MASTER

DUQUESNE LIGHT COMPANY
SHIPPINGPORT ATOMIC POWER STATION

TEST RESULTS

DLCS 2410202
T-641300

NON-DESTRUCTIVE TESTING OF STAINLESS-CARBON
STEEL WELDS

CORE I SEED 2

Section 2 of 2 Sections

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CORE I SEED 2

Purpose

To determine the condition of selected stainless to carbon steel welds in the Reactor Plant.

Also, to provide a set of radiographs which may be used as a basis for comparison of future radiographs in determining the effects of thermal cycling on the welds.

Conclusions

All the stainless to carbon steel welds which were radiographed appear to be satisfactory for continued use in the plant except the 1A reactor coolant loop drain weld (T-6). The radiograph of this weld indicates the presence of a 3/8 inch transverse defect. The majority of the welds radiographed showed slight indication of porosity.

The quality of the radiographs of the transition welds is good and these radiographs will be used as a basis for determining the effects of future thermal cycling on these welds.

Description of Test Equipment and Test Procedure

The Pittsburgh Testing Laboratory obtained radiographs of the eleven transition welds as required by the procedure. The source utilized was a 1/16 inch square of Iridium 192 rated at approximately 20 curies (at the beginning of the test).

The thickness of the penetrameters used to determine sensitivity was .02 inches for the four-inch pipes and .013 inches for the two-inch pipes. The four-inch pipe penetrometer had a 4T, 2T, and a 1T hole and the penetrometer for the two-inch pipes had a 4T and 2T hole (4, 2, and 1 times the thickness of the penetrometer). The length and width of the penetrameters was reduced during the test to prevent overlapping of the penetrometer and transition welds. The Shippingport Branch Office of the Atomic Energy Commission and Westinghouse concurred with these changes. Figure 1 shows the penetrameters used in this test.

Two films were used for each exposure to insure that flaws or marks on either film would not be mistaken as flaws in the welds.

Exposure times varied depending upon pipe density and the distance between the film and the source. Generally, an exposure of time of 30 minutes was used for two-inch pipes and 28 minutes for four-inch pipes. The 30 minute exposure time is indicative that water was present in the two-inch pipes.

The developing time used was 8 minutes at 68 F with full agitation during development. Fresh developer and fixing solution were used. The film used in this test was Kodak Type M Industrial X-Ray Film.

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The source to film distance was approximately 17 inches except for the 1-2 position of T-11 and the 3-0 position of T-10 where 12 inches was the maximum distance obtainable in the flash tank inlet valve cubicle.

Four radiographs, one for each quadrant of each weld, were taken; except for T-5 (discharge end of the Pressurizer Pilot Operated Relief Valve) which could only be radiographed in two quadrants due to the location of a welded wall bracket attaching the pipe to the wall.

Radiographs were taken and read on the following eleven welds:

<u>Weld No.</u>	<u>Location</u>
T-1	Discharge end of Reactor Relief Valve (06-H15-2) in the Auxiliary Chamber.
T-2	Discharge end of Reactor Relief Valve (06-H15-8) in the Auxiliary Chamber.
T-3	Discharge end of Reactor Relief Valve (06-H15-3) in the Auxiliary Chamber.
T-4	Discharge end of Reactor Relief Valve (06-H15-9) in the Auxiliary Chamber.
T-5	Discharge end of Pressurizer Pilot Operated Relief Valve (06-H18-1) in the Auxiliary Chamber.
T-6	Discharge end of 1A Main Loop Drain Valve (09-H11-1) in 1AC Boiler Chamber.
T-7	Discharge end of 1C Main Loop Drain Valve (09-H11-3) in 1AC Boiler Chamber.
T-8	Discharge end of 1B Main Loop Drain Valve (09-H11-2) in 1BD Boiler Chamber.
T-9	Discharge end of 1D Main Loop Drain Valve (09-H11-4) in 1BD Boiler Chamber.
T-10	Inlet end of Flash Tank Inlet Valve (09-H11-7) in the Auxiliary Chamber.
T-11	Discharge end of Flash Tank Inlet Valve (09-H11-7) in the Auxiliary Chamber.

Results

DLCS 2410202 was performed March 10, through April 21, 1960.

The sensitivity of all radiographs was such that the 4T and 2T holes could be seen, except for the 2-3 position of T-9 where only the 4T hole was visible. In several shots, the 1T hole was visible.

While there were indications of porosity in most welds, the size of these indications coupled with the relatively small number seen and the good quality of the radiographs, all welds are considered satisfactory except T-6 (1A coolant loop drain). In the 2-3 position radiograph of T-6, a 3/8 inch long transverse defect

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was seen located near the number 2 position marker.

The sensitivity obtained in DLCS 2410202 is such that future tests can be compared and any progression of existing defects may be detected as well as any new defects which may be caused by thermal cycling. Figure 1 illustrates the penetrameters used in the test.

Figures 2-7 show the relative position of the source, the weld, and the film for each radiograph.

Table I is a compilation of comments concerning each radiograph, its sensitivity and visible defects, along with the date taken and the exposure time.

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Two Inch Pipe Transition Weld Penetrameter

Lead numbers (height 1/4") attached to penetrameter

Penetrameter thickness - .013 inches

Four Inch Pipe Transition Weld Penetrameter

Lead numbers (height 1/4") attached to penetrameter

Penetrameter thickness - .02 inches

FIGURE 1

FIGURE 2
Relative Source Position for Transition Welds
T-1 through T-4

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FIGURE 3

Relative Source Position
for Transition Weld T-5

Position 0-1

Position 2-3

NOTE: Only two positions of this weld could be radiographed due to the bracket attaching the pipe to the wall.

FIGURE 4

Relative Source Position
for Transition Weld T-6

FIGURE 5

Relative Source Position
for Transition Weld T-7 through T-9

Position 2-3

Position 0-3

FIGURE 6

Relative Source Position
for Transition Weld T-10

FIGURE 7.

Relative Source Position
for Transition Weld T-11

Position 0-1

To Pressurizer

Position 1-2

Position 2-3

Position 3-0

TABLE I

Interpretation of Radiographs by Duquesne Light Company

Radiograph	Date Taken	Exposure Time (min)	Position	Sensitivity	Comments
T-1	4-5-60	28	0-1	4T and 2T	One void 1/16" diameter, 2 slight indications of porosity.
	4-5-60	28	1-2	4T and 2T	3 slight indications of porosity.
	3-25-60	28	2-3	4T and 2T	No visible defects.
	4-11-60	35	3-0	4T, 2T, and 1T	2 slight indications of porosity.
T-2	4-11-60	35	0-1	4T and 2T	2 slight indications of porosity.
	4-5-60	28	1-2	4T and 2T	1 slight indication of porosity.
	4-5-60	28	2-3	4T and 2T	No visible defects.
	4-6-60	30	3-0	4T and 2T	1 slight indication of porosity.
T-3	4-13-60	35	0-1	4T and 2T	1 slight indication of porosity, 1 apparent surface irregularity.
	4-12-60	35	1-2	4T, 2T and 1T	1 slight indication of porosity, 1 slight indication of porosity
	4-14-60	--	2-3	4T and 2T	1 slight indication of porosity
	4-13-60	35	3-0	4T and 2T	No visible defects.
T-4	4-13-60	35	0-1	4T, 2T, and 1T	1 slight indication of porosity.
	4-14-60	35	1-2	4T and 2T	No visible defects.
	4-14-60	35	2-3	4T and 2T	No visible defects.
	4-14-60	35	3-0	4T, 2T, and 1T	1 slight indication of porosity.
T-5	4-18-60	35	0-1	4T and 2T	1 slight indication of porosity.
	4-18-60	--	2-3	4T and 2T	1 slight indication of porosity.
T-6	3-15-60	40	0-1	4T and 2T	No visible defects.
	3-16-60	30	1-2	4T and 2T	No visible defects.
	3-16-60	40	2-3	4T and 2T	Transverse defect, 3/8" long.
	3-15-60	30	3-0	4T and 2T	3 slight indications of porosity.

TABLE I (cont'd)

Interpretation of Radiographs by Duquesne Light Company

Radiograph	Date Taken	Exposure Time (min)	Position	Sensitivity	Comments
T-7	3-14-60	30	0-1	4T and 2T	No visible defects.
	3-15-60	30	1-2	4T and 2T	No visible defects.
	3-15-60	30	2-3	4T and 2T	1 slight indication of porosity, 1 slight indication of porosity.
	3-15-60	30	3-0	4T and 2T	2 slight indications of porosity.
T-8	3-11-60	30	0-1	4T and 2T	No visible defects.
	3-14-60	30	1-2	4T and 2T	2 slight indications of porosity.
	3-14-60	30	2-3	4T and 2T	No visible defects.
	3-11-60	38	3-0	4T and 2T	1 slight indication of porosity.
T-9	3-10-60	30	0-1	4T and 2T	Scattered porosity.
	3-10-60	30	1-2	4T and 2T	2 slight indications of porosity.
	3-10-60	30	2-3	4T	No visible defects.
	3-11-60	30	3-0	4T and 2T	Scattered indications of porosity.
T-10	3-16-60	30	0-1	4T and 2T	Scattered indications of porosity.
	3-19-60	40	1-2	4T and 2T	2 slight indications of porosity.
	3-19-60	30	2-3	4T and 2T	Several minute indications of porosity
	3-22-60	18	3-0	4T and 2T	Several minute indications of porosity
T-11	3-21-60	30	0-1	4T and 2T	1 slight indication of porosity.
	3-22-60	18	1-2	4T and 2T	No visible defects.
	3-21-60	30	2-3	4T and 2T	No visible defects.
	3-22-60	30	3-0	4T and 2T	No visible defects.

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Results Prepared By William E. Graker 9-1-60

Results Reviewed By Ronald A. Hughes 9-1-60

Approved (Duquesne Light Company) [Signature] Date 1/10/60