

WELDING PROJECT

EMPLOYEE CONCERN

EVALUATION REPORT

SURFACE GRINDING OF WELDS AT BROWNS FERRY
NUCLEAR PLANT

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EMPLOYEE CONCERN

SUMMARY SHEET

SURFACE GRINDING OF WELDS AT BROWNS FERRY
NUCLEAR PLANT

I. SCOPE OF EVALUATION

This report addresses two employee concerns dealing with grinding of weld surfaces and shrinkage of stainless steel butt weld joints. These concerns were limited to two issues to aid in the evaluation effort.

- A. Grinding of weld surfaces may mask weld surface defects and remove "excess" metal.
- B. Stainless steel butt weld joints exhibit excessive shrinkage at the joint.

Text of the two concerns is provided in the technical report WP-11-BFN under Attachment 1.

II. ANALYSIS OF ISSUES ADDRESSED BY CONCERNS

The issues addressed by this evaluation evolved from Watts Bar concerns that were applied to Browns Ferry for evaluation for generic implication.

- A. One issue implies inspectors require weld surfaces to be ground to a smooth finish that may mask surface defects and excess metal seems to have been removed. Grinding of weld surfaces is not in violation of construction codes, standards, or Browns Ferry Construction Procedures. In contrast, in many cases codes, standards, and construction procedures require grinding to obtain suitable weld profiles for nondestructive testing and to eliminate or reduce surface defects.

This issue is discussed in WP-11-BFN, Paragraph III A.

- B. One issue stated there was excessive shrinkage at stainless steel butt weld joints. Construction codes, standards, and specifications do not offer established criterion for acceptance or rejection of shrinkage.

This issue is discussed in WP-11-BFN, Paragraph III B.

III. COLLECTIVE SIGNIFICANCE

No collective significant effect on hardware or the TVA welding program at Browns Ferry was identified.

IV. ROOT CAUSE(S)

The root cause of the employee concerns in this area is the TVA decision to apply Watts Bar employee concerns to other nuclear sites for evaluation for generic implications.

V. CORRECTIVE ACTION

No corrective action is indicated.

VI. REINSPECTION REQUIRED

No.

VII. ISSUE CLOSURE

Closed.

VIII. ATTACHMENTS

1. Evaluation Report WP-11-BFN.

WELDING PROJECT
EMPLOYEE CONCERN
EVALUATION REPORT
SURFACE GRINDING OF WELDS AT BROWNS FERRY
NUCLEAR PLANT

I. SCOPE OF EVALUATION

This report addresses two employee concerns. Text of the concerns is provided under Attachment 1.

The subject concerns originated at Watts Bar Nuclear Plant, and were generically applied to Browns Ferry Nuclear Plant (BFN). This evaluation is based on review of the BFN Welding Phase 1 Report, current and superseded process specifications and implementing procedures, and the Weld Project Reports WP-11-SQN and WP-19-SQN. Also reviewed were the BFN Corrective Action Reports, Discrepancy Reports, Nonconformance Reports, and the AEC/USNRC Inspection Reports for 1970 through 1985. The American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code Section III, The USA Standard for Pressure Piping B31.1.0, American Institute of Steel Construction's (AISC) Eighth Edition of the Manual of Steel Construction, and the American Society For Metals (ASM) Metals Handbook Volume 1 were reviewed and compared with the text of the concerns. The findings presented herein are based upon review of the above noted documents and interviews with cognizant TVA personnel.

II. ISSUES ADDRESSED BY CONCERNS

- A. Surface grinding of welds may mask surface defects and remove "excess" metal.
- B. Excessive shrinkage at stainless steel butt joints.

III. ANALYSIS OF ISSUES ADDRESSED BY CONCERNS

- A. One concern stated that TVA inspectors required pipe welds to be surface ground to a smooth finish and that the finish may mask a surface defect. The other concern stated that stainless steel butt weld joints seem to have "excess" metal removed.

ASME Section III Subsections NB, NC, ND 4424 require in part that the surface of welds shall be sufficiently free from coarse ripples, grooves, overlaps, and abrupt ridges and valleys for proper interpretation of radiographic and other required nondestructive examinations (NDE) of the welds.

Additionally, when surface defects have been detected, NB, NC, ND 4452 states in part, "weld metal surface defects may be removed by grinding or machining."

ASME Section V Article 2, T-222.2, requires that weld ripples or weld surface irregularities be removed by any suitable process to such a degree that the resulting radiographic image due to any irregularities cannot mask or be confused with the image of any discontinuity.

USA Standard B31.1.0 at 127.4.2 requires in part that the finished surface of the weld shall merge smoothly into the component surface at the weld toe.

Nuclear Power Operations Procedure PMP 1502.07 Procedure No. N-VT-3 requires in part that after welding all welds shall be examined for compliance with the applicable welding specification for at least weld defects, contour and finish of outside surface of welds, reinforcement and suitability to perform other nondestructive tests.

Browns Ferry Construction Procedure BF-15 requires in part all welded joints to be examined by radiography shall have excessive weld ripples or weld surface irregularities removed by grinding.

A review of the BFN Discrepancy Reports, Nonconformance Reports, Corrective Action Reports, and the AEC/USNRC Inspection Reports revealed no indication that the surface grinding of welds has created a hardware deficiency.

The above review shows no problem exists at BFN relative to surface preparation of welds by grinding and that the construction codes, standards, and procedures not only recognize grinding as an acceptable means for surface preparation and defect removal or reduction but, in some cases require it.

Considering that portion of the concern relative to inspectors requiring surface grinding of welds, it is recognized that some inspectors require weld surface preparation which may exceed the minimum requirements. It is also widely recognized that as the visual inspector gains experience in the various NDE surface preparation requirements, he/she is less likely to ask for cosmetic preparation beyond that required for proper interpretation of the specified NDE.

- B. One concern states that stainless steel butt weld joints exhibit excessive shrinkage.

Austenitic stainless steels exhibit variable amounts of distortion and warping when heat is applied. The ASM Metals Handbook section on stainless steels, austenitic grades, states in part, "their high coefficient of thermal expansion - over half again as great as that for ordinary steel or 400 series alloys - demand careful attention to control of distortion and warping."

The AISC Manual of Steel Construction, in part 6 Miscellaneous Data and Mathematical Tables, states in part, "Application of heat by welding produces residual stresses, which are generally accompanied by distortion of various amounts. Both the stresses and distortions are minimized by controlled welding procedures and fabrication methods.

BFN detailed weld procedures GT-SM-88-0-1, GT-SM-88-0-1A, GT-SM-88-01-1B, and GT-SM88-0-1C for welding stainless steel specify the amperage ranges, based on filler material size, that may be used and establishes a maximum allowable interpass temperature.

Further review of the BFN Corrective Action Reports, Discrepancy Reports, Nonconformance Reports, and the AEC/USNRC Inspection Reports did not reveal indication that a problem exists with the distortion and warpage (hoop shrinkage) in the stainless steel butt weld joints at BFN.

The above review did not reveal any established criterion to base acceptance or rejection of shrinkage of stainless steel butt weld joints. The review did establish; however, that various amounts of distortion and warpage will occur when welding stainless steel. Also, detailed welding procedures have been implemented at BFN to minimize distortion and warping when welding stainless steel.

IV. COLLECTIVE SIGNIFICANCE

This evaluation revealed no adverse effect on hardware or the TVA welding program.

V. ROOT CAUSE(S)

The reason for the employee concerns relating to surface grinding of welds and shrinkage of stainless steel butt weld joints is the application of Watts Bar concerns to other TVA nuclear sites for evaluation for generic implications.

VI. CORRECTIVE ACTION

No corrective action is indicated.

VII. ATTACHMENTS

1. Employee Concerns

WELDING PROJECT
EMPLOYEE CONCERN EVALUATION REPORT

ATTACHMENT 1

TEXT OF EMPLOYEE CONCERNS

Evaluation Report WP-11-BFN addresses two employee concerns. The text of the concerns is shown on the following pages.

IN-85-282-002
IN-85-299-003

REFERENCE - ECPS132J-ECPS132C
 FREQUENCY - REQUEST
 DNP - ISSS - RHM

TENNESSEE VALLEY AUTHORITY
 OFFICE OF NUCLEAR POWER
 EMPLOYEE CONCERN PROGRAM SYSTEM (ECP)
 EMPLOYEE CONCERN INFORMATION BY CATEGORY/SUBCATEGORY
 WP - 11 SURFACE GRINDING OF WELDS

PAGE -
 RUN TIME - 11:5
 RUN DATE - 03/1

CATEGORY: WE NON QA/QC WELDING

CONCERN NUMBER	CAT	SUB CAT	S H R D	PLT LOC	1 REPORT APPL 2 SAF RELATED BF BL SQ WB	HISTORICAL REPORT	CONCERN ORIGIN	CONCERN DESCRIPTION	REF. SEC CAT - SUBCAT -
IN -85-282-00202 T50014	WE	50711	N	HBN	1 Y Y Y Y 2 SR SR SR SR		IN-85-282-002 QTC	UNTIL RECENTLY, TVA WELD INSPECTORS REQUIRED ALL PIPE WELDS TO BE SURFAC E GROUND TO A SMOOTH FINISH. THE CO NCERN IS THAT SMOOTH GRINDING MAY AC TUALLY MASK A SURFACE DEFECT WHICH W OULD OTHERWISE BE DETECTABLE. NO FU RTHER DETAILS WERE AVAILABLE. (SQN I SSUES ADDRESSED IN RPT WP-11-SQN R1)	

1 CONCERNS FOR CATEGORY WE WP - 11

CONCERNS ARE GROUPED BY LAST 2 DIGITS OF SUBCATEGORY NUMBER.

REFERENCE - ECPS132J-ECPS132C
 FREQUENCY - REQUEST
 WP - ISSS - RHM

TENNESSEE VALLEY AUTHORITY
 OFFICE OF NUCLEAR POWER
 EMPLOYEE CONCERN PROGRAM SYSTEM (ECPS)
 EMPLOYEE CONCERN INFORMATION BY CATEGORY/SUBCATEGORY
 WP - 34 UNSATISFACTORY WELD APPEARANCE

PAGE - 1
 RUN TIME - 11:56:4
 RUN DATE - 03/16/8

CATEGORY: WE NON QA/QC WELDING

CONCERN NUMBER	CAT	SUB CAT	S H R D	PLT LOC	1 REPORT APPL				HISTORICAL REPORT	CONCERN ORIGIN	CONCERN DESCRIPTION	REF. SECTIO CAT - WE SUBCAT - 34
					2	SAF	RELATED	BF				
IN -85-299-00301 T50188	WE	50919	S	WBN	1	N	N	Y	N		QTC	SS WELDS SEEM TO HAVE EXCESS METAL R EMOVED AT BUTT WELD JOINTS, ALSO THE WELDS EXHIBIT EXCESSIVE SHRINKAGE A T JOINTS. THIS CONCERN IS GENERIC B UT HAVE EXAMPLES. THIS HAS BEEN NOT ICED FOR THE PAST 6 YEARS IN BOTH UN ITS. DETAILS KNOWN TO QTC, WITHHELD DUE TO CONFIDENTIALITY. CONSTRUCTIO N DEPT CONCER. (SQN ISSUES ADDRESSED IN RPT WP-19-SQN R1)
					2	NA	NA	SR	NA			
	02 WE	50934	S	WBN	1	Y	Y	N	Y			
					2	SR	SR	NA	SR			

1 CONCERNS FOR CATEGORY WE WP - 34

CONCERNS ARE GROUPED BY LAST 2 DIGITS OF SUBCATEGORY NUMBER.