THE M W. KELLOGG COMPANY

Sheet 1 of 4

PACIFIC GAS & ELECTRIC CO.

APPROVED FOR CONSTRUCTION

ENGINEERING DEPARTMENT

EX (1:11 | DATE (1747)

Spec No. P8-OB-F7-OTAW-4-60

Date: 5/7/71

Rev. Date: (0-11-71 ( Bomore 5% funcing)

\*\* 6/30/72

TITLE: SPECIFICATION FOR WELDING OF

Austernic Stainless Steel

SCOPE: This specification covers preparation, welding, weld finish, inspection and heat treatment of: Austontic Stainless Steel

BASE METAL: ABUR Section IX-PS Base Meterial

FILLER METAL AWS AS. 9 ER308 Ferrite Contro! Per Customer Specification

SUB ARC FILLY Mone

INSURT METAL None

TUNGSTEN ELECTRODE: AND ENTS - 2-25 Thoring. OMLY

TORCHINLET CAS PROPERTY TO BE A TOTAL TO COME S LINES ...

BACKITO ORE PURE per chart E-108P to have oxygen content below

POSITION. Welding shall be done in the Fixed angular position (60)

PROCESS. The welding shall be done by the CTAT

CURRENT The current used shall be shown on Sheet #3.

PREHEATING AND INTERPASS TEMP. : 60° F. Min. Interpass Tomp. 300° F. Max.

POST HEAT-TREATMENT: None

\*\* Argon purge not required on 1/3" wall and above for filler welds 'nly

APPROVED FOR
CONSTRUCTION
ENGINEERING DEPARTMENT

EY 777 DATE 7/67

STATION CONSTRUCTION DEFINITION OF THE STATE OF THE STATE

8708200178 870814 PDR FDIA DEVINE84-743 PDR THE M. W. KELLOGE COMPANY

Sheet 2 of 4

Date: 8/7/71

Rev. Date: (0-11-7)

9-21-71 Removes 5% Figure Price 1

Base Metal i reparation: The edges or surfaces of the parts to be joined by welding shall be prepared by flame cutting, plasma arc, grinding, machining or any combination of methods to form the geometry of the weld shown on Sheet #3. Surfaces for welding shall be clean and free from paint, scale, rust or other foreign materials that are detrimental to quality welding. (Flame cutting does not apply for s/s.)

Cleaning: All slag or flux remaining on any head of weld metal or on adjacent base metal shall be removed before depositing the next successive head.

Welding Technique Welding inchnique shall substantially be performed as shown on Sheet #3.

### Underside Groove Preparation:

Detects: All defects in welds requiring repairs shall be removed by gi inding, arc, chipping, gonging or machining. Repair welds shall be accomplished to a qualified procedure and the method of examination shall be the same of the briginal weld.

entire range of current against a for GIAW a remote foot control shall be used to initiate high frequency, are starting, current decay, to climinate crater indications.

dire qualifications dates, symbols and all pertinent information as to process and radiographic inspection.

Appearance of Wolding Beads: Each welding head shall show complete fusion to adjacent weld deposit and to base metal. The finished surface of the weld shall merge smoothly into the component surface.

inspection: Inspection shall conform to applicable job code.

even attemperatures recommended by electrodes and flux shall be kept in a dry rod even attemperatures recommended by electrode manufacturers to nummize moisture absorption. (This paragraph does not apply for OTAN.)

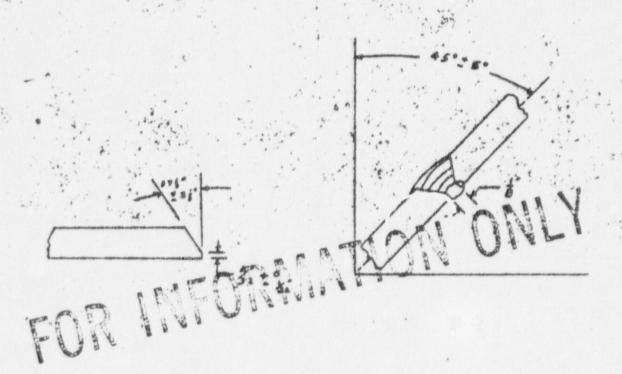
Welding Sequence There shall be a minimum amount of interruptions during welding. The maximum width of a weld bead shall be three times the core diameter of the filler wire. The maximum thickness of any layer shall be 1/5"/.

Sheet 3 of 4

Spec. No. P8-08-77-08 AV-4-60

8/9/92

Rev. Date: 6-11-71 9-21-71 REMOVED 590 FERRITE PROFI



Pass No.	Filler Metal Size	Filler Metal Type	AMPs	Volts	Polarity	Torch A Gas Flo-rate	Tungsten Size & Polarity
LL-OTAE	3/32"	RR-808	100-130	12-14	BIRALELI	288PR	3/32" Dia.
		1				***	

#### THE M. W. KELLOGG COMPANY

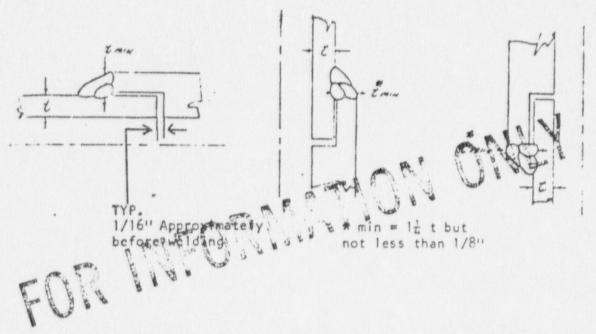
A Division of PULLMAN INCORPORATED

WELDING PROCEDURE SPECIFICATION NO. P8-08-F7-GTAW-4-6G

DATE: 4-26-68 Rev. 8/9/72\*

SHEET: 3A of 4-

#### GROOVE DETAILS - WELDING TECHNIQUE



Fillets may have 2, 3 or more passes to meet the min.  $1\frac{1}{4}$  t requirement.

WELDING	PASS	FILLER WIRE		POL.	SHIELDING GAS	AMP	ARC
PROCESS		DIA.	TYPE		AND FLOW RATE		VOLTS
		1/16			ARGON	70-120	
GTAW	ALL	3/32	ER-308	STRAIGHT	20 CFH	00-130	12-14

110 4.4	A Rellier Confiant	,
	A. Cartin	
1 1	St Wildram Fr	
	1111	

wArded fillet detail loss re ₹ cop. not an essential variable.

8

# PIPING FABRICATION

# RECOVMENDED FORM Q-1 MANUFACTURER'S RECORD OF WELDING PROCEDURE

Welding Process OF	Bearing & gr	Manual or Machine	8/7/71 WX
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Single or Multiple Are			M.O.M
Placement Account		ter Hern. A Fig. Q-2 &	Q-1. Or QN-2 & QN-3)
	FOR INLORMA	LILIN INLY	
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Type of Racking AZES	B 04.0	am; - m volta	inche d'pra mie
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***	1441		
GU	IDED BEND TESTS(Figs. Q-7.)	0-12. QN-7.1, QN-1.2	, QN-7.3)
Type and Figure No.	Keswi	Figure No.	Result
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See sheet 4 o	8.4		
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eated in accordance with	the requirements of Section 11	of the ASME Lude.	eids were prepared, weided and
		ward The M. W.	Kellogg Company
		(Ma	indacturer)
		11, Frank	Bulant.
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equired by the code. Kee	ommended toom of its availation	tor I wichase at ASME I	(cadeusness)
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THE B. W. KELLOGO COMPANY

Sheet 4 of 4

### RESNABICAL TESTING LABORATORY

	Specification Ne. 1	1-08-F	7 - QT AW	-4-60			Date	8/9/9	1		
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We certify that the statements in this record are currect and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

n dans Card

TILM. W. KELLOGG COMPANY
A Division of Pullman Incorporated
Piping Fabrication
Williamsport, Pa. 17701

Page 1 of 9 Weld Procedure Code No. 92/93 Spec. No. P1-08-F4-SMAW-2G-5G Date 4/4/67 Revision Dates 7/2/70, 3/16/70, Retyped 6/27/73, Retyped 12/3/73 11/11/76

PROCEDURE SPECIFICATION FOR: Carbon steel piping, SMAW (root and build-up), for socket welds, fillet welds, and for the welding-on of couplings. Coupling must be drilled or cut through before or after welding.

BASE METAL: The base metal shall conform to the specifications for ASME, Section IX, P-1 materials.

FILLER METAL: The filler metal shall conform to ASME Filler Metal Specifications Number SFA-5.1 for ferrous filler metal in Group Number F-4.

The chemical composition of the weld deposit shall fall within the limits of weld metal Analysis Number A-1.

GAS FOR TORCH SHIELD: Nominal composition of argon, 99.995% minimum purity (for CTAW process).

GAS FOR BACK UP PURGE: [NEAD [ ]

TACK WELDS FOR SET-UP: The GTAW process using filler metal type listed on Page 2 may be used with or without back-up purge in 1/16, 3/32 or 1/3" diameter. Test reports are Pages 5 & 6.

POSITIONS: The welding may be done in all positions.

PREHEAT A.10 INTERPASS: 50° F minimum. 175° F minimum for material that has a carbon content in excess of 0.30% and 1" thickness.

POST HEAT TREATMENT: 1100-1200° F 1 hour per inch minimum (see job specifications for cycle and thicknesses requiring post heat treatment).

BACKING STRIP: None

TRAVEL SPEED: SMAW - 1" - 8" per min

THIS PROCEDURE IS A REVRITE OF AND COMBINES: Code No. 92. PI-08-F4-SMAW-4-2C Code No. 93. PI-08-F4-SMAW-7-5G WELDING PROCESS: The welding shall be done by the SMAW root and weld out process using manual equipment. GTAW tack welding shall be done using a nonconsumable electrode of 2% Thoriated Tungsten, EWTH-2.

EASE METAL THICKNESS: This procedure is qualified to allow welding of unlimited thickness on structural members under AWS Requirements. When welding to ASME Requirements, the allowable material thickness for the 2G position is 1/16" to 0.56" and for the 5G position 3/16" to 0.812" (aswelded); and 3/16" to 3.25" (heat treated).

PREPARATION OF BASE MATERIAL: The edges or surfaces of the parts to be joined by welding shall be prepared by flame cutting, plasma arc, grinding, machining, or any combination of methods to essentially form the geometry of the weld shown on Page 2 as detailed on the attached sketches and shall be cleaned of all oil or greater and excessive amounts of scale of the state.

TLECTRICAL CHARACTERISTICS: The current used shall be DC SMAW - Reverse Polarity GTAW - Straight Polarity

JOINT WELDING PROCEDURE: The welding technique, such as electrode sizes, and voltages and currents for each electrode, size of the welding tip and filler rods, shall be substantially as shown on Page 2.

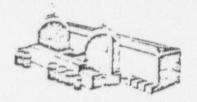
APPEARANCE OF WELDING LAYERS: The welding current and manner of depositing the weld metal shall be such that there shall be practically no undercutting on the side walls of the welding groove or the adjoining base material. See job specifications for specific undercutting limitations.

CLEANING: All slag or flux remaining on any bead of welding shall be removed before laying down the next successive bead of welding.

DEFECTS: Any cracks or blow holes that appear on the surface of any bead of welding shall be removed by chipping, grinding, or gouging before depositing the next successive bead of welding.

### INTEROFFICE MEMORANDUM

# Diablo Canyon Project



Harold Karner
Pullman Power Products

From D. A. Rockwell

of General Construction

At Diablo Canyon Extension

PACIFIC GAS AND ELECTRIC COMPANY BECHTEL POWER CORPORATION

Date January 24, 1983

File No.

Restraints
Reference Pullman Letter
Dated January 14, 1983

Weld procedure specification code 7/8 has been approved for the process and joint configurations itemized on the weld procedure specification are supported by tests and procedure qualification records (PQR) If not itemized a new WPS and PQR's are required.

since the square groove welds shown in your letter are not considered prequalified by AWS for SMAW in the material sizes shown and are not supported by tests and PQR's these welds are not allowed.

D. A. Rockwell

Assistant Project Superintendent

RTorstrom:fgm

cc:

HBFriend JBHoch JRManning JWShryock RDEtzler

FOR INFORMATION ONLY

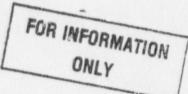
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# Pullman Power Products Corporation

Diablo Canyon Nuclear Project Post Office Box 367 Avila Beach, California 93424 Telephone (805) 595-2356

January 14, 1983

Mr. Jerry Arnold Pacific Gas & Electric Co. P O Box 117 Avila Beach, CA 93424

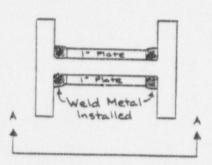


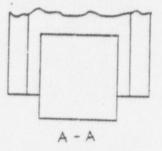
Subject: Weld Procedures for Rupture Restraint Welds

Attention: R. Torstrom

Dear Sirs,

There have been multiple welds made in Unit #1 and #2 with the following configuration:





The design drawing weld symbol was for a square groove weld.

Approved welding procedure was used to install these welds but a

Procedure Qualification Record was not prepared for this specific weld groove
detail thickness. (Weld Procedure Specification Code 7/8)

The referencing code A.W.S. D1.0-69, page 54, Section 5, paragraph 502 (a) states:

"Except for the procedures exempted in Art. 501, joint welding procedures which are to be employed in executing contract work under this Code shall be previously qualified prior to use by tests as prescribed in Appendix A, Part I, of this Code to the satisfaction of the Building Commissioner. The Commissioner, at his discretion, may accept evidence of previous qualification of the joint welding procedures to be employed."

(Building Commissioner interpreted as PG&E)



Mr. J. Arnold Pacific Gas & Electric Co.

January 14, 1983

PG&E has reviewed and accepted our welding procedures for use on Rupture Restraints.

Is it mandatory that Pullman Power Products qualify a Procedure Qualification Record for this joint detail and every joint detail not considered a prequalified joint by A.W.S.?

Thank you for your prompt attention.

Harold W. Karner QA/QC Manager

HWK/dd

FOR INFORMATION
ONLY

n.R.C.

### Pullman Power Products Corporation

DATE:

JANUARY IT, 1984

Diablo Canyon Nuclear Project

Post Office Box 387

Avila Beach, California 93424 Telephone (805) 595-2356

TO:

J. ARNOLD, PG&E

FROM:

C. M. NEARY, QEG WELDING ENGINEER
H. W. KARNER, FIELD QA/QC MANAGER

SUBJ:

INFORMATION REQUESTED BY NRC (WEEK OF 1/9/84)

The NRC has requested information concerning Pullman Power Products welding and welding procedures as used at Diablo Canyon. The subject matter and responses are as follows:

1) SUBJECT:

CLARIFICATION OF THE RELATIONSHIP BETWEEN WELDING PROCEDURE SPECIFICATIONS (WPSs) AND WELDING TECHNIQUE SPECIFICATIONS

RESPONSE:

Pullman Power Products' WPSs are qualified and documented in accordance with ASME Section IX (for example, WPS 7/8). When these WPSs are to be used for welding within the scope of AWS D1.1, the WPS can be used in conjunction with the welding technique specification. The welding technique specification lists additional base materials permitted for use under AWS D1.1 and also provides additional joint details for use under AWS D1.1.

The preheat requirements of AWS D1.1 are also contained within the welding technique specification. Welding Technique Specifications were used to control welding to repair the rupture restraints (contract specification 8833XR).

2) SUBJECT:

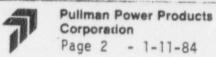
EVALUATION OF THE EFFECT OF WELDING ON NOTCH TOUGHNESS OF HSLA RUPTURE RESTRAINT STEELS

RESPONSE:

A441, A572 (Gr 42 & 50) and A588 GrA steels were welded during the fabrication of the Rupture Restraints at Diablo Canyon. An evaluation has been performed to determine the effect of welding on the notch toughness of these steels. The difficulty in welding a material without lowering the notch toughness of the material may be estimated by the carbon equivalent (CE). The higher the CE value, the more difficult it is to successfully weld the material. The CE formula is:

 $\frac{\text{CE} = \%\text{C} & \frac{\%\text{Mn}}{4} & \frac{\%\text{Ni}}{20} & \frac{\%\text{Chr}}{10} & \frac{\%\text{Cu}}{40} - \frac{\%\text{Mo}}{50} - \frac{\%\text{V}}{10}$ 

The respective CEs based on worst case per spec chemistry. ranges are:



CE588 = .59 CE572-42 = .55

CE441 = .54 CE572-50 = .57

Clearly, A 588 is the most difficult material to weld. Test welding of A588 was performed (see attached PDR 467). Even with low preheat temperatures (50°F) and high heat inputs (62KJ/in) the notch roughness of the HAZ was significantly improved with respect to the base metal.

3) SUBJECT: USE OF COPPER BACKUP BARS FOR BOLT HOLE RESTORATION

RESPONSE: Copper backup bars are a common technique for making weld joints where a removable backing is desired. The AWS Welding Handbook makes reference to copper backing bars (see attached). These backup bars were used only for bolt hole restoration. In all cases, the backside of the weld was visually examined to assure there was no melting of the backup bar. The backside of the weld also received an MT examination.

4) SUBJECT: EXPLANATION OF USE OF FLARE BEVEL JOINTS WITH CLOSE FITUP (NO ROOT OPENING) AND WITH 3/16" MAXIMUM ROOT OPENING FOR RUPTURE RESTRAINT WELDING

RESPONSE: Flare bevel joints with no root opening may be considered as prequalified as the joint configuration is equivalent to prequalified joint configuration BTC-P4 from AWS D1.1, 1981.

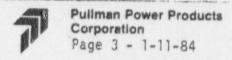
Flare bevel joints with root openings less than or equal to 3/16" may be considered as welding with backing as the initial SMAW deposit is used only to provide backing for subsequent weld passes. This initial weld pass is not considered when calculating the effective throat of the weld.

5) SUBJECT: CORRECTIVE ACTION FOR UNSCHEDULED AUDIT #32, AAR #5, FINDING #1 (UNQUALIFIED WELDING OF SQUARE GROOVE JOINTS).

RESPONSE: See attached for the closed AAR and correspondence between Pullman Power Products and PG&E. This correspondence and DR 4899 resulted in the qualification of Pullman Power Products' PQRs, numbers PQR - AWS 13 to 20, which are also attached.

6) SUBJECT: CORRECTIVE ACTION FOR UNSCHEDULED AUDIT #35, AAR #1, FINDING #3 (UNQUALIFIED WELDING OF A515 MATERIAL.)

RESPONSE: See the attached AAR. Corrective action for this finding resulted in the qualification of Pullman Power Products' PQRs, numbers PQR-AWS 9 to 12, which are also attached.



C. M. Neary QEC Welding Engineer

H. W. Karner Field QA/QC Manager

CMN:WHK:sam

cc: File

C.M. Neary

E.F. Gerwin A.A. Eck

NRC