield strength as the base metal tested, reduction in yield strength for increase in material thickness excepted; i.e., a procedure qualified with a 1 in.-thick 100,000 psi yield strength base metal also qualifies for a 3 in.-thick 90,000 psi yield strength base metal of the same Material Specification.

5.5.1.4 Qualification of a welding procedure established with a combination of base metals included in 10.2 of different minimum specified yield strengths, one of which is greater than 50,000 psi, shall qualify the procedure for welding that high yield strength base metal to any other of those base metals having a minimum specified yield strength equal to or less than that of the lower strength base metal used in the test.

5.5.2 The changes set forth in the following schedule shall be considered essential changes in a welding procedure and shall require establishing a new procedure by qualification. When a combination of welding processes is used, the variables applicable to each process shall apply.

5.5.2.1 **Shielded Metal-Arc Welding.**

(1) A change increasing filler metal strength level; e.g., a change from E70XX to E80XX, but not vice versa.

(2) A change from a low-hydrogen type electrode to a non-low-hydrogen type of electrode, but not vice versa.

(3) An increase in the diameter of the electrode used, over that called for in the procedure specification.

(4) A change of more than 15% above or below the specified mean arc voltage and amperage for each size electrode used.

(5) For a specified groove, a change of more than ±25% in the specified number of passes. If the area of the groove is increased, it is also permissible to increase the number of passes in proportion to the increased area.

(6) A change in position in which welding is done as defined in 5.8.

(7) A change in the type of groove; e.g., a change from a Vee- to a U-groove.

(8) A change, exceeding tolerances of 2.9, 2.10, or 10.13 in the shape of any one type of groove involving:

(a) A decrease in the included angle of the groove or

(b) A decrease in the root opening of the groove or

(c) An increase in the root face of the groove or

(d) The omission of backing material but not vice versa.

(9) A decrease of more than 25 F in the minimum specified preheat temperature.

(10) In the case of vertical welding, a change from the progression specified for any pass from upward to downward or vice versa.

[34] Welding procedures for processes listed in 1.3 qualified in accordance with the requirements of previous editions of this Code shall be considered to have qualified under the tests prescribed herein subject to the Limitation of Variables in 5.5. Any requalifications or new qualifications shall be made in accordance with the requirements of this Edition.

[2] Ibid, p 40

ATTACHMENT 6[5]

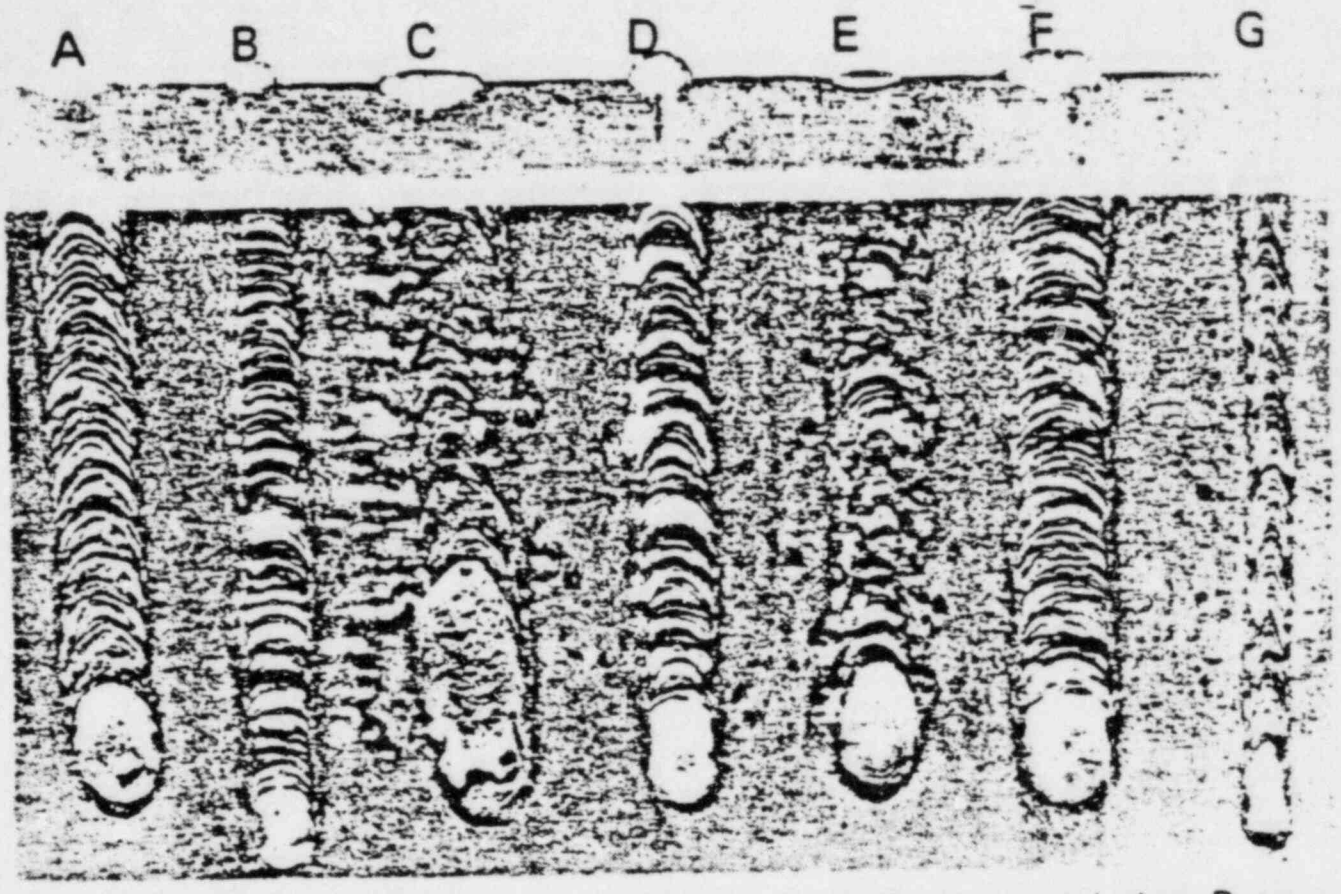


Fig. 6-26. Effect of welding variables on bead characteristics. Proper current, travel speed, and arc length (a). Current too low (b). Current too high (c). Arc length too short (d). Arc length too long (e). Travel speed too slow (f). Travel speed too fast (g).

[5]The Procedure Handbook of Arc Welding, Twelfth Edition, The Lincoln Electric Company, Cleveland, Ohio, 1973, p 6.2-17

ATTACHMENT 7[6]

3.6 Weld Profiles

3.6.1 The faces of fillet welds may be slightly convex, flat, or slightly concave as shown in Fig. 3.6, Details A, B, and C, with no defects as such shown in Fig. 3.5, Detail D. Except at outside corner joints, the convexity shall not exceed the value of 0.1S plus 0.03 in. where S is the actual size of the fillet weld in inches. (See Fig. 3.6, Detail C)

3.6.2 Groove welds shall preferably be made with slight or minimum reinforcement except as may be otherwise provided. In the case of butt and corner joints, the reinforcement shall not exceed ⅛ in. in height and shall have gradual transition to the plane of the base metal surface. (Fig. 3.6, Detail E) They shall be free of defects as shown for butt joints in Fig. 3.6, Detail F.

3.6.3 Surfaces of butt joints required to be flush shall be finished so as not to reduce the thickness of the thinner base metal or weld metal by more than $\frac{1}{32}$ in. or 5% of the thickness, whichever is smaller, or leave reinforcement that exceeds $\frac{1}{32}$ in. However, all reinforcement must be removed where the weld forms part of a faying or contact surface. Any reinforcement must blend smoothly into the plate surfaces with transition areas free from edge weld undercut. Chipping may be used provided it is followed by grinding. Where surface finishing is required, its roughness value[11] shall not exceed 250 MU-in. Surfaces finished to values of over 125 MU-in. through 250 MU-in. shall be finished parallel to the direction of primary stress. Surfaces finished to values of 125 MU-in. or less may be finished in any direction.

3.6.4 For buildings and tubular structures undercut shall be not more than 0.01 in. deep when its direction is transverse to primary tensile stress in the part that is undercut, nor more than $\frac{1}{32}$ in. for all other situations.

3.6.5 For bridges, undercut shall be not more than 0.01 in. deep when its direction is transverse to the primary stress in the part that is undercut. Undercut shall be not more than $\frac{1}{32}$ in. deep when its direction is parallel to the primary stress in the part that is undercut.

3.6.6 Welds shall be free from overlap.

[6] Structural Welding Code, AWS D1.1-72, American Welding Society, Miami, Florida, 1972, p 20

ATTACHMENT 8[11]

ARC LENGTH

The arc length is the distance from the molten tip of the electrode core wire to the surface of the molten weld pool. Proper arc length is important in obtaining a sound welded joint. Metal transfer from the tip of the electrode to the weld pool is not a smooth, uniform action. Instantaneous arc voltage varies as droplets of molten metal are transferred across the arc, even with constant arc length. However, any variation in voltage will be minimal when welding is done with the proper amperage and arc length. The latter requires constant and consistent electrode feed.

The correct arc length varies according to the electrode classification, diameter, and covering composition; it also varies with amperage and welding position. Arc length increases with increasing electrode diameter and amperage. As a general rule, the arc length should not exceed the diameter of the core wire of the electrode. The arc usually is shorter than this for electrodes with thick coverings, such as iron powder or "drag" electrodes.

Too short an arc will be erratic and may short circuit during metal transfer. Too long an arc will lack direction and intensity, which will tend to scatter the molten metal as it moves from the electrode to the weld. The spatter may be heavy and the deposition efficiency low. Also, the gas and flux generated by the covering are not as effective in shielding the arc and the weld metal from air. The poor shielding can cause porosity and contamination of the weld metal by oxygen or nitrogen, or both. The quality of the weld will be poor.

Control of arc length is largely a matter of welder skill, involving the welder's knowledge, experience, visual perception, and manual dexterity. Although the arc length does change to some extent with changing conditions, certain fundamental principles can be given as a guide to the proper arc length for a given set of conditions.

For downhand welding, particularly with heavy electrode coverings, the tip of the electrode can be dragged lightly along the joint. The arc length, in this case, is automatically determined by the coating thickness and the melting rate of the electrode. Moreover, the arc length is uniform. For vertical or overhead welding, the arc length is gaged by the welder. The proper arc length, in such cases, is the one that permits the welder to control the size and motion of the molten weld pool.

For fillet welds, the arc is crowded into the joint for highest deposition rate and best penetration. The same is true of the root passes in groove welds in pipe.

When arc blow is encountered, the arc length should be shortened as much as possible. The various classifications of electrodes have widely different operating characteristics, including arc length. It is important, therefore, for the welder to be familiar with the operating characteristics of the types of electrodes he uses in order to recognize the proper arc length and to know the effect of different arc lengths. The effect of a long and a short arc on bead appearance with a mild steel electrode is illustrated in Figs. 2.13(D) and (E).

[11] Welding Handbook, Volume Two, Seventh Edition, American Welding Society, Miami, Florida, 1978, p 68

ATTACHMENT 9[9]

6.2-30 Welding Carbon and Low-Alloy Steel

SHIELDED METAL-ARC (MANUAL)

Position: Vertical up
Weld Quality Level: Code
Steel Weldability: Fair
Welded From: One side

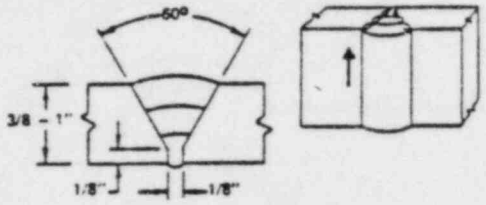


Plate Thickness (in.)	3/8		1/2		3/4		1	
Pass	1	2	1	2 – 3	1	2 – 7	1	2 – 11
Electrode Class	E6010	E7018	E6010	E7018	E6010	E7018	E6010	E7018
Size	5/32	5/32	5/32	5/32	5/32	5/32	5/32	5/32
Current (amp) DC(+)	160	160	160	160	160	160	160	160
Arc Speed (in./min)	4.3-4.7	3.2-3.5*	4.3-4.7	3.2-3.5*	4.3-4.7	3.2-3.5*	4.3-4.7	3.2-3.5*
Electrode Req'd (lb/ft)	0.281	0.341	0.281	0.758	0.281	1.93	0.281	3.52
Total Time (hr/ft of weld)	0.104		0.176		0.381		0.659	

* Second pass only. Vary speed on succeeding passes to obtain proper weld size.

SHIELDED METAL-ARC (MANUAL)

Position: Vertical up
Weld Quality Level: Code
Steel Weldability: Good
Welded From: Two sides

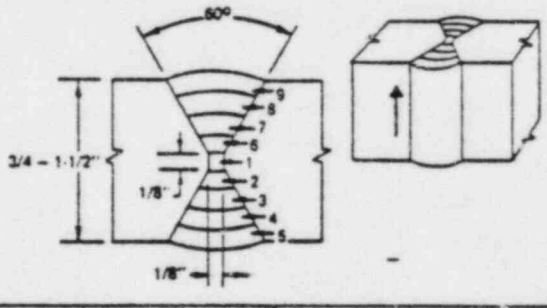


Plate Thickness (in.)	3/4		1		1-1/4		1-1/2	
Pass	1	2 – 5	1	2 – 7	1	2 – 7	1	2 – 9
Electrode Class	E6010	E7018	E6010	E7018	E6010	E7018	E6010	E7018
Size	5/32	5/32	5/32	5/32	5/32	5/32	5/32	5/32
Current (amp) DC(+)	140	160	140	160	140	160	140	160
Arc Speed (in./min)	3.5-4.1	4.1-4.9	3.5-4.1	3.5-4.1	3.9-4.1	2.3-2.9	3.5-4.1	2.4-3.0
Electrode Req'd (lb/ft)	0.240	0.900	0.240	1.66	0.240	2.40	0.240	3.16
Total Time (hr/ft of weld)	0.230		0.367		0.514		0.645	

Gouge out seam for first pass on second side.

[9] The Procedure Handbook of Arc Welding, Twelfth Edition, The Lincoln Electric Company, Cleveland, Ohio, 1973, p 6.2-30

ATTACHMENT 10[10]

Arc Length

The end of an electrode must be close enough to the work to ensure that molten metal from the electrode will be transferred directly and accurately into the weld puddle. Arc length, the distance between the end of the electrode and the weld puddle, is a designed function of the electrode covering, but changes may be necessary under some welding conditions. In general, arc length should not exceed the diameter of the electrode core wire. Welders should deviate from this rule only on the basis of their skill and experience. Arc length is usually shorter for the types of electrodes that have thick coverings. Maintenance of arc length depends mainly on the skill of the welder — which, in turn, depends on his knowledge, visual perception, manual dexterity, and experience.

Arc length largely controls arc voltage and directly affects welding speed and efficiency. Shorter arcs allow an increase in current, which will increase rate of deposition and thus welding speed. When an arc is too long, heat is dissipated to the air, the stream of molten metal from the electrode to the work is scattered in the form of weld spatter, and deposition rate is reduced. In addition, susceptibility to arc blow, and porosity due to loss of shielding, increase as length of arc increases. In welding with direct current, the shortest possible arc is used, to minimize arc blow and contamination by the air.

Control of arc length in vertical and overhead welding demands greater attention from the welder and more skill than in welding in the flat position. In overhead welding, only certain types of electrodes can be used and the welder must adjust the arc length during deposition to retain control of the weld puddle.

For fillet welds, and for root passes in properly prepared butt welded pipe joints, the arc can easily be crowded into the joint for maximum speed and penetration.

The importance of controlling arc length is demonstrated in the example that follows.

[10] Metals Handbook, Volume 6, Welding and Brazing, Eighth Edition, American Society for Metals, Metals Park, Ohio, 1971, p 9

~~P Stepp~~ Vandil

Response due 6/16

50-329

Docket No. 50-330

Consumers Power Co.

ATTN: _____

_____

_____

_____

Gentlemen:

Thank you for your letter dated June 7, 1978, informing us of the steps you have taken to correct the noncompliance identified in our letter dated June May 4, 1978. [redacted] will be reviewed your corrective action during a future inspection.

Your cooperation with us is appreciated.

Sincerely yours,

R. F. Heishman, Chief
Reactor Construction and
Engineering Support Branch

*Substitute appropriate comments when required.

Vandil / Hays / Ngiden Lee / Danielson / [redacted] / Heishman

UNCONTROL... NOT TO BE USED FOR CONSTRUCTION

SCN NO. C-304-8003 (A)

DATE AUGUST 25, 1978

SPECIFICATION CHANGE NOTICE

A. SPECIFICATION NO. 7220 - C 304 REV. 4 DATE MAY 9 1978

B. SPECIFICATION TITLE FIELD FABRICATION, REPAIR AND ERECTION OF STRUCTURAL AND MISC. METAL

C. CHANGE REQUESTED BY CLIENT (ENG'R'G) (FIELD) VENDOR/CONTRACTOR

D. CHANGE PREPARED BY Jon G. Hook DATE AUGUST 25 1978

E. DESCRIPTION OF CHANGE

REVISE SECTIONS 6.2 AND 6.3 AND ADD SECTIONS 6.4 AND 6.5 AS INDICATED ON THE ATTACHED PAGES

RECEIVED
SEP 1978
BECHTEL POWER CORP.
JOB 7220

F. REASON FOR CHANGE

SPECIFICATION CLARIFICATION TO REFLECT THE INTENT OF THE ENGINEER

G. APPROVAL SIGNATURES — DATE

BECHTEL ENGINEERING
PROJECT ENGINEER — 8/28/78
GROUP SUPERVISOR — 8/28/78
CHECKER — 8/25/78
ORIGINATOR — 8.25.78

ATTACH THIS SCN PER INSTRUCTIONS OF EDPI 4.49.1
JOB 7220

AA-0-7

H. INCORPORATED IN SPEC. ____ REV. ____ GROUP SUPERVISOR ____ DATE

8302240374

5pp.

6.2 Except as specified in Sections 6.3 and 6.4, welds in structural steel and miscellaneous metal shall conform to the visual inspection acceptance criteria of AWS D1.1 with the exceptions and clarifications listed below.

6.2.1 Fillet weld sizes shall be as shown on the drawings, measured to the nearest 1/16 inch. In addition, the following shall apply:

a. The minimum fillet weld size shall be the size specified on the drawing, and shall not underrun the size specified more than 1/16 inch for more than 10% of the weld length.

b. Maximum overrun for either or both fillet weld legs shall not exceed +3/16 inch for welds up to and including 3/8 inch and +1/4 inch for welds larger than 3/8 inch. Fillet welds larger than these require field engineering approval prior to final acceptance.

c. Convexity height, rollover, and weld reinforcement may be accepted without limit.

d. Maximum underrun for fillet weld lengths shall not exceed 1/8 inch for end returns and 1/4 inch for all other welds.

e. Fillet weld lengths longer than those specified are acceptable. Continuous fillet welds in lieu of intermittent fillet welds are acceptable.

6.2.2 Butt welds shall be slightly convex, of uniform height, and shall be full penetration unless otherwise shown. Weld reinforcement for butt welds shall not exceed 3/16 inch.

6.2.3 Undercut shall not exceed 1/32 inch.

6.2.4 Thorough fusion shall exist between the weld metal and base metal.

6.2.5 The following welds shown on the design drawings shall not be altered without the approval of project engineering:

a. The field welding of the web framing angle to the supporting member shall be the vertical weld, with end returns limited to a maximum of twice the specified weld leg size plus 1/2 inch.

b. In those cases where the top and bottom flange of a beam are welded to a column flange (i.e., a moment connection) the end returns of the fillet welds shall be a maximum of 1/2 inch.

c. When a flexible seat angle is used for connecting beam to column flange, the two vertical fillet welds on the angle shall be returned around the top portion of the seat angle for a distance not exceeding 1/2 inch.

6.2.6 No welding across the flange of the beam shall be done without the prior approval of project engineering.

6.2.7 Additional welds not shown on the drawing, other than as specified in Subsection 6.2.5 and 6.2.6, require field engineering approval prior to final acceptance.

6.3 Welds in electrical supports and equipment, including the connection to the building structure, shall conform to the visual inspection acceptance criteria of AWS D1.1 with the exceptions and clarifications listed below.

6.3.1 The weld shall meet or exceed specified size requirements. Either or both fillet weld legs may exceed the design size. Continuous welds may be accepted in place of intermittent welds. Unequal leg fillets may be accepted without limit, provided the smaller leg meets or exceeds minimum requirements.

6.3.2 The fillet leg dimension shall not underrun the size specified by more than 1/16 inch for more than 10% of the weld length. Fillet weld sizes shall be measured to the nearest 1/16 inch.

6.3.3 Convexity height, rollover, and weld reinforcement may be accepted without limit.

6.3.4 Thorough fusion shall exist between the weld metal and the base metal.

6.3.5 Underfilled groove weld craters shall be accepted, provided the depth of the underfill is 1/16 inch or less. On multipass fillet welds, crater depths 1/16 inch or less shall be accepted.

6.3.6 Porosity is not a criteria for rejection.

6.3.7 There is no specified limit or undercut, except for attachment welds to the building frame. Undercut to the building frame shall not exceed 1/32 inch.

6.3.8 Misalignment not in excess of the thinner member thickness is acceptable.

6.3.9 Arc strikes are acceptable, providing the craters do not contain cracks as determined by visual examination.

6.3.10 No welding shall be done across the flange of the beam without the prior approval of project engineering.

6.4 Welds in HVAC equipment, including connections to the building structure, shall conform to the visual inspection acceptance criteria of AWS D1.1 with the exceptions and clarifications listed below.

6.4.1 The weld shall meet or exceed the specified size requirements. Either or both fillet weld legs may exceed the design size. Welds may be longer than specified. Continuous welds may be accepted in place of intermittent welds. Unequal leg fillets may be accepted without limit, provided that the smaller leg meets or exceeds the minimum requirements.

6.4.2 The fillet leg dimensions shall not underrun the nominal fillet size by more than 1/16 inch for more than 10% of the weld length.

6.4.3 Porosity is not a criteria for rejection.

6.4.4 Convexity height, rollover, and weld reinforcement may be accepted without limit.

6.4.5 Crater cracks on any single pass weld which is less than continuous along or around the interface shall be accepted. Crater cracks shall be confined to the weld crater and shall not extend past the first ripple. All other cracks are unacceptable.

6.4.6 Thorough fusion shall exist between the weld metal and the base metal.

6.4.7 There is no specified limit on undercut.

6.4.8 Abutting parts to be joined by butt welds shall be carefully aligned, and misalignment shall not exceed the thickness of the thinner material being welded as measured from highest abutting member.

6.4.9 Butt weld profiles shall be convex.

6.4.10 Corner welds used to seal ductwork are designated partial penetration welds. Such welds do not require full penetration. Weld reinforcement greater than the material thickness shall verify the adequacy of the weld, provided the toes of the weld have complete fusion.

6.4.11 Fillet welds joining turning vanes and turning vane rails to heavier gage ductwork may exceed the profile and convexity limits as previously described and are acceptable for this application. Minor burn through on vanes will be permitted up to 1/4 inch in length, provided that equivalent lengths of fillet welds are added to compensate for welds weakened by burn through.

6.4.12 Burn through is permitted, provided leaktight integrity is maintained. Metal flow on the inside of the duct is permitted, provided that it is fused completely with the parent metal and metal thickness is not reduced by greater than 50%.

6.4.13 Scratching is not a basis for rejection.

6.4.14 Distortion caused by welding longitudinal seams shall not exceed 2% of the nominal diameter measured from the cross-sectional cord of the distorted area.

6.4.15 Arc strikes are acceptable, provided that the craters do not contain cracks as determined by visual examination.

6.4.16 No welding across the flange of a beam shall be done without the approval of project engineering.

6.4.17 Each criterion shall be applied independently.

6.5 Welders and welding operators shall be qualified in accordance with either AWS D1.1 or ASME Section IX.

UNCONTROLLED
NOT TO BE USED
FOR CONSTRUCTION

(A)

SCN NO. C-304-8002

DATE 3-29-78

SPECIFICATION CHANGE NOTICE

A. SPECIFICATION NO. 7220-C-304 REV. 3 DATE 12-20-77

B. SPECIFICATION TITLE FIELD FABRICATION, REPAIR, AND ERECTION OF STRUCTURAL AND MISC. METAL

C. CHANGE REQUESTED BY CLIENT ENG'R'G (FIELD) VENDOR/CONTRACTOR

D. CHANGE PREPARED BY R J. MARL DATE 3-29-78

E. DESCRIPTION OF CHANGE

1. SECTION 6.2, REVISE TO READ:

"WELDS SHALL CONFORM TO THE VISUAL INSPECTION ACCEPTANCE CRITERIA OF AWS D1.1 WITH THE EXCEPTIONS AND CLARIFICATIONS SPECIFIED BELOW."

2. SECTION 6.2.1, REVISE TO READ:

"FILLET WELD SIZES SHALL BE AS SHOWN ON THE DRAWINGS, MEASURED TO THE NEAREST 1/16 INCH.

a) MINIMUM FILLET WELD SIZES SHALL BE PER AWS D1.1, SECTION 8.15.1.6

(CONT'D ON PAGE 2)

F. REASON FOR CHANGE

RECEIVED
APR 12 1978
BECHTEL POWER CORP.
LOS ANGELES

G. APPROVAL SIGNATURES DATE

PER JOB 7220

BECHTEL ENGINEERING

PROJECT ENGINEER 3-30-78

GROUP SUPERVISOR 3-29-78

CHECKER 3-29-78

ORIGINATOR 3-29-78

ATTACH THIS SCN PER INSTRUCTIONS OF EDPI 4.49.1
JOB 7220

H. INCORPORATED IN SPEC. REV. GROUP SUPERVISOR DATE

AA-0-72

E. DISCRIPTION OF CHANGE (CONT'D)

b) MAXIMUM OVERRUN FOR EITHER OR BOTH FILLET WELD LEGS SHALL NOT EXCEED + 3/16 INCH FOR WELDS UP TO AND INCLUDING 3/8 INCH, AND + 1/4 INCH FOR WELDS LARGER THAN 3/8 INCH.

c) CONVEXITY SHALL NOT EXCEED 1/8 INCH.

d) MAXIMUM UNDERRUN FOR FILLET WELD LENGTHS SHALL NOT EXCEED 1/4 INCH, EXCEPT FOR WELD END RETURNS, UNDERRUN SHALL NOT EXCEED 1/8 INCH FOR EACH RETURN.

e) FILLET WELD LENGTHS LONGER THAN THAT SPECIFIED ARE ACCEPTABLE. CONTINUOUS FILLET WELDS IN LIEU OF INTERMITTENT FILLET WELDS ARE ACCEPTABLE."

Consumers Power Company

Stephen H. Howell
Vice President

General Offices: 1945 West Parnall Road, Jackson, Michigan 49201 • Area Code 517 788-0453

August 4, 1978
Howe-136-78

Mr J G Keppler, Regional Director
Office of Inspection & Enforcement
Region III
US Nuclear Regulatory Commission
799 Roosevelt Road
Glen Ellyn, IL 60137

MIDLAND NUCLEAR PLANT -
UNIT NO. 1, DOCKET NO. 50-329
UNIT NO. 2, DOCKET NO. 50-330
SEISMIC CABLE TRAY SUPPORTS

Reference: 1) Letter, S H Howell to J G Keppler, Midland Nuclear Plant - Unit No 1, Docket No 50-329; Unit No 2, Docket No 50-330; Seismic Cable Tray Supports, Serial Howe-75-78, dated May 12, 1978.

2) Letter, S H Howell to J G Keppler, Midland Nuclear Plant - NRC Items of Noncompliance, Inspection Report No 50-329/78-03 and No 50-330/78-03; dated June 7, 1978

3) Letter, S H Howell to J G Keppler, Midland Nuclear Plant - Unit No 1, Docket No 50-329; Unit No 2, Docket No 50-330; Seismic Cable Tray Supports, Serial Howe-107-78, dated June 30, 1978.

The referenced letters were interim 50.55(e) reports as is this letter. Enclosed is Bechtel's final report to MCAR-23. It provides a detailed description of the corrective actions taken and reports that the "as fabricated" conditions do not present a potential detrimental effect to the public safety. The final 50.55(e) report will be sent following approval of the proposed changes to Specification 7220-C-304, which is the only remaining corrective action to be implemented.

Another report, either interim or final, will be sent on or before September 8, 1978.

Bill Murgy for SHHowell

7 1978

8006170827 10pp.

Enclosure: MCAR-23, Cable Tray Support Construction Welding Discrepancy, Final Report, Revision 1, dated August 3, 1978

CC: Director of Office of Inspection & Enforcement
Att: Mr John G Davis, Acting Director, USNRC (15)

Director, Office of Management
Information and Program Control, USNRC (1)

Enclosure 1
Howe-107-78

Bechtel Associates Professional Corporation

777 East Eisenhower Parkway
Ann Arbor, Michigan

Mail Address P O Box 1000, Ann Arbor, Michigan 48106

SUBJECT: MCAR #23 (Issued 4/17/78)

Cable Tray Support Construction Welding Discrepancy

INTERIM REPORT #2

DATE: 5/31/78

PROJECT: Consumers Power Company
Midland Plant Units 1 & 2
Bechtel Job 7220

General

This interim report is prepared in response to Midland Project Management Corrective Action Report #23 dated April 17, 1978. Project engineering's action following the issuing of Interim Report #1 up to May 31, 1978, is summarized in this report.

Engineering Evaluation of NCRs 1287 and 1306

Engineering's evaluation of both the undersized and oversized weld problems were summarized in Interim Report #1.

NCRs 1287 and 1306 were dispositioned on May 18, 1978, and it was concluded that the project design stress requirements had been met and no safety implications were involved. Deviations pertaining to minimum weld size and oversize welds were reviewed and were found acceptable.

Cable Tray Support Welds for Areas Not Reinspected

To evaluate welding adequacy in the areas other than those welds in the lower cable spreading room, project engineering selected a minimum sample of 50 welded support connections from installed cable tray supports in the auxiliary building on April 25, 1978. Field welding engineers conducted a detailed inspection of the selected connections and transmitted the summary results to project engineering on May 19, 1978. Project engineering is currently evaluating the weld connections results transmitted by field engineering. The results of this evaluation will be presented in the final report scheduled on July 1, 1978.

Attachment to BLC-6048

Reportability

Project engineering's evaluation to date concludes that the discrepancies in the welding as reported in NCR 1287 and NCR 1306 do not present a potential detrimental effect to public safety and is not a reportable condition within the requirements of the Nuclear Quality Assurance Manual, Section 5, Number 10.

Prepared by: [signature]

Reviewed by: J Arora

Approved by: RLC/[signature]

Concurrence by: Karl [signature]

BECHTEL ASSOCIATES PROFESSIONAL CORP.

KT/jp

Bechtel Associates Professional Corporation

SUBJECT: MCAR #23 (Issued 4/17/78)

Cable tray support construction welding discrepancy

FINAL REPORT, REVISION 1

DATE: August 3, 1978

PROJECT: Consumers Power Company
Midland Plant Units 1 & 2
Bechtel Job 7220

Introduction

This final report supersedes the final report dated July 24, 1978, and is prepared in response to Midland Project Management Corrective Action Report #23, dated April 17, 1978. Project engineering's dispositions of NCRs 1287, 1306, and 1360 are summarized in this report.

ıgineering Evaluation of NCRs 1287 and 1306

NCRs 1287 and 1306 address weld discrepancies in the lower cable spreading room of the auxiliary building. Connections involved are of four types and are shown in Figures 1-4. The discrepancies consisted of oversize, undersize, and weld defects. Engineering's evaluation effort was to examine the adequacy of the actual reported weld size to the specified design load at each connection. The above engineering evaluation led to the conclusion that the project design stress requirements have been met. The welds were inspected in accordance with Section 8.15 of AWS D1.1, Rev 2-77 and the inspection did not reveal any cracks or lack of fusion between the weld metal and base metal. Therefore, there was no adverse effect and the deviations from the AISC code for minimum weld size are found to be acceptable.

Engineering Evaluation of NCR 1360

To evaluate the adequacy of welds in areas other than the lower cable spreading room, project engineering selected at random 50 welded support connections from the installed cable tray supports in the auxiliary building on April 25, 1978. The number of welds to be inspected was

determined on the basis of accepted principles of the theory of probability using a binomial distribution chart for a one-sided (lower) confidence limit. The field quality control group conducted a detailed inspection of the sample connections and forwarded the inspection findings to project engineering for evaluation through NCR 1360.

The maximum undersize noted in the inspected welds was 1/16 inch. Engineering evaluation of these weld connections indicated that the stresses under as-built conditions do not exceed the design stresses.

Specification C-304, Rev 4 permits an oversize of 3/16 inch for the welds under discussion. Nine welds were found to exceed this limit, but the stresses under as-built conditions are well below the design stresses.

Convexity height, rollover, and weld reinforcement can be accepted without limit because these conditions occur at a minimal rate and do not reduce the efficiency of the weld joints in this type of application.

Based on the above evaluation, project engineering concludes that all connections inspected are adequate to meet the design conditions specified. Because all inspected welds are adequate and meet the specified design conditions and based on the sample size used, it can be stated with a 95% level of confidence that at least (but not limited to) 94% of all the weld assemblies meet or exceed the design requirements. Therefore, project engineering concludes that the adequacy of the quality of all the inspected welds is representative of the quality of welds in the uninspected support connections.

NCR 1360 was dispositioned on June 29, 1978.

Corrective Action

The following corrective actions have been taken:

I. The quality control engineers received training on February 13 and April 6, 1978, designed to prevent further problems. Although the session conducted on February 13 preceded issuance of MCAR #23, the subsequent discrepancy reports and nonconformance reports issued since the training session in this area and a review of the quality trend program indicate that the referenced welds were performed prior to the training. The instruction required two training sessions and provided direction in the following topics:

   A. Undersized Fillet Welds

   B. Fillet Welds

      1. Proper use of "fibermetal" fillet gage.
      2. Actual weld coupons were examined which showed known defects and irregularities.
      3. Discussion of tolerances.

   C. AWS D1.1 weld symbols were discussed including their definitions.

II. The weld engineers were directed by Welding Notice 28, dated February 13, 1978, to provide instruction to the craft welders pertinent to this problem. Employing the same rationale used above, it is felt this training also postdates the deficiency.

III. The technical specification has been revised to mitigate further problems. SCN-C-304-8002, issued March 30, 1978, states in part, "Welds shall conform to the visual inspection acceptance criteria of AWS D1.1...Minimum fillet weld sizes shall be per AWS D1.1, Section 8.15.1.6...Maximum underrun for fillet weld lengths shall not exceed 1/4 inch, except for weld end returns, underrun shall not exceed 1/8 inch for each return." This specification change notice originally written to address MCAR #21 is applicable to and clarifies the welding specification for MCAR #23.

IV. A more rigorous application of the QCI instructions has been instituted through training and monitoring by quality control. The stated inspection technique is no longer being modified by applying qualifying judgement and practical experience. QC welding engineers have been directed to perform weld inspections on all hanger field fillet attachment welds in strict accordance with Special Instruction 8 and ACT/TASK 3.1 of PQCI/7220 W-1.000, Rev 3.

Special emphasis is being placed on Special Instruction 8 regarding the definition of (V&M) which states, "Visually examine to detect the apparent worst condition, take a measurement to verify acceptance, and visually compare the other items based on this measurement."

V. The initial placement of hold tags prevented the use of possibly deficient cable tray supports. Training and strict implementation of the inspection procedure should prevent further problems in this area. Nonconformance reports 1287 and 1306, which prompted the issuance of MCAR #23, have both been dispositioned "use as is." All hold tags were removed on May 30, 1978.

VI. Revisions to weld acceptance requirements have been developed to modify inspection criteria for electrical supports in Specification 7220-C-304. These revisions have been submitted for review by Consumers Power Company and will be issued after coordination with them is complete.

Reportability

Project engineering's evaluation indicates that the discrepancies of the weld sizes are reported in NCRs 1287, 1306, and 1360 do not present a potential detrimental effect to the public safety and are not a reportable condition within the requirements of the Nuclear Quality Assurance Manual, Section V, Number 10.

Prepared by: V. Lakshminarayan

Reviewed by: [illegible]

Approved by: [illegible]

Concurrence by: Karl Wiedner

VL/jp

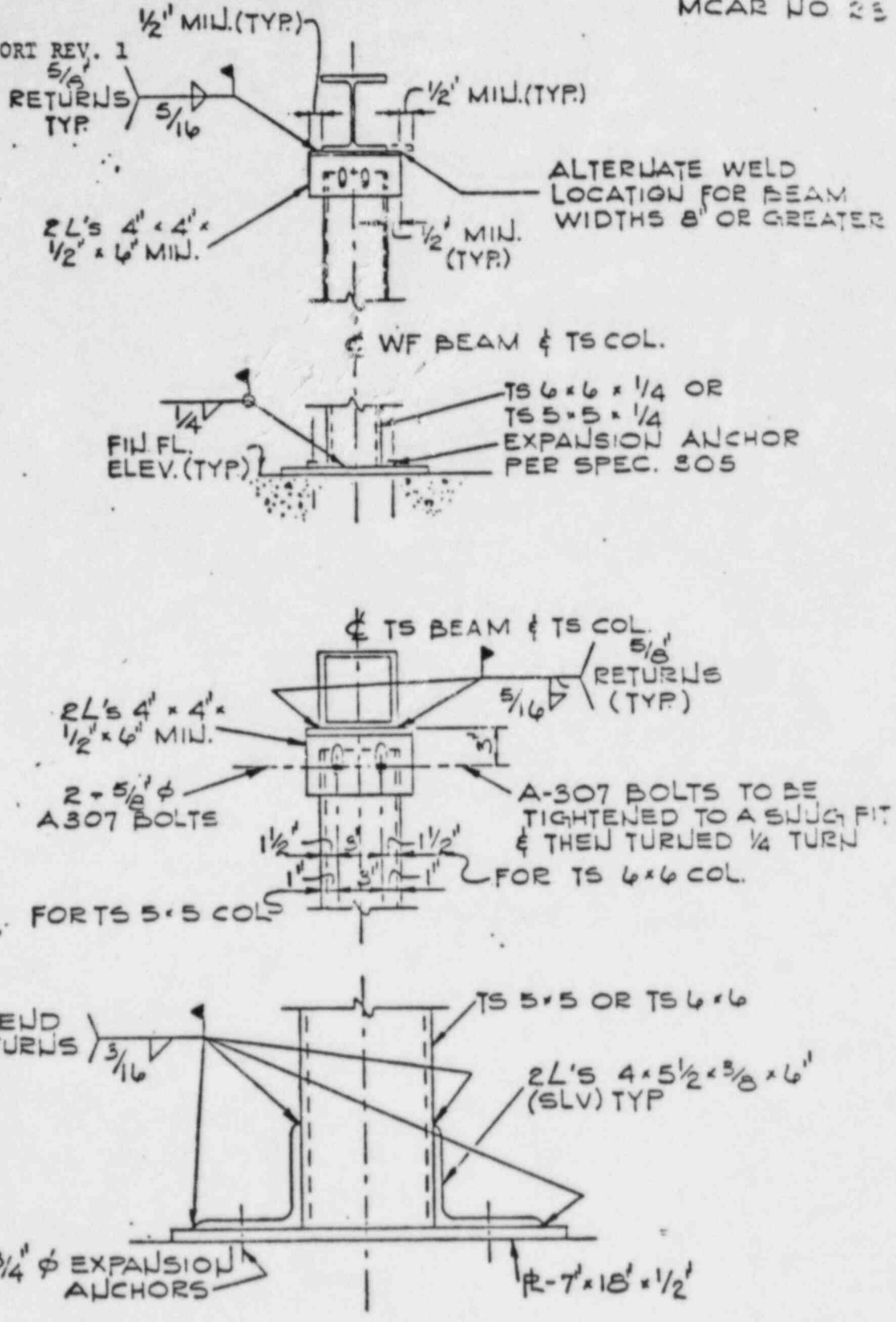


FIG 1 TYPICAL UPPER & LOWER SUPPORT COLUMN CONNECTION

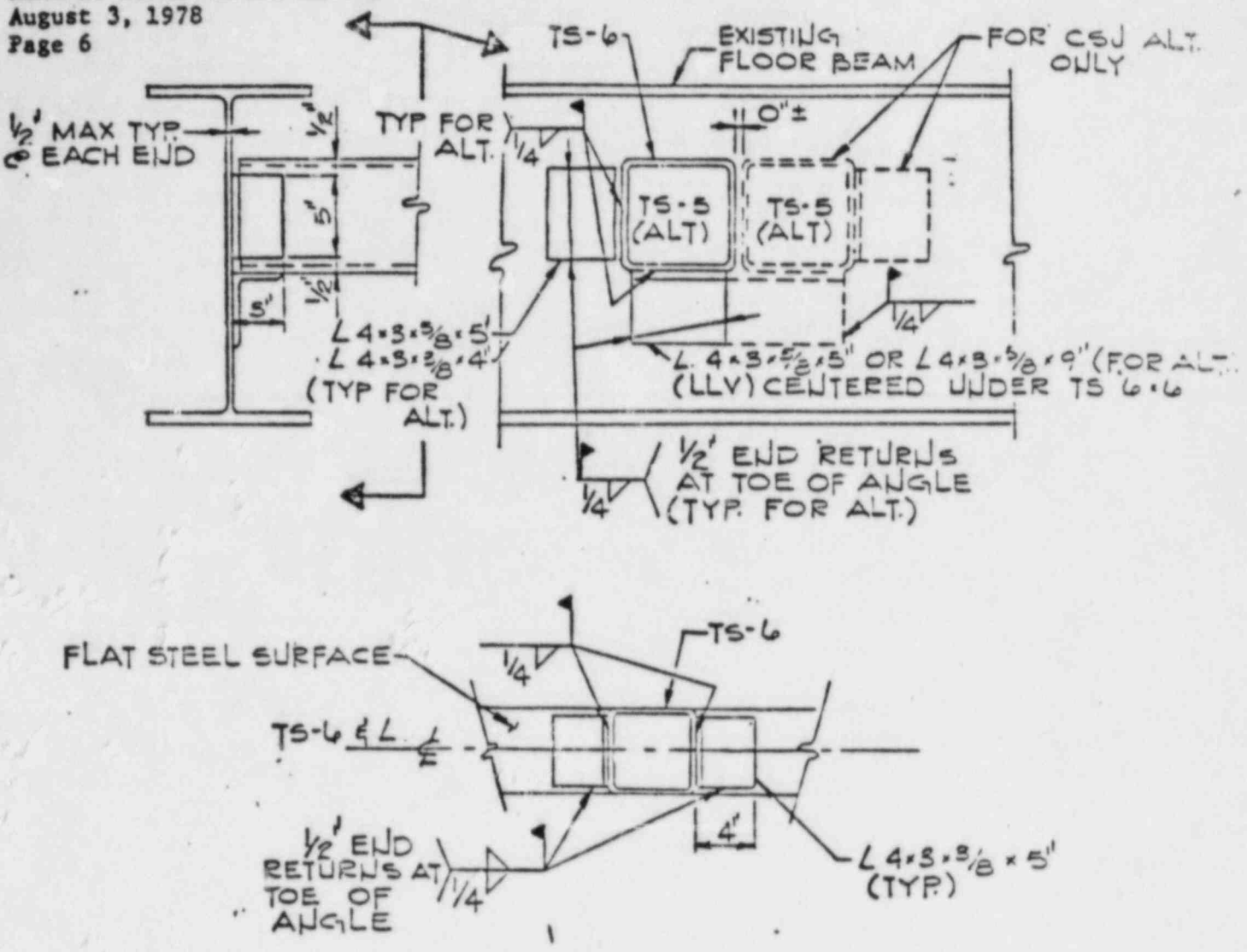


FIG. 2 TYPICAL CROSSOVER BEAM CONNECTION

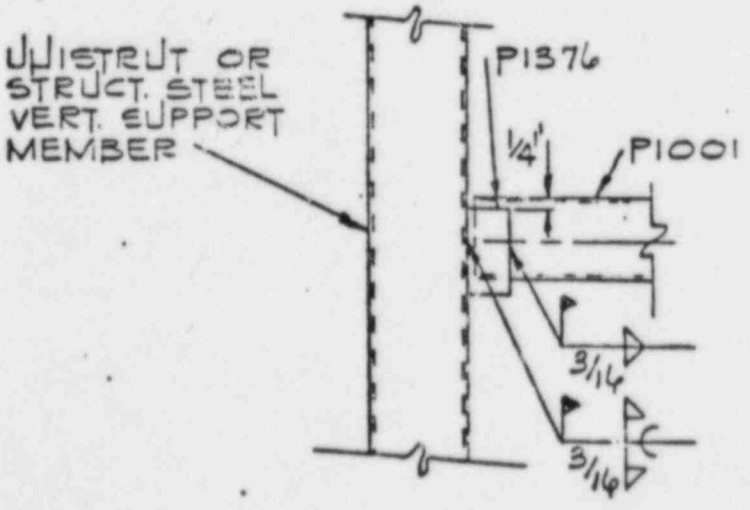


FIG. 3 TYPICAL HORIZONTAL TO VERTICAL STRUCT. MEMBER CONNECTION

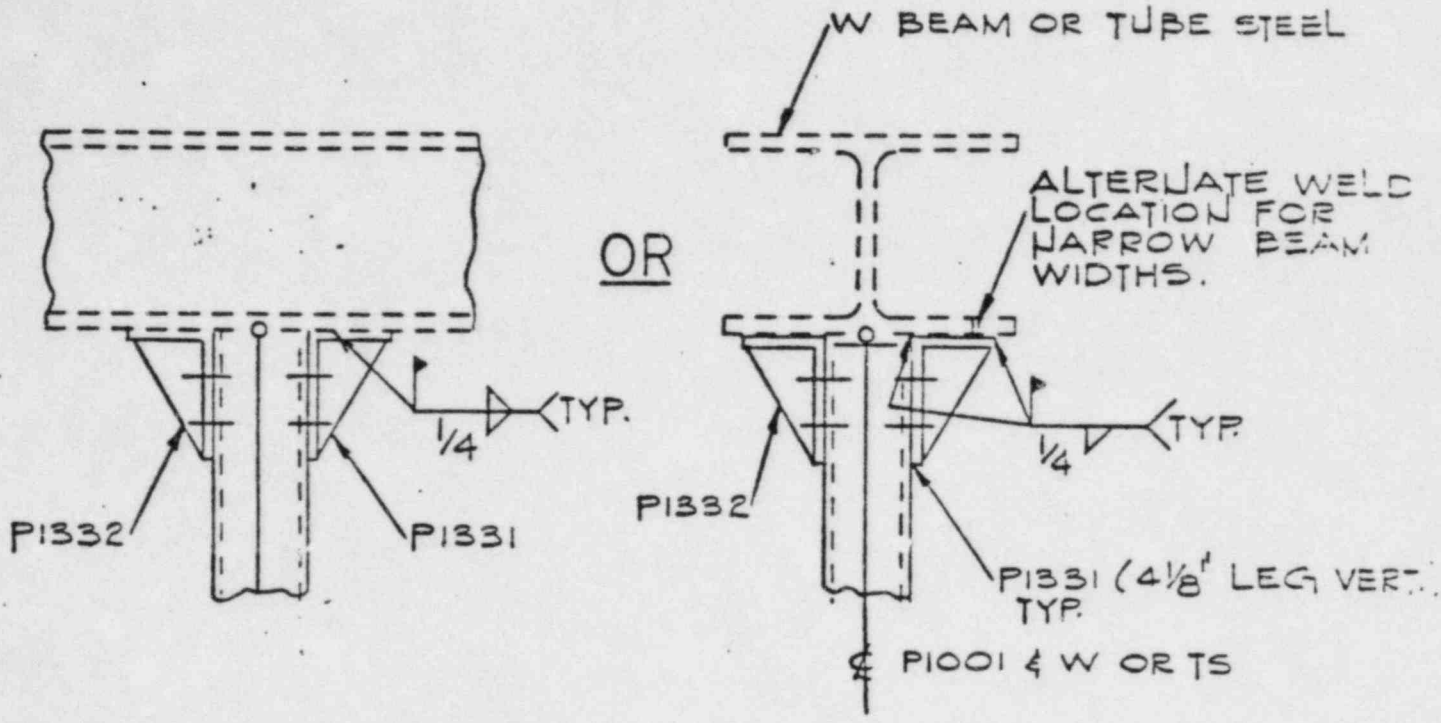


FIG. 4 TYPICAL VERTICAL HANGER CONNECTION

NONCONFORMANCE REPORT

1. PROJECT NAME: Midland	JOB NO.: 7220				19. NO. 987	20. PAGE 1 of 2
2. UNIT(S): #1	3. DRAWING/PART NO.: E-710	REV: 3	4. ITEM DESCRIPTION: Seismic Cable Tray Supports		5. ITEM LOCATION: Aux. Bldg. Cable Spreader Room 616	
6. P.O. OR SPEC NO.: N/A	7. SERIAL NO.: N/A	8. REPLACEMENT PART P/N N/A REV N/A SER NO. N/A	9. SOURCE: Construction	10. CONTRACTOR/SUPPLIER: N/A		
11. INSPECTION CRITERIA ( ) DWG (X) SPEC ( ) OTHER	IR NO. C304-244W NO. C304 Rev. 2	12. ASME AUTHORIZED INSPECTION REQ'D ( ) YES (X) NO	13. SKETCH ATTACHED ( ) YES (X) NO	14. Discovered During ( ) Rec'g (X) Const ( ) Test	15. Equip Furnished By ( ) Client ( ) Eng (X) FLO	

16. NONCONFORMING CONDITION:

Specification C-304 Rev. 2, paragraphs 6.1.2, 6.1.5 and 6.1.6 state:

6.1.2 "Each weld shall be uniform in width and size...welding shall be smooth and free of slag, cracks, pinholes and undercut... the cover pass shall be free of coarse ripples, high crown and deep ridges or valleys between beads."

6.1.5 "Repairs, chipping or grinding of welds shall be done so as

17. REPORTED BY: [signature] DATE: 10/13/77

18. VALIDATED BY: [signature] DATE: 10-13-77

21. ROUTING: (X) TO FIELD ENGINEERING ( ) TO OTHERS (SPECIFY)

22. ( ) Field Engineering Disposition (X) Field Engineering Recommended Disposition to Project Engineering

DISPOSITION REQUESTED BY: 5-19-78

[illegible] for Acceptance with Specification

[signature] 11-30-77

[signature] 11-30-77

Revise disposition as shown in Block 22 continued on page 2.

23. PROJECT ENGINEERING DISPOSITION

Project Engineering has reviewed blocks 16 and 22 as noted above, and concludes that excess fillet welds do not compromise the integrety of the structure, in addition oversize fillet welds tend to aid in the distribution of stresses in the welded area. Therefore, for the fillet welds that are oversized, but otherwise conform to the requirements specified in specification C-304, Project Engineering concurs with the Field Engineering's disposition to "use as is".

[signature] 6-26-78 [signature] 6-26-78 [signature] 6-26-78

24. DISPOSITION CONCURRENCE

rework	reject	repair	use as is
X			

[signature] 12/5/77
PROJECT FIELD ENGINEER DATE

[signature] 6-21-78
PROJECT ENGINEER DATE

[signature] 12-1-77
PROJ CONSTR QC ENGINEER DATE

AUTHORIZED INSPECTOR DATE

25. DISPOSITION RESULTS

As is is Dispositioned

Sketch 25 required

Further Action

[signature] 7/5/78

26. QC ACCEPTANCE [signature] 7/5/78
QC ENGINEER DATE

AUTHORIZED INSPECTOR DATE

NONCONFORMANCE REPORT (CONT'D)

Block 16 continued:

Not to gouge, groove, or reduce the base metal thickness."

6.1.6 "Welding is subject to inspection prior to painting..."

Contrary to the above, the fillet welds on seismic supports (Aux. #1, Cable Spreader Room, el. 646') have coarse ripples, high crowns, excessive convexity and undercut. The base metal has been ground and grooved to unacceptable thicknesses. Fillet welds have been added that are not shown on the weld detail drawings. The fillet welds have been blasted and painted before final visual acceptance by Q.C.

"Q" Number 3.005

Hold for Engineering Disposition

30 59 Hold Tags Applied on columns in Lower Spreader Room
J.H. 10/11/77

~~[illegible]~~ There were no records of this. NCR was reopened, reinspected & closed in 1980.

BLOCK 22 CONTINUED:

1. Field Engineering recommends disposition "rework" for all fillet welds that have coarse ripples, high crowns, excessive concavity or convexity, and where the base metal has been ground and grooved to unacceptable thicknesses.
2. Field Engineering recommends disposition "use as is" for all oversize fillet welds that are otherwise conforming to specification C-304.

J.R. Barber 5-8-78

NCR # 987
Page 1 of 2
Electrical Cable
Tray Welds
in Mix. Bldg.

NCR Items
ARE FLAGGED

MEMORANDUM

TO: LOCATION:

FROM: DATE: 19

SUBJECT: NCR # 987 JOB NO.

FILE

Col # 6 - 2 arms excessive grinding & undercut
" 7 - 3 arms undercut & excessive Weld crown
" 9 - 4 arms excessive Weld crown
" 10 - 5 arms excessive Weld crown
" 27 - Weld made across the structural steel flange
" 34 - 1 arm undercut
" 67 - 2 arms painted before final insp by QC
" 68 - 2 arms " " " " " " " moisture to clip
" 69 - 7 arms " " " " " " " "
" 70 - 1 arm undercut, 1 arm painted b/f insp, 1 gouge in T.S. vert.
" 71 - 1 arm painted before final insp.
" 75 - 4 arms " " " "
" 77 - 1 tube steel arm not completely welded, painted over
" 78 - 1 arm undercut - 3 arms painted before final insp.
" 79 - 4 arms painted before final insp.
" 80 - 2 arms undercut & undersized welds
" 81 - 1 arm poor welds
" 82 - 3 arms porosity & undercut
" 83 - 4 arms undercut, undersize & painted before final insp.
84 - 1 arm undersize welds
92 - Same cond as col # 27
54 - 1 arm porosity & undercut

D. WILLIAMS
D. BLEVINS
C. RICHARDSON

DISCREPANCY REPORT

QCIR NO. C-3011-2 AAM

PAGE 1 OF 1

Item No.	Area/Location	Item	Discrepancy	QCE Int. Date	Rework Description	QCE Accept Date
13.2	AUX BLDG UNIT #1 EL. 646' TO 656' H TO KC E-6 TO 6.6	SEISMIC SUPPORTS LOWER CABLE SPREADING ROOM	60 TO 70 % OF ALL THE FILLET WELDS ON THE SEISMIC SUPPORTS CANNOT HAVE A FINAL Q-C ACCEPTANCE MADE BECAUSE OF THE FOLLOWING: 1- OVERSIZE FILLET WELDS PER DRAWINGS & AWS D-1.1 CRITERIA. 2- WELDS ADDED THAT DO NOT SHOW ON THE DRAWINGS 3- WELD END RETURNS; SOME ARE TOO MUCH, OTHER ARE NOT ENOUGH 4- UNDERCUT IN EXCESS OF STANDARDS 5- SLAG ENTRAPPED IN THE WELDS 6- WELDS NOT OF UNIFORM SIZE (BIG AT THE BOTTOM, LITTLE AT THE TOP OF THE SAME WELD) 7- EXCESS CONVEXITY OF FILLETS 8- COLD LAP OF WELDS. ALL OBJECTIONABLE WELDS HAVE BEEN MARKED BY Q.C. WELDING ENGINEERING WITH WHITE P.T. DEVELOPER	RMT 9-13-77	This DR was upgraded to an NCR. SEE NCR# 987 Issued 10-13-77 RDQ 12-3-77	RDQ 12-3-77

Form QC-DR-1
Rev. I

NONCONFORMANCE REPORT (CONT'D)

1. PAGE 5 OF 5 — 14. NCR NO. 987

24. Disposition Concurrence Item

REWORK	REJECT	REPAIR	USE AS IS
			X

See Block 24 page 1 — PROJECT FIELD ENGINEER — DATE

See Block 24 page 1 — PROJECT ENGINEER — DATE

Barclay — PROJECT CONSTR QC ENGINEER — 7/7/78 DATE

AUTHORIZED INSPECTOR — DATE

24. Disposition Concurrence Item

REWORK	REJECT	REPAIR	USE AS IS

PROJECT FIELD ENGINEER — DATE

PROJECT ENGINEER — DATE

PROJECT CONSTR QC ENGINEER — DATE

AUTHORIZED INSPECTOR — DATE

24. Disposition Concurrence Item

REWORK	REJECT	REPAIR	USE AS IS

PROJECT FIELD ENGINEER — DATE

PROJECT ENGINEER — DATE

PROJECT CONSTR QC ENGINEER — DATE

AUTHORIZED INSPECTOR — DATE

24. Disposition Concurrence Item

REWORK	REJECT	REPAIR	USE AS IS

PROJECT FIELD ENGINEER — DATE

PROJECT ENGINEER — DATE

PROJECT CONSTR QC ENGINEER — DATE

AUTHORIZED INSPECTOR — DATE

24. Disposition Concurrence Item

REWORK	REJECT	REPAIR	USE AS IS

PROJECT FIELD ENGINEER — DATE

PROJECT ENGINEER — DATE

PROJECT CONSTR QC ENGINEER — DATE

AUTHORIZED INSPECTOR — DATE

24. Disposition Concurrence Item

REWORK	REJECT	REPAIR	USE AS IS

PROJECT FIELD ENGINEER — DATE

PROJECT ENGINEER — DATE

PROJECT CONSTR QC ENGINEER — DATE

AUTHORIZED INSPECTOR — DATE

24. Disposition Concurrence Item

REWORK	REJECT	REPAIR	USE AS IS

PROJECT FIELD ENGINEER — DATE

PROJECT ENGINEER — DATE

PROJECT CONSTR QC ENGINEER — DATE

AUTHORIZED INSPECTOR — DATE

24. Disposition Concurrence Item

REWORK	REJECT	REPAIR	USE AS IS

PROJECT FIELD ENGINEER — DATE

PROJECT ENGINEER — DATE

PROJECT CONSTR QC ENGINEER — DATE

AUTHORIZED INSPECTOR — DATE

24. Disposition Concurrence Item

REWORK	REJECT	REPAIR	USE AS IS

PROJECT FIELD ENGINEER — DATE

PROJECT ENGINEER — DATE

PROJECT CONSTR QC ENGINEER — DATE

AUTHORIZED INSPECTOR — DATE

24. Disposition Concurrence Item

REWORK	REJECT	REPAIR	USE AS IS

PROJECT FIELD ENGINEER — DATE

PROJECT ENGINEER — DATE

PROJECT CONSTR QC ENGINEER — DATE

AUTHORIZED INSPECTOR — DATE

24. Disposition Concurrence Item

REWORK	REJECT	REPAIR	USE AS IS

PROJECT FIELD ENGINEER — DATE

PROJECT ENGINEER — DATE

PROJECT CONSTR QC ENGINEER — DATE

AUTHORIZED INSPECTOR — DATE

24. Disposition Concurrence Item

REWORK	REJECT	REPAIR	USE AS IS

PROJECT FIELD ENGINEER — DATE

PROJECT ENGINEER — DATE

PROJECT CONSTR QC ENGINEER — DATE

AUTHORIZED INSPECTOR — DATE

Vandele

JUN 13 1978

Docket No. 50-329
Docket No. 50-330

Consumers Power Company
ATTN: Mr. Stephen H. Howell
Vice President
1949 West Parnall Road
Jackson, MI 49201

Gentlemen:

Thank you for your three letters dated May 12, 1978, pursuant to 10 CFR 50.55(e) regarding seismic cable tray supports, decay heat removal pump radiography, and small break analysis. We will complete our review of these matters upon receipt of your final reports.

Your cooperation with us is appreciated.

Sincerely,

R. F. Heishman, Chief
Reactor Construction and
Engineering Support Branch

cc w/ltrs dtd 5/12/78:
Central Files
Reproduction Unit NRC 20b
PDR
Local PDR
NSIC
TIC
Ronald Callen, Michigan Public
Service Commission
Dr. Wayne E. North
Myron M. Cherry, Chicago.

RIII	RIII	RIII	RIII
Vandel/ls	Cook	Hayes	Heishman
6/12/78			

8006120785

12/28/83
9:49 AM

JAY.

You were called on 12/28/83 by Bruce Burgess of Midland.

On Dec 27, 1983, U.S. Testing issued a stop work order against themselves for Control copies of QA Manuals not being updated.

They pulled all control copies of QA manuals while work was in progress resulting in work being performed without QA manuals.

Please call him if you have questions

J. Kneisley

J. Harrison

CONSUMERS
POWER
COMPANY

Projects, Engineering
and Construction
Midland Project Quality
Assurance Department

ORAL COMMUNICATIONS RECORD

Chron File No: 0921.1,
0485.21

Date of Communication: 1/3/84
Time of Communication: 2:05 PM

MPQA Personnel Participating: WRBird, PMilano
Other Party(s): DHood, NRC, BHarshe, CPCo
DSommers, CPCo

Prepared By: WRBird WRB

Projects and/or Subjects Discussed: SPATIAL SYSTEMS INTERACTION

Summary of Conversation:

Reference: Letter, D Hood to J W Cook, dated 12/7/83

As an introduction, D A Sommers read the statement in question for everyone.

1. We clarified that the system interaction program was not specifically tied into the resolution of the FCR/FCN condition. Rather, the system interaction program compliments general design review in that it provides an opportunity to pick up conditions which could have a generic implication not addressed in current design criteria.

2. We identified that QA does not look at non-Q designs.

3. We described that the condition where QA had not reviewed an FCR on a non-Q specification which was made also applicable to a Q specification was a temporary (or

JAN 18 1984

interim) condition in that MPQAD does review all changes to Q specifications at time of incorporation. The MPQAD review would only be lacking while the FCR remained unincorporated into the base specification. This condition is eliminated when the specification is actually revised and given a new revision number.

D Hood and B Harshe had an extended conversation of what was really meant by point #1 and what the system interaction team was looking for versus the engineering practices in place during non-Q design to avoid system interactions. At the end of the discussion, Mr Hood stated that he heard some new information in this clarification with respect to some of the statements made at the October 26 meeting, but that the understandings he came away with from the October 26 meeting remain valid.

It was discussed that in addition to the system interaction walkdowns, there were other inspections/walkdowns by the project which specifically look for compliance to the project design criteria in regards to separation of Q and non-Q. This includes the reinspection by QC for the Quality Verification Program and area and system walkdowns in support of turnover.

The meeting concluded with Mr Hood stating that he had recently documented two other SSIP meetings from 6/14/83 and 11/29-30/83 and to call him if we had any questions on those minutes.

WRB/lr

CC: DMBudzik
JEBrunner
RJErhardt
HPLeonard
DATaggart
RAWells
DHood

Dave Summers 81128

JWC
D Budzik

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

DEC 7 1983

Docket Nos.: 50-329, 50-330

APPLICANT: Consumers Power Company

FACILITY: Midland Plant, Units 1 and 2

SUBJECT: SUMMARY OF OCTOBER 26, 1983 MEETING ON SYSTEMS INTERACTION PROGRAM

On October 26, 1983, Messrs. B. Harshe and M. Capicchioni of Consumers Power Company visited D. Hood and M. Miller of NRC to discuss the Systems Interaction (SI) Program for Midland Plant, Units 1 and 2. The purpose of the brief visit was to notify NRC of CPCo's decision to start the resolution process for the seismic portion of the SI program, prior to staff review of CPCo's October 19, 1983 letter forwarding associated procedures. Mr. Harshe stressed that any adjustments to the program due to future staff comments would be accommodated at a later date. CPCo's need to start the program further results from the recent discovery that the quality assurance organization had not been reviewing design changes for non-safety-related work which might affect safety-related systems (see Board Notification 83-167, dated October 28, 1983 and Management Corrective Action Report 73 dated October 27, 1983).

The staff recognized the desirability of obtaining an early assessment of the significance and extent of the matters discussed in BN 83-167, and agreed to expedite scheduling of a meeting in November 1983 to discuss SI procedures. Other background submittals describing the SI program are dated January 28 and June 7, 1983.

Darl Hood, Project Manager
Licensing Branch No. 4
Division of Licensing

H.

cc: See next page

8312200009

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

December 27, 1983

PRINCIPAL STAFF			
DRA		DP-P	
D/RA		DE	
A/RA		DRMSP	
RC		DRMA	
PAO		SCS	
SGA		ML	
ENF		File	

Docket Nos.: 50-329, 50-330

APPLICANT: Consumers Power Company

FACILITY: Midland Plant, Units 1 and 2

SUBJECT: SUMMARY OF JUNE 14, 1983 MEETING ON SYSTEMS INTERACTION

On June 14, 1983, the NRC met in Bethesda, Maryland with Consumers Power Company (CPCo), Bechtel and CPCo consultant, Mark Jones, to discuss the spatial systems interaction (SSI) program for Midland Plant, Units 1 and 2. Meeting attendees are listed in Enclosure 1.

The SSI program was first outlined to the NRC during a June 2, 1982 meeting with the ACRS Subcommittee. Development and implementation of the Midland program is proceeding in parallel with development of Unresolved Safety Issue A-17 discussed in Appendix C of the Midland SER. The SSI program is further described in CPCo letters dated January 28 and June 7, 1983. Much of the meeting consisted of a review of information from the January and June 1983 letters, and is not repeated in this summary. Enclosure 2 shows the meeting agenda and other visual aids used during presentations by or on behalf of CPCo.

Some structures, systems and components which are not needed to accomplish a safety function for nuclear power plants are, nevertheless, generally recognized to be important to safety because they contribute to the safe operation of the plant and to the protection of the public. Also, a component can be important to safety because its failure could challenge or even impair achievement of the safety function of a nearby safety system, such as by adverse physical impact due to seismic forces. The purpose of the Midland SSI program is to identify such significant adverse interactions by conducting plant walkdowns by special teams, assure that appropriate analyses are performed by discipline engineers, and provide for any necessary plant modifications.

The Midland SSI program is intended to detect three types of adverse interactions: (1) safety grade - safety grade interactions, (2) non safety grade - safety grade interactions, and (3) non safety grade - non safety grade cascading interactions which include a safety grade interaction. The meeting discussed the procedures for performing the search (walkdown) for seismic systems interactions and associated administrative details. Procedures for resolution of identified potential interactions were not included and will be presented to the staff at a later date. An initial walkdown is being performed at the present stage of plant construction; a final comprehensive walkdown will be performed once sufficient construction of systems and areas have been completed.

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The NRC staff asked several questions regarding the quality of non-safety grade equipment and the justification to be provided for associated assumptions used in analyses. CPCo will provide a description of the quality aspects for the design, fabrication and installation of non-safety grade commodities.

The seismic systems interaction program will be a 0 program, and an experienced third party consultant not involved with Midland original plant design will perform the SSI walkdowns and provide independent SSI seismic evaluations. In addition to audits by the Midland Project Quality Assurance Department, third party overviews will be conducted by Stone and Webster and (for certain systems) by the TERA Corporation.

CPCo is considering the possibility of using probabilistic risk assessments (PRAs) as part of the SSI program, but no decisions have been made at present. CPCo also stated that submittal of the Midland PRA to NRC had slipped from August 1, 1983 to late summer 1983. Further effort prior to submittal is being directed to the probability of early containment failure which may be unnecessarily high because motor-operated purge valves (which fail as-is upon loss of power) are used in the present Midland design.

Dari Hood, Project Manager
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Enclosures: As stated

cc: See next page

MIDLAND

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ENCLOSURE 1

ATTENDEES JUNE 14, 1983

D. Hood	LB4/DL/NRR
W. R. Speight	CPCo
B. Harshe	CPCo
F. Buckman	CPCo
T. Postlewait	CPCo
E. Tomlinson	PSB/DSI
B. LeFave	ASB/DSI
D. Sommers	CPCo
D. Budzik	CPCo
M. Jones	CPCo - Consultant
C. Morris	RRAB
E. Hull	Bechtel/OPD
R. Snaider	TERA
D. Lewis	Bechtel
D. Kopinski	Bechtel
A. Thadani	NRR/DST
J. Conran	NRR/DST
E. Chelliah	RRAB/DST/NRR
D. Lasher	RRAB/DST/NRR
W. Haass	IE/OUAB
J. Spraul	IE/OA Branch
F. Coffman	NRC/RRAB
R. Kirkwood	NRC/DE/MEB
J. Gilray	NRC/OAB
T. Novak	NRC/DL/NRR
L. Gibson	CPCo
R. Teuterberg	CPCo/Engineering
B. Bosnak	MEB/NRC

ENCLOSURE 2

VIEWGRAPH SLIDES USED DURING

JUNE 14, 1983 PRESENTATION

AGENDA

Systems Interaction Meet - 6/14/83

1. OVERVIEW OF THE MIDLAND SYSTEMS INTERACTION PROGRAM

2. SPATIAL SYSTEMS INTERACTION - PHILOSOPHY
   - COORDINATION OF PRIMARY & SECONDARY WALKDOWNS
   - PLANT DESIGN BASIS
   - CRITERIA FOR IDENTIFYING ITEMS IMPORTANT TO SAFETY
   - A.2 OF KEPPLER LTR of March 25, 1983

3. SPATIAL SYSTEMS INTERACTION - IMPLEMENTATION
   - INTRODUCTION/OVERVIEW
   - EVALUATION TECHNIQUES R.G. 1.29 REQUIREMENTS
   - ACCEPTANCE CRITERIA FOR R.G. 1.29

4. DISCUSSION

SSIP/S INTRODUCTION/OVERVIEW

OBJECTIVE/SCOPE - FOLLOWING SSE

- MAINTAIN INTEGRITY OF REACTOR COOLANT PRESSURE BOUNDARY
- MAINTAIN FUNCTIONALITY OF SYSTEMS, COMPONENTS AND STRUCTURES NECESSARY TO:
  - Attain and Maintain Safe Shutdown
  - Prevent or Mitigate Radioactive Releases in excess of 10CFR 100

PROGRAM TO IMPLEMENT OBJECTIVE/SCOPE

- CP CO OVERALL CONTROL
- THIRD PARTY CONSULTANT (made some Eng. Const.)
- QUALITY ASSURANCE INVOLVEMENT Program made Appendix B
- PROGRAM MANUAL
- TARGET LIST (includes non-safety and Fire protection)
- WALKDOWNS
- INTERACTION IDENTIFICATION & RESOLUTION
- PLANT MODIFICATIONS
- DOCUMENTATION
- IMPLEMENTING PROCEDURES

THIRD PARTY CONSULTANT

- NOT INVOLVED IN ORIGINAL PLANT DESIGN
- PROVIDES INDEPENDENT SSIP/S EVALUATION
- SAME CONSULTANT PERFORMED DIABLO CANYON SSIP

QUALITY ASSURANCE INVOLVEMENT

- MIDLAND SSIP/S IS Q PROGRAM
- MPQAD REVIEWS AND APPROVES OF CONSULTANT'S QA MANUAL, QUALITY PLAN, PROGRAM MANUAL & IMPLEMENTING PROCEDURES
- MPQAD WILL AUDIT SSIP/S

PROGRAM MANUAL

- CONTROLLED DOCUMENT
- PROVIDES PROGRAM OVERALL DESCRIPTION
- PROVIDES DETAILED DESCRIPTION OF SOURCE EVALUATION AND ACCEPTANCE CRITERIA
- PROVIDES GUIDELINES & CRITERIA FOR EVALUATING INTERACTION EFFECTS
- PROVIDES TARGET CRITERIA INCLUDING TARGET COMPONENT LIST
- BASIC TOOL FOR USE BY WALKDOWN TEAM

TARGET LIST

- CONTROLLED DOCUMENT
- MIDLAND Q-LIST
- PROVIDES ASSURANCE ALL TARGETS HAVE BEEN WALKED DOWN
- INCLUDES ALL STRUCTURES, COMPONENTS AND SYSTEMS CONSIDERED NECESSARY TO MEET OBJECTIVE/SCOPE

WALKDOWNS

- PERFORMED BY A TEAM OF EXPERIENCED DEGREED ENGINEERS, FAMILIAR WITH SSIP/S METHODOLOGIES AND ANALYSIS METHODS AND TRAINED IN SSIP/S WALKDOWN PROCEDURES

- TWO BASIC 100% WALKDOWNS OF ALL TARGETS, BY AREA OR SYSTEM; ONE AT PRESENT STAGE OF CONSTRUCTION AND THE OTHER AFTER CONSTRUCTION HAS BEEN COMPLETED

- INTERMEDIATE WALKDOWNS AS APPROPRIATE

- MODIFICATIONS RESULTING FROM SSIP/S RE-EVALUATED FOR SSIP/S CRITERIA

INTERACTION IDENTIFICATION & RESOLUTION

- PER CONTROLLED PROCEDURES approved by MPQAD
- ALL INTERACTIONS NOT MEETING ACCEPTANCE CRITERIA ARE IDENTIFIED AND DOCUMENTED
- RESOLUTION BY:
  - (1) Walkdown Team at Time of Walkdown
  - (2) Later Analysis by Discipline Engineers
  - (3) Plant Modification

PLANT MODIFICATIONS

- NOT IN SCOPE OF SSIP/S CONSULTANT
- DESIGNED AND IMPLEMENTED BY ESTABLISHED PROJECT PROCEDURES

DOCUMENTATION

- INTERACTIONS IDENTIFIED ARE DOCUMENTED AND TRACKED TO ASSURE CLOSURE
- CONTROLLED PER PROCEDURE
- RESULTS OF PROGRAM SUMMARIZED IN FINAL REPORT

IMPLEMENTING PROCEDURES

- CONTROLLED AND AUDITABLE
- REVIEWED AND APPROVED BY CP CO ENGINEERING AND MPQAD
- COVER TASKS SUCH AS:
  1. CONSULTANT QA AUDITS & PERSONNEL
  2. CORRESPONDENCE AND DOCUMENTATION CONTROL
  3. ORIENTATION & TRAINING OF PERSONNEL
  4. PERFORMANCE OF WALKDOWNS AND INTERACTION RESOLUTION
  5. DOCUMENTATION OF POSTULATED INTERACTIONS
  6. PERFORMANCE OF PROJECT CALCULATIONS
  7. PERFORMANCE OF ENGINEERING TESTS
  8. PROJECT INTERFACE CONTROL

EVALUATION TECHNIQUES

- TARGETS IDENTIFIED
- SOURCE ACCEPTANCE CRITERIA
- WALKDOWN OF ALL TARGETS BY TEAM OF EXPERIENCED ENGINEERS
- IDENTIFIED INTERACTIONS RESOLVED BY ANALYSIS OR MODIFICATION

ACCEPTANCE CRITERIA FOR EVALUATIONS

- ALL POTENTIAL INTERACTIONS ARE IDENTIFIED PER PROGRAM
- ACCEPTANCE BASIS
  - Interaction Shown not to Occur
  - Target Damage Insufficient to Impair It's Safety Function

REG. GUIDE 1.29 SUMMARY

REASONABLE ASSURANCE PROVIDED THROUGH:

- SSIP/S Q PROGRAM
- PROGRAM CRITERIA CONSERVATIVE
- INTERACTION RESOLUTIONS PERFORMED USING CONSERVATIVE CRITERIA
- PROGRAM ACTIVITIES FULLY AUDITABLE

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6/14/83

SYTEMS INTERACTION SCOPE

- O SAFETY GRADE - SAFETY GRADE INTERACTIONS
- O NONSAFETY GRADE - SAFETY GRADE INTERACTIONS
- O Nonsafety Grade - Nonsafety Grade interactions (only for cases where they interact with Safety Grade)

SYSTEMS INTERACTIONS

THREE TYPES

- Spatial
- Functional
- Human

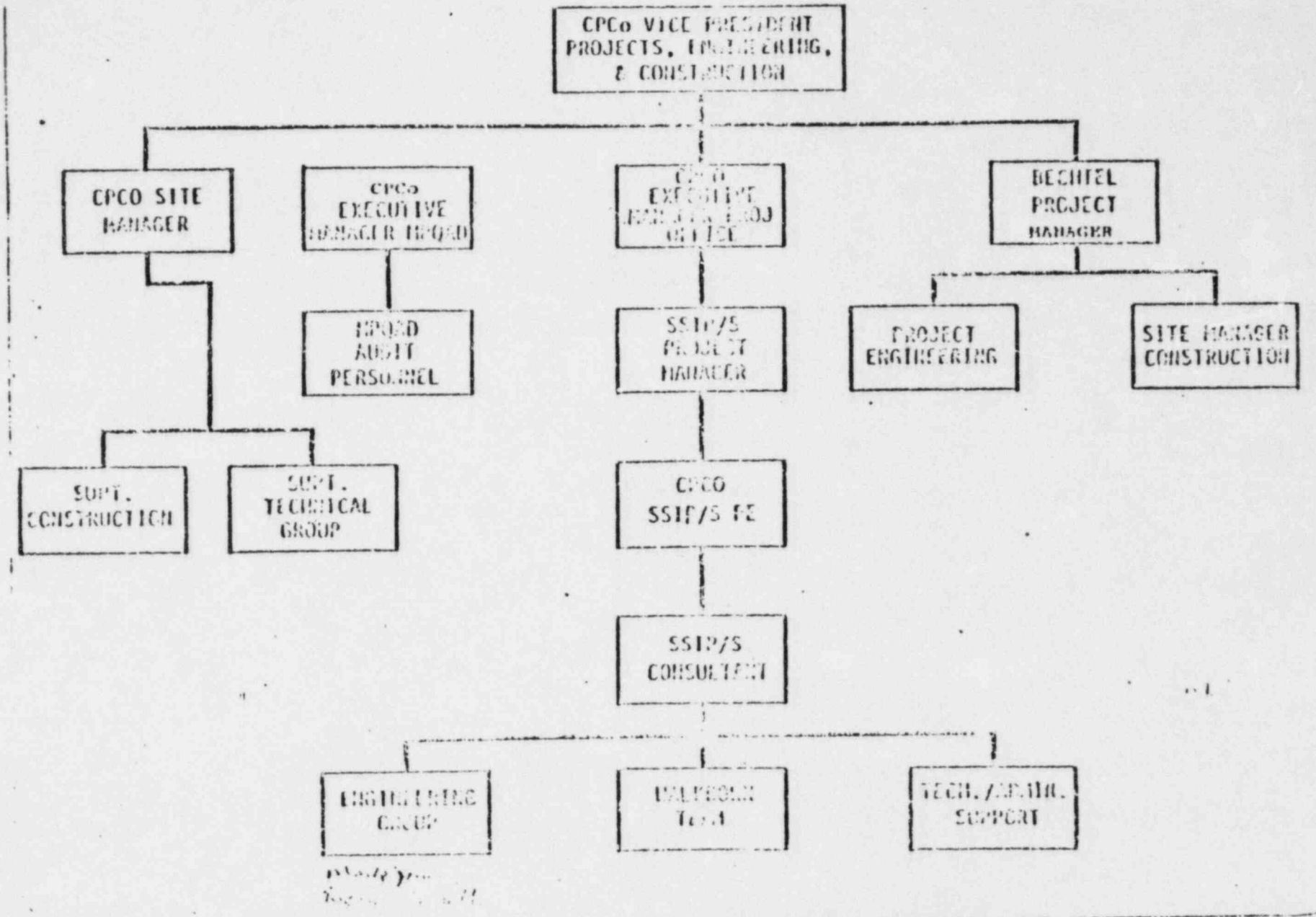
MIDLAND UNITS 1 AND 2
NRC MEETING 6/14/83

SPATIAL INTERACTIONS
(Addressed by Dale Wallerstedt)

- SEISMIC / PROXIMITY
- MELBA
- MATERIAL RECALLS
- FLOODS

FIGURE 7.2.1

SSIP/S ORGANIZATION CHART -
MIDLAND ENERGY CENTER



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HOLLAND UNITS 1&2
NRC MEETING 8/14/03

FUNCTIONAL ELEMENTS

- ADDRESSED BY:
  - Design Controls
  - Risk Assessment
  - Control Systems Failure Evaluation
  - [illegible]
  - [illegible]

[illegible] [illegible]

- ADDRESSED BY:
  - Operator Training
  - Control Room Design Review
  - [illegible]
  - [illegible]