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DEFECT DISTRIBUTION IN WELDS OF INCOLOY 908

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ABSTRACT

Incoloy 908 is one of the candidate materials for ITER CS cable jacket. The weakest points are in welds since the welds include non-uniformity of structure and property, as well as the residual tension and more defects. The defect distribution is an essence to evaluate the fatigue crack growth life of the jacket. This report summarizes the measured defect distribution in the Incoloy 908 welds in addition to welding process and defect inspection method.

CONTENTS

1. Introduction

Incoloy 908 is one of the candidate materials for ITER CS cable jacket. The weakest points are in welds since the welds include non-uniformity of structure and property, as well as the residual tension and more defects. The defect distribution is a must to more accurately evaluate the fatigue crack growth life. Unfortunately, there is no any published data in this field except assumptions. This report summarizes the measured defect distribution in the Incoloy 908 welds.

2. Materials

The inspected material includes 20 orbital welds made of Incoloy 908 by GTAW. The nominal compositions of the base metal and the filler material as well as the provided raw materials are listed in Tables 1 and 2. The 4 CS1 jackets to generate the welds are shown in Fig. 1.

Table 1: Nominal composition of the base metal and filler metal

	Fe	Ni	Cr	Nb	Al	Ti	Si	C
908 base metal	40.8	48.7	4.1	3.0	1.1	1.5	0.2	0.01
9HA filler metal	41.67	51.15	4.07	0.52	1.09	1.85		

- All these materials are fabricated by Inco. Alloy International, now, Special Metal

Table 2: Provided raw materials for welding

Item	*Material*	*Heats*
Conduit	Incoloy 908 CS1 tubes, Total 4 pieces, 24” per piece, see figure 1	Heat: HW0621CK122
Filler metal	9HA wires, 0.035” dia Total 3 spools, 12 Ib per spool,	Heat 1: HV7804 Heat 2: HV7806 Heat 3: HV7808

Fig. 1 Four CS1 jacket tubes with 24” each in length

3. Welding process

The butt welding by orbital GTAW was performed in ARC Applications, Inc (AAI).[1] Four CS1 jacket tubes were supplied. Six coupons were cut from each of the 24"-long jacket tubes, and generated 5 welds per tube. The filler metal is 9HA.

The whole process consists of (a) machining of the joint ends, (b) auto-orbital welding of the round parts, (c) manual welding of the 4 corners, and (d) NDE inspections. The groove design of the joint ends is slightly different from that of Ansaldo for better welding quality. The orbital welding was performed in clock-wise direction (using right direction view) with two zones in different welding parameters, see Fig. 2. One zone starts from the top (~315^0) clockwise to the bottom (180^0) with mostly downhill welding and therefore a slightly hotter welding condition. The 2^{nd} zone starts from the bottom and clockwise to the top with uphill welding and slightly colder welding parameters. The auto-orbital welding process was completed up to flushing the OD of the thin wall part by 4 passes and 95Ar/5H protection gas (Fig. 3). Then manually welding process was carried out to fill the remaining 4 corners (Fig. 4).

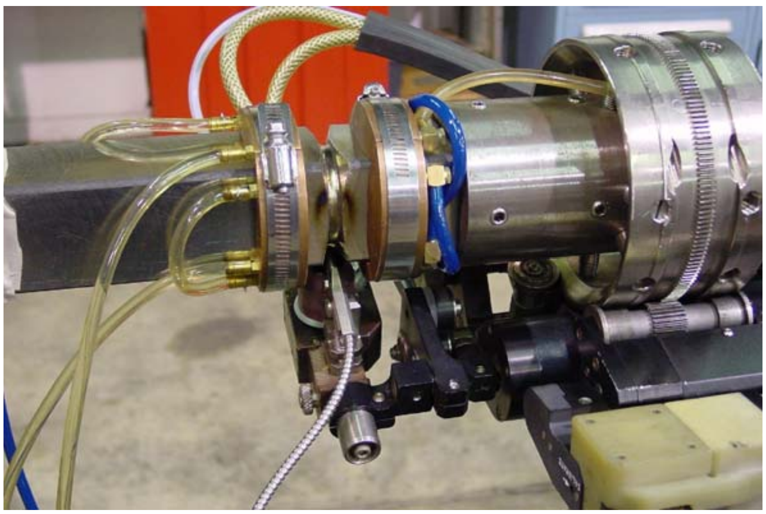

Fig. 2 Orbital welding in process

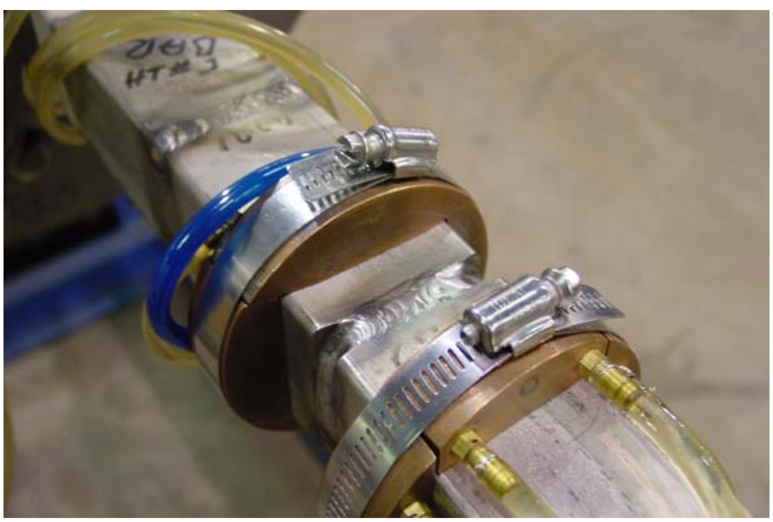

Fig. 3 Completion of auto-orbital welding

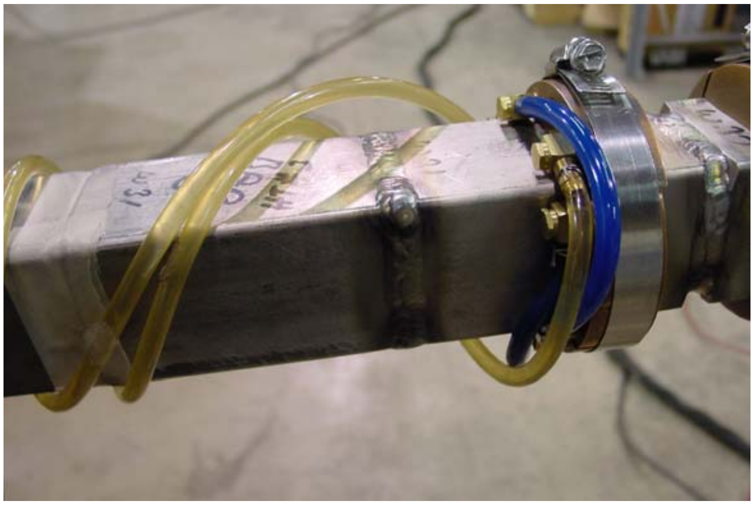

Fig. 4 Completion of manual-corner welding

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Each welded jacket tube (labeled as A, B, C and D respectively) is cut into 4 plates (e.g., A1, A2, A3, A4). The process assignment for each plate is listed in Table 3.

Table 3: Process matrix for the Incoloy 908 welds

Plate ID	*CW+HT*	*HT*	*CW*	*As received*	*NDE sample*
A1	A11-A15				A11
A2		A21-A25			A25
A3			A31-A35		
A4				A41-A45	
B1	B11-B15				B15
B2		B21-B25			B21
B3			B31-B35		
B4				B41-B45	
C1	C11-C15				C15
C2		C21-C25			C21
C3			C31-C35		
C4				C41-C45	
D1	D11-D15				
D2		D21-D25			
D3			D31-D35		
D4				D41-D45	D45

4. NDE by X ray radiography

4.1 First measurement

AAI uses Integrated Technologies Inc (ITI) to perform NDE inspections. Both liquid penetration and x ray radiographic methods were applied. All welds are accepted according to liquid penetration method. All but two welds are accepted according to x-ray radiography. Most of welds show concave root. The rejected 2 welds show severe lack of fusion, and they were late repaired. Visual inspection also found localized shrinkage due to radial and angular distortion at the corners, see Figs. 5 and 6.

The received welds tubes were then cut in longitudinal direction by EDM. Part of these welds was sent to Baker Testing Services, Inc. (BTS) for x-ray inspection to verify the NDE results from ITI. It is found that most of the welds at top and at 270^0 (uphill) are convex, and the others are concave. There are a few large defects due to lack of fusion and many small defects (e.g., pores), as listed in Table 4. Some typical defects are shown in the figures of Appendix 1.

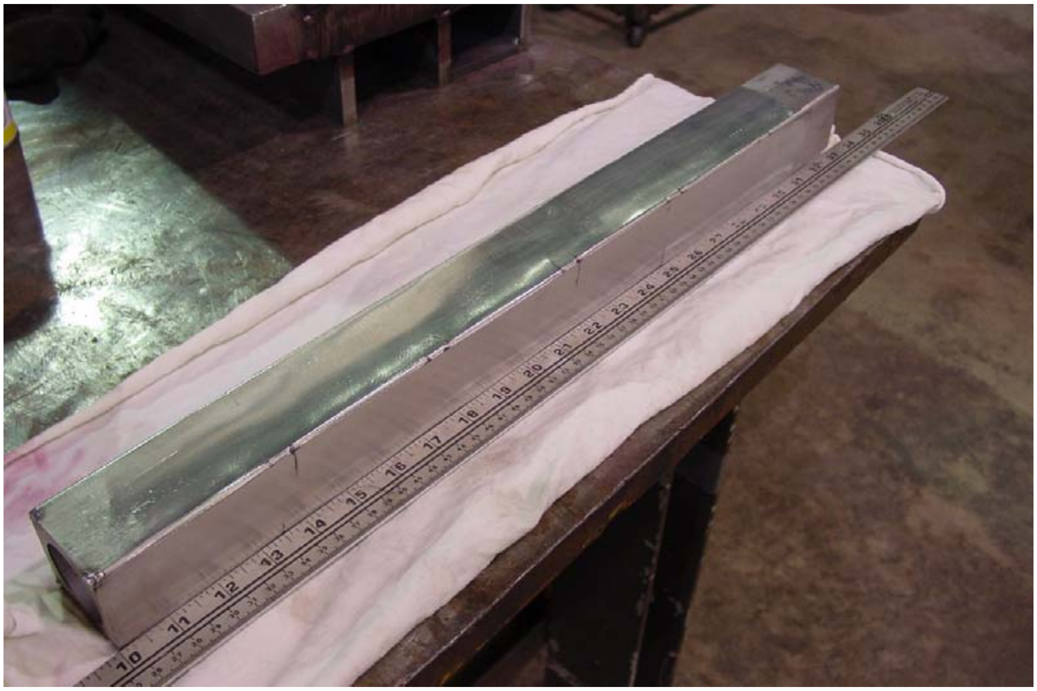

Fig. 5   OD appearance of the jacket welds after surface grinding

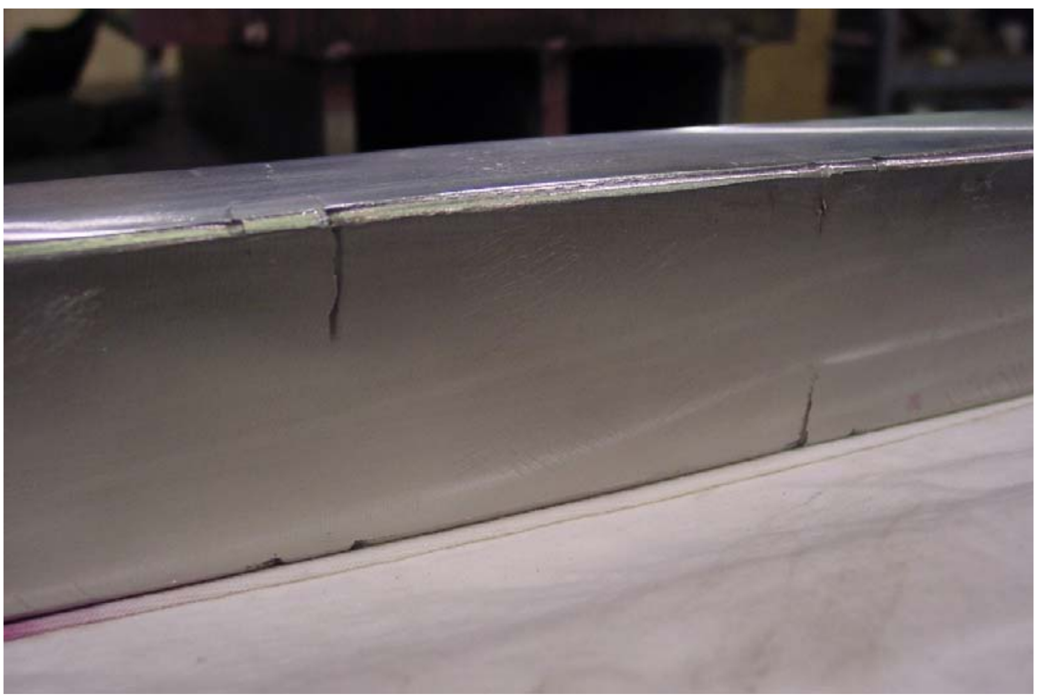

Fig. 6 localized shrinkage due to radial and angular distortion at the corners.

Table 4 BTS results of NDE by X-ray radiography

AAI ID	EDM ID	Weld ID	Fusion shape	Severe lack of fusion in ID (mm)	Pore number
Bar 2 (A)	slice A1 Right 90^0	A11	V	15 x 1	21
		A12	V		1
		A13	V		0
		A14	V		0
		A15	V	14.3 x 0.7	3
	A2 left 270^0	A21	X		3
		A22	X		2
		A23	X		0
		A24	X		2
		A25	X		19
	A3 top 0^0	A31	X		0
		A32	X		0
		A33	X		0
		A34	X		1
		A35	X		3
	A4 bottom 180^0	A41	V		5
		A42	V		0
		A43	V		0
		A44	V		0
		A45	V		1
Bar 3 (B)	slice B1 Right 90^0	B11	V	6.3 x 1.1	8
		B12	V		3
		B13	V		2
		B14	V		6
		B15	V	9.2 x 1.1	14
	B2 left 270^0	B21	V/X	5 x 1.1	15
		B22	X		5
		B23	X		4
		B24	X		4
		B25	X		6
	B3 top 0^0	B31	X		2
		B32	X		2
		B33	X		0
		B34	X		1
		B35	X		3
	B4 bottom 180^0	B41	V		2
		B42	V		1
		B43	V		0
		B44	V		0
		B45	V		1

- V: concave, X: convex, V/X: mixed

The convex/concave weld shapes may be due to gravitation effect during welding. The melted metal during welding flows to ID at the top (0^0), and to OD at bottom (180^0) due to the gravitation of the liquid metal. For the 2 side plates (90^0 and 270^0), the melted metal during welding flows to both ID and OD for the uphill welding (270^0), and flows away from both ID and OD for the downhill welding (90^0) due to combined effect of gravitation and surface shrinkage. The concave welding shape would result in a notch effect and therefore reduce fatigue life. The convex welding surface includes many roughness and discontinuity, all of which would have negative impact on the fatigue life.

The defect size distribution is shown in Fig. 7, where the number of defect is plotted against the cross area of defect. All the small defects are pores with mostly circular shape and located more in edge than in center.

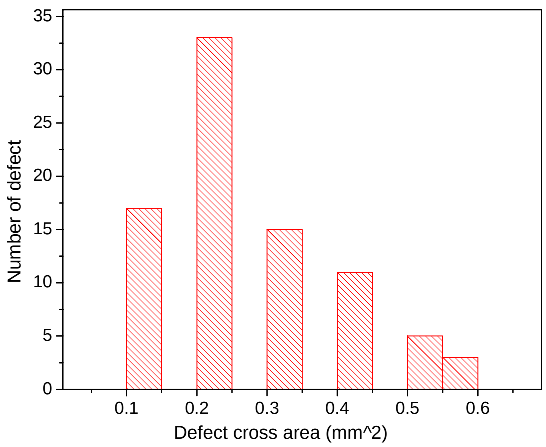

Fig. 7 Size distribution of defect

Apparently, BTS results show many small defects, which were not found in ITI results although both companies applied x-ray radiography. The difference may be due to the following 2 factors (a) uniformity and thickness of the specimen, BTS inspected the plates with uniform thickness of 6mm, but ITI inspected the jacket with un-uniform thickness varying from 6 to 17mm; (b) Distance of the radiation source, ITI radiation source is much closer than BTS because of its in situ inspection nature.

4.2 Second measurement

Second measurement has been performed to give more detailed defect features of distribution. Total 574 defects in the 20 welds are measured for its long axial length, short axial length and distance to edge. All the measured data as well as the calculated parameters (e.g., area of defect, aspect ratio of defect, and eccentricity) are listed in the table of Appendix 2. The summary statistics for overall defect characteristic is shown in Figs. 9 to 13, as well as in Tables 5 to 9.

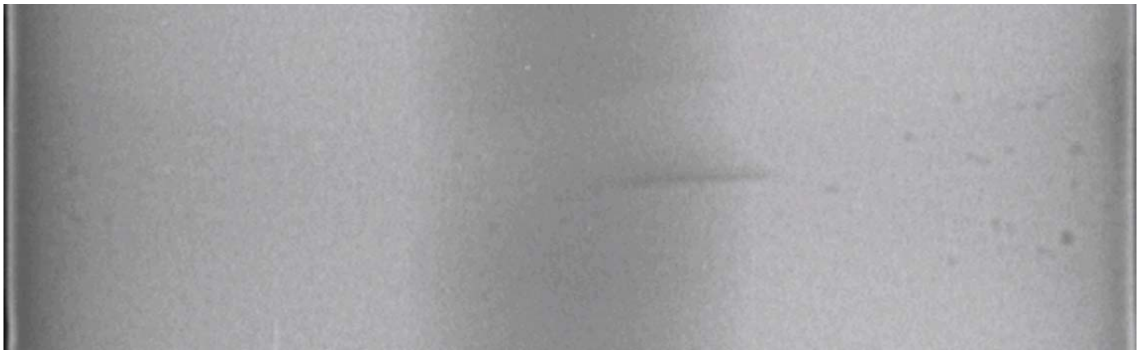

Fig. 8 A typical x-ray radiography photo, weld C15.

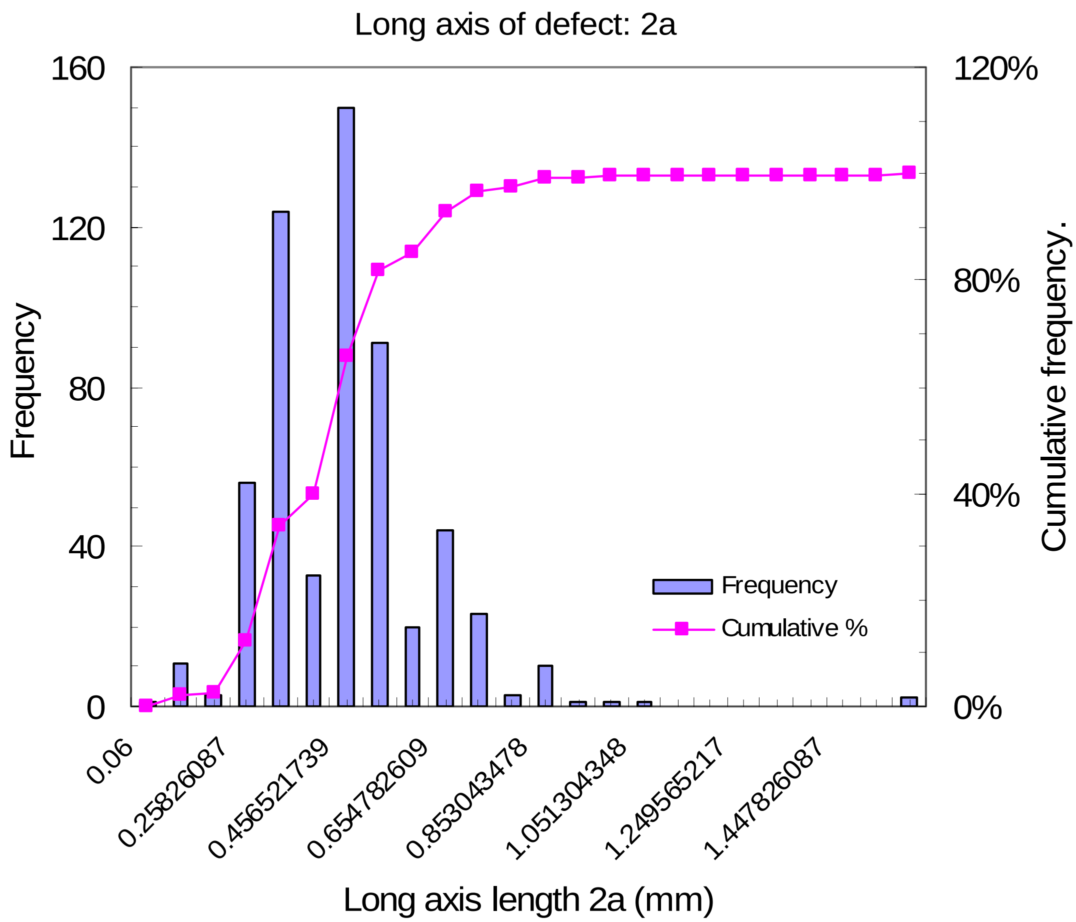

Fig. 9 Statistics distribution of the long axial length of defects, 2a

Table 5 Descriptive statistics of the long axial length of defects, 2a

Item	*Calculated value (length unit mm)*
Mean	0.418728223
Standard Error	0.006888257
Median	0.4
Mode	0.4
Standard Deviation	0.165030917
Sample Variance	0.027235203
Kurtosis	7.629277997
Skewness	1.515930743
Range	1.52
Minimum	0.06
Maximum	1.58
Sum	240.35
Count	574
Confidence Level (95.0%)	0.013529315

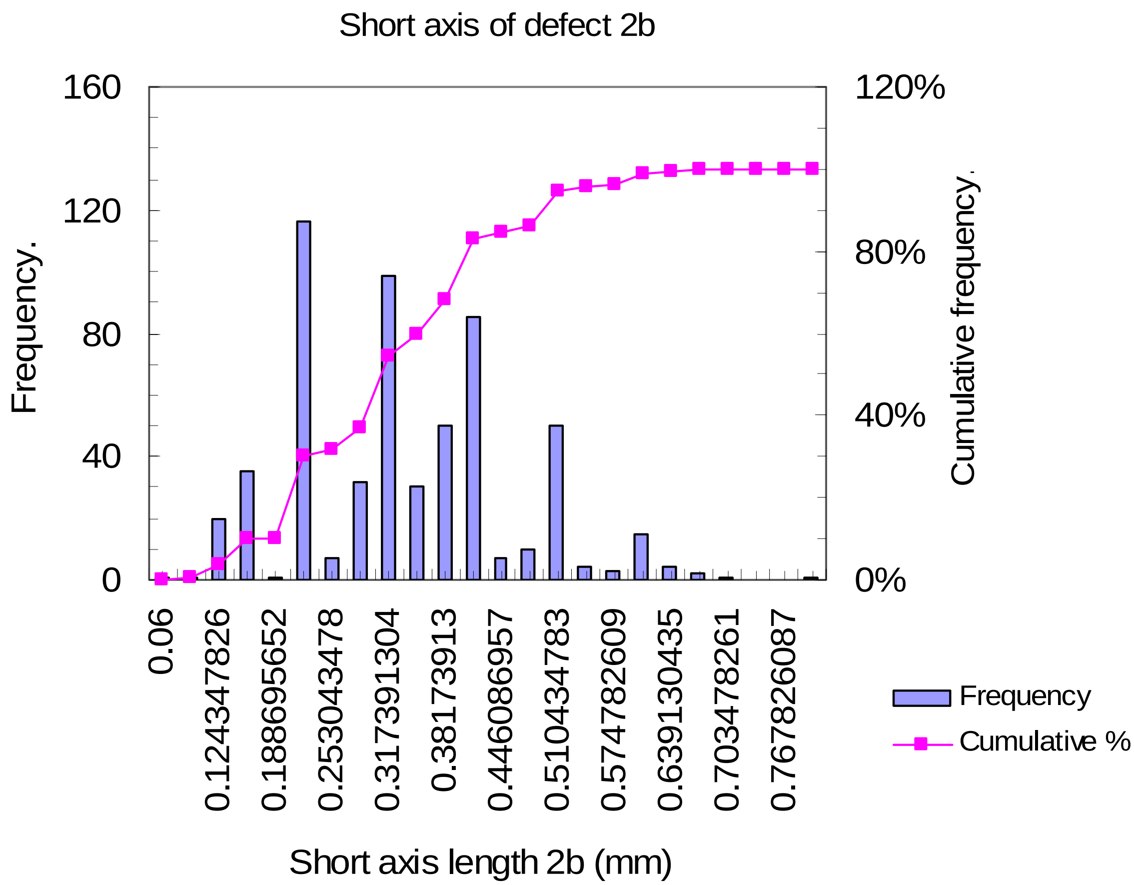

Fig. 10 Statistics distribution of the short axial length of defects, 2b

Table 6 Descriptive statistics of the short axial length of defects, 2b

Item	*Calculated value (length unit mm)*
Mean	0.32108
Standard Error	0.005157
Median	0.3
Mode	0.3
Standard Deviation	0.123562
Sample Variance	0.015268
Kurtosis	0.021779
Skewness	0.455836
Range	0.74
Minimum	0.06
Maximum	0.8
Sum	184.3
Count	574
Confidence Level (95.0%)	0.01013

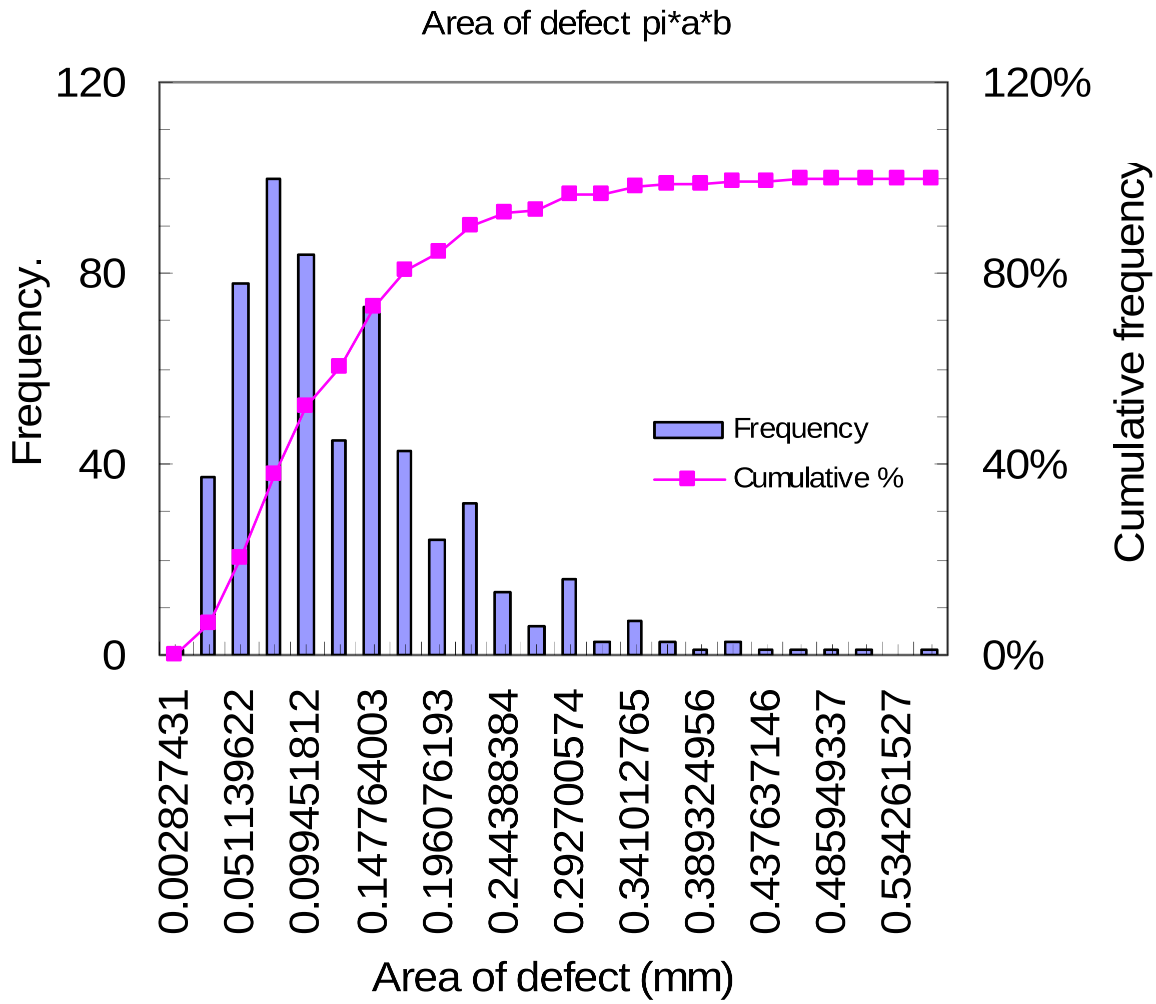

Fig. 11 Statistics distribution of defect area, the area is obtained by $defect\_area = \pi ab$.

Table 7 Descriptive statistics of defect area

Item	*Calculated value (length unit mm)*
Mean	0.117076
Standard Error	0.003477
Median	0.094248
Mode	0.070686
Standard Deviation	0.083299
Sample Variance	0.006939
Kurtosis	3.405565
Skewness	1.554631
Range	0.55559
Minimum	0.002827
Maximum	0.558418
Sum	67.20136
Count	574
Confidence Level (95.0%)	0.006829

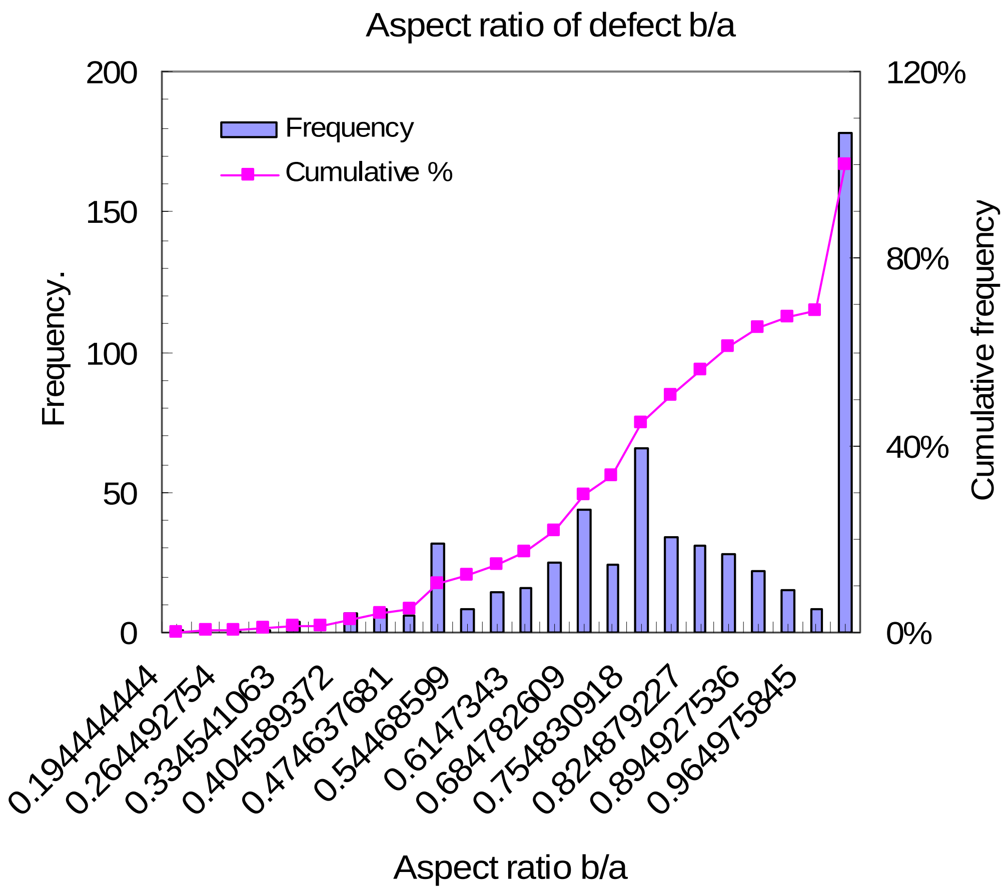

Fig. 12 Statistics distribution of defect aspect ratio, b/a

Table 8 Descriptive statistics of defect aspect ratio, b/a

Item	*Calculated value (length unit mm)*
Mean	0.789424
Standard Error	0.00773
Median	0.784314
Mode	1
Standard Deviation	0.185191
Sample Variance	0.034296
Kurtosis	-0.48596
Skewness	-0.50727
Range	0.805556
Minimum	0.194444
Maximum	1
Sum	453.1292
Count	574
Confidence Level (95.0%)	0.015182

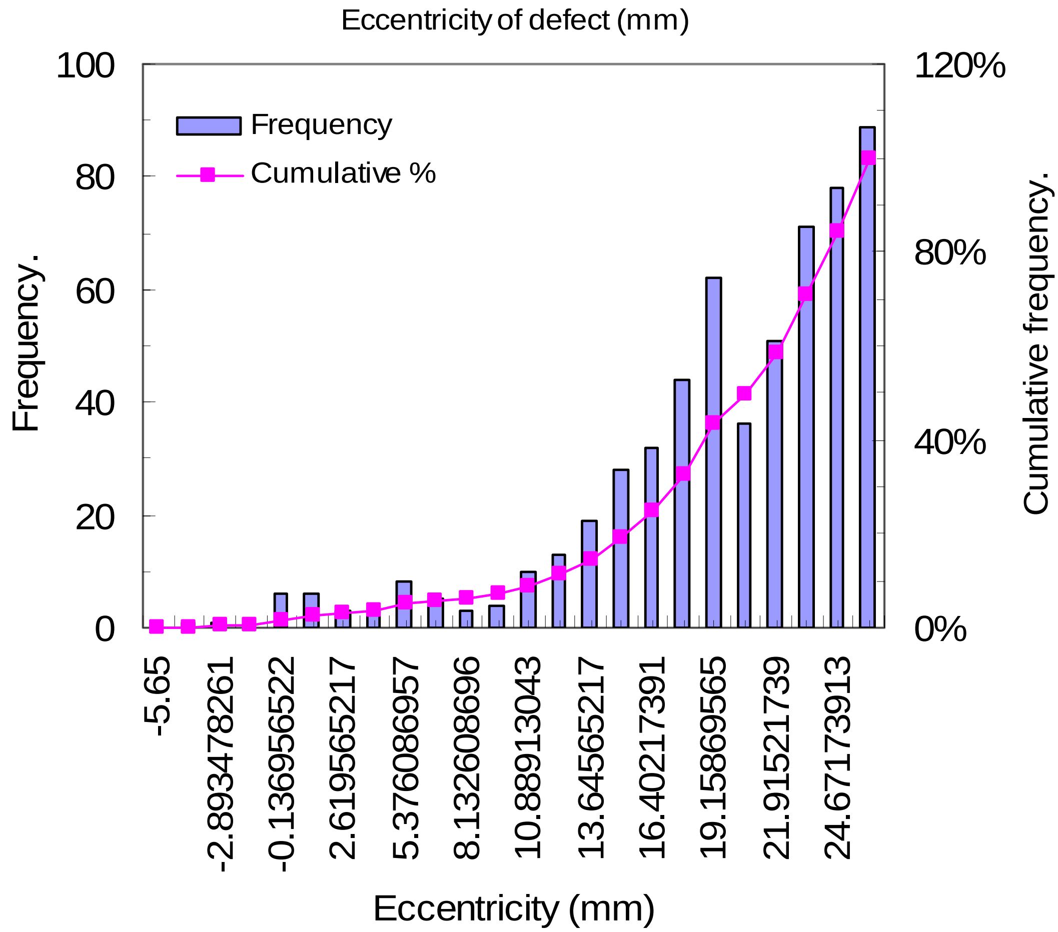

Fig. 13 Statistics distribution of defect eccentricity. The eccentricity is defined as the distance from the defect to the plate center. The eccentricity in this report is for the width direction ($eccentricity\_in\_width = plate\_width/2 - distance\_to\_edge$). The eccentricity in thickness direction is more significant. However, both are assumed to be similar.

Table 9 Descriptive statistics of defect eccentricity

Item	*Calculated value (length unit mm)*
Mean	19.09055
Standard Error	0.251279
Median	20.575
Mode	25.5
Standard Deviation	6.020212
Sample Variance	36.24296
Kurtosis	2.013013
Skewness	-1.39143
Range	31.7
Minimum	-5.65
Maximum	26.05
Sum	10957.98
Count	574
Confidence Level (95.0%)	0.49354

5. Discussion

This report summarizes the measured defect distribution in the welds of Incoloy 908. It is the detected defect distribution, not true defect distribution. The true defect distribution may better be described by the Marshall model: [2]

$$P(b) = \frac{1}{\mu}\exp\left(-\frac{b}{\mu}\right) , \qquad (1)$$

where b is the half defect depth in x-y plane and μ is the mean depth. The cumulative distribution of the defect depth is then obtained from the integration of $P(b)$ from 0 to b:

$$F(b) = 1 - \exp\left(-\frac{b}{\mu}\right) . \qquad (2)$$

The different between the true distribution and the measured defect distribution is the un-detectability of the material. Apparently, the smaller the defect, the large the un-detectability.

References

[1] Welding of Incoloy 908 CS1 Test Coupons, MIT-PSFC #4500689, AAI #20151, Jon Salkin, AAI, Sep. 15, 2005.

[2] J. Feng, "Fatigue life estimation for ITER CS conductor jacket by probabilistic fracture mechanics," Fus Eng and Des, V. 73, 2005, pp. 357-373.

Appendix 1:   First defect measurement

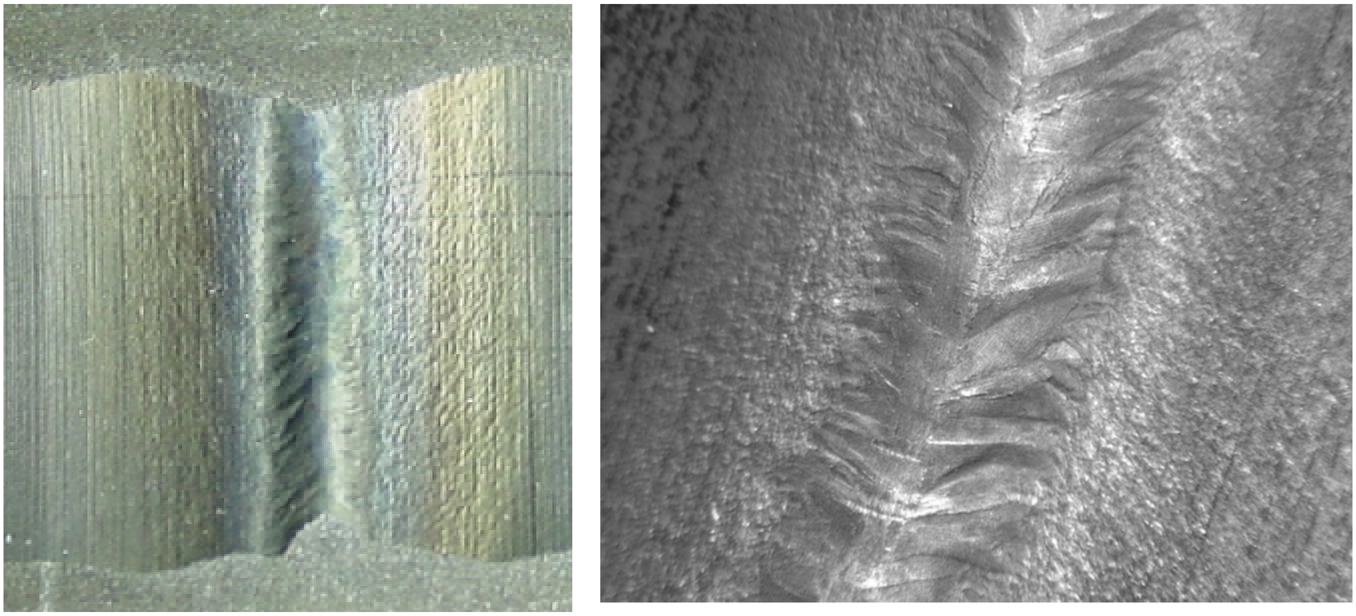

Fig. A1 Typical convex welding with extra deposit in 2 different magnifications (A34)

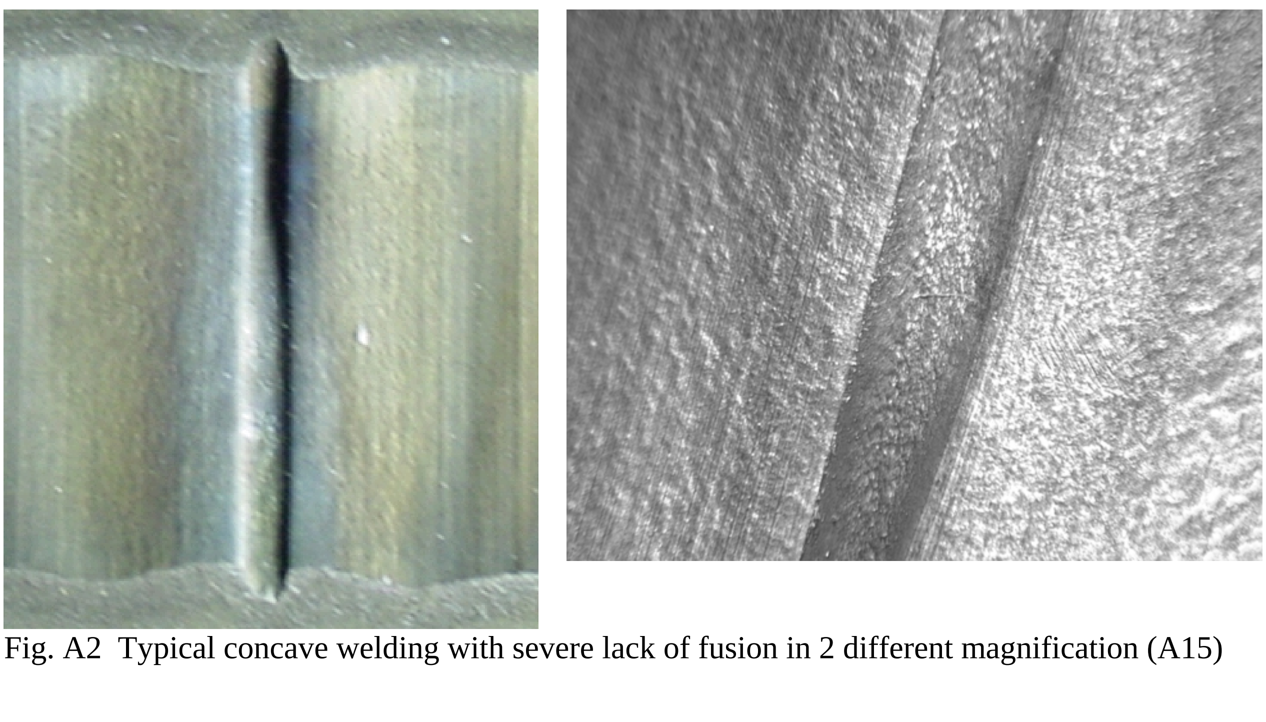

Fig. A2 Typical concave welding with severe lack of fusion in 2 different magnification (A15)

Fig. A3   Global view of Bar A by x-ray radiography

Fig. A4 Global view of Bar B by x-ray radiography

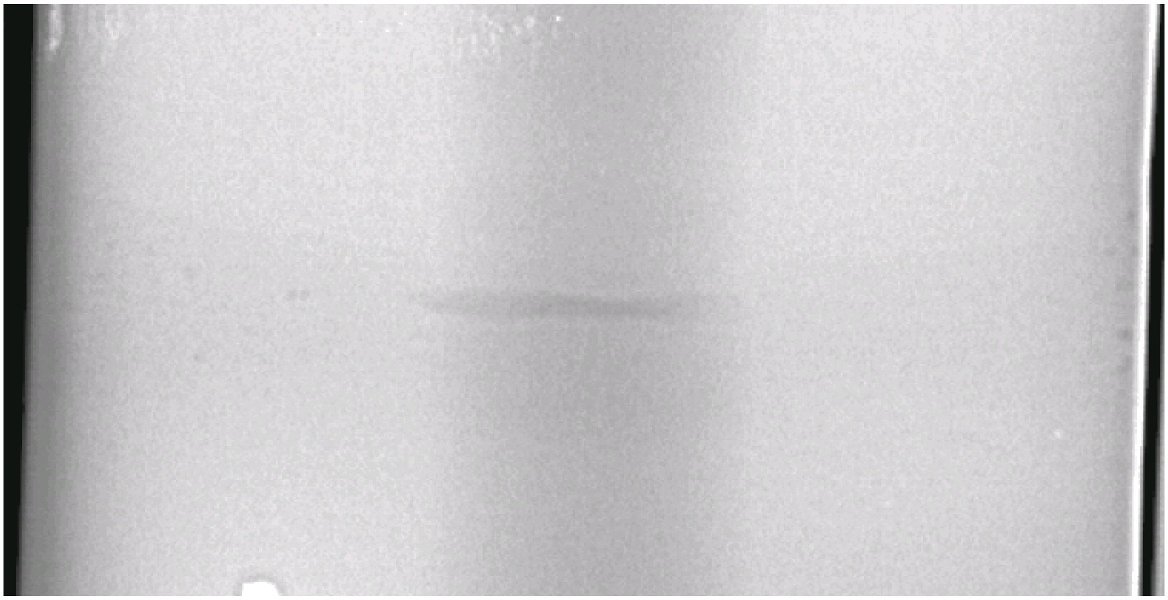

Fig. A5 View of x-ray radiography for the weld A11

Table A1 Defects in weld A11

Defect no.	Type	Dimension	Location
1	Lack of fusion	15mm x 1mm	Center
2	Pore	0.5 mm^2	Right edge
3	Pore	0.2	
4	Pore	0.2	
5	Pore	0.6	
6	Pore	0.4	
7	Pore	0.5	
8	Pore	0.3	Left edge
9	Pore	0.3	
10	Pore	0.1	
11	Pore	0.1	
12	Pore	0.1	
13	Pore	0.4	
14	Pore	0.2	
15	Pore	0.3	
16	Pore	0.3	
17	Pore	0.2	
18	Pore	0.3	
19	Pore	0.3	
20	Pore	0.2	
21	Pore	0.2	
22	Pore	0.3	

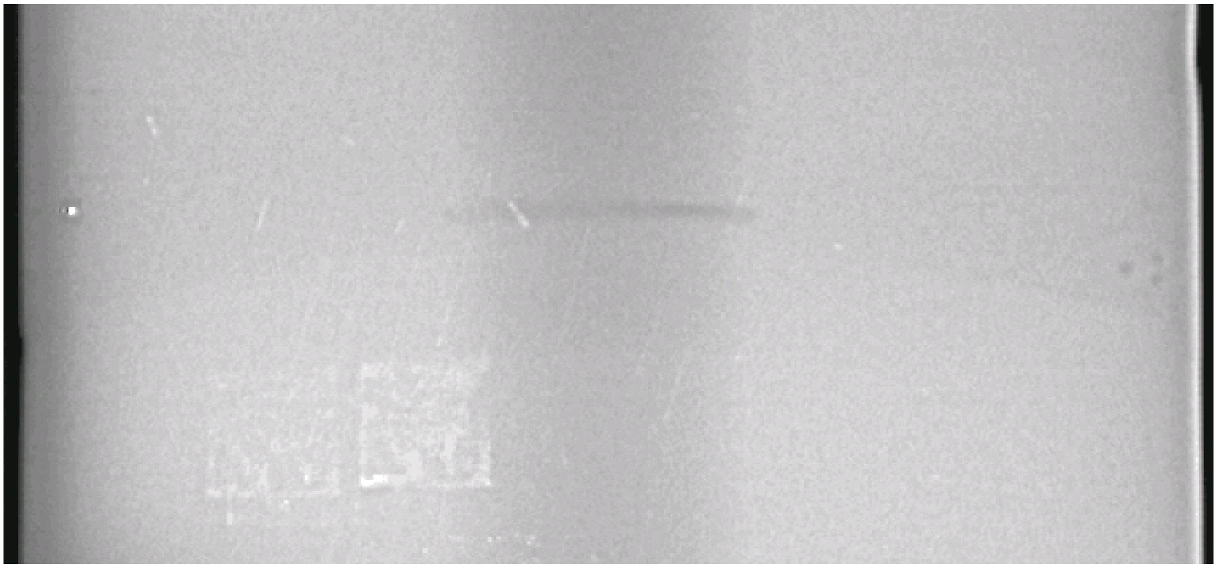

Fig. A6 View of x-ray radiography for the weld A15

Table A2 Defects in weld A15

Defect no.	Type	Dimension	Location
1	Lack of fusion	14.3mm x 0.7mm	Center
2	Pore	0.5 mm^2	Right edge
3	Pore	0.3	
4	Pore	0.3	

Fig. A7 View of x-ray radiography for the weld A25

Table A3 Defects in weld A25

Defect no.	Type	Dimension	Location
1	Pore	0.4 mm^2	Right edge
2	Pore	0.2	
3	Pore	0.6	
4	Pore	0.2	
5	Pore	0.2	
6	Pore	0.2	
7	Pore	0.1	

8	Pore	0.1	
9	Pore	0.4	Left edge
10	Pore	0.3	
11	Pore	0.4	
12	Pore	0.2	
13	Pore	0.2	
14	Pore	0.4	
15	Pore	0.3	
16	Pore	0.2	
17	Pore	0.2	
18	Pore	0.3	
19	Pore	0.4	

Fig. A8 View of x-ray radiography for the weld B11

Table A4 Defects in weld B11

Defect no.	Type	Dimension	Location
1	Lack of fusion	6.3mm x 1.1mm	Center
2	Pore	0.5 mm^2	Right edge
3	Pore	0.4	
4	Pore	0.2	
5	Pore	0.2	
6	Pore	0.2	
7	Pore	0.3	Left edge
8	Pore	0.2	
9	Pore	0.2	

Fig. A9 View of x-ray radiography for the weld B15

Table A5 Defects in weld B15

Defect no.	Type	Dimension	Location
1	Lack of fusion	9.2mm x 1.1mm	Center
2	Pore	0.1 mm^2	Right edge
3	Pore	0.1	
4	Pore	0.1	
5	Pore	0.1	
6	Pore	0.2	
7	Pore	0.2	
8	Pore	0.1	
9	Pore	0.2	
10	Pore	0.1	
11	Pore	0.5	
12	Pore	0.1	
13	Pore	0.2	Left edge
14	Pore	0.4	
15	Pore	0.2	

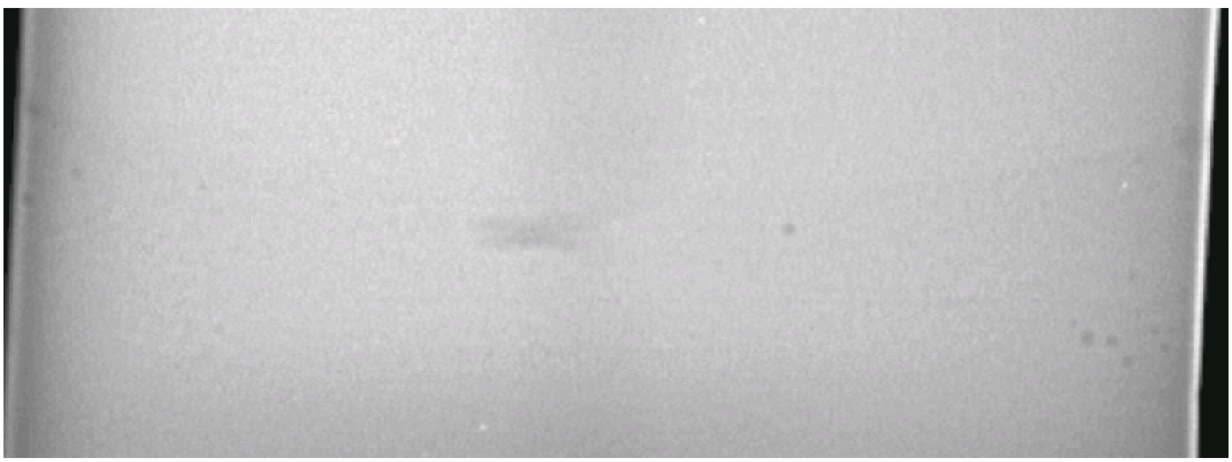

Fig. A10 View of x-ray radiography for the weld B21

Table A6 Defects in weld B21

Defect no.	Type	Dimension	Location
1	Lack of fusion	5mm x 1.1mm	Center
2	Pore	0.2 mm^2	Right edge
3	Pore	0.1	
4	Pore	0.2	
5	Pore	0.2	
6	Pore	0.3	
7	Pore	0.2	
8	Pore	0.4	
9	Pore	0.1	
10	Pore	0.1	Left edge
11	Pore	0.2	
12	Pore	0.2	
13	Pore	0.2	
14	Pore	0.2	

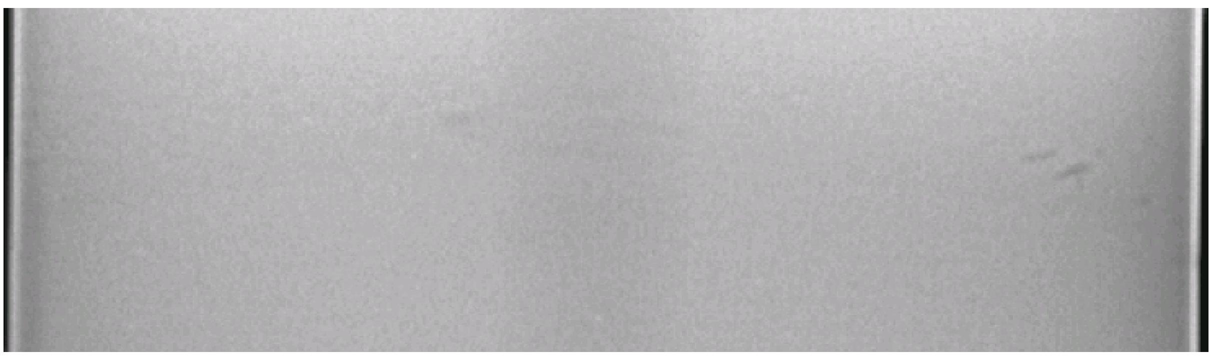

Fig. A11 View of x-ray radiography for the weld B23

Table A7 Defects in weld B23

Defect no.	Type	Dimension	Location
1	Pore	0.1mm^2	Right edge
2	Pore	0.2	
3	Pore	0.6	
4	Pore	0.4	

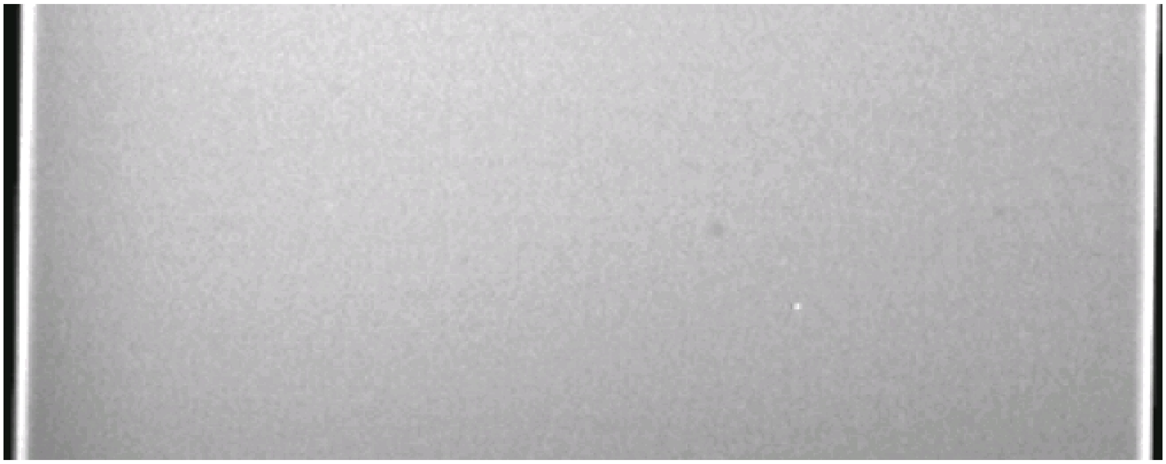

Fig. A12 View of x-ray radiography for the weld B31

Table A8 Defects in weld B31

Defect no.	Type	Dimension	Location
1	Pore	0.1mm^2	Right - center
2	Pore	0.3	

Appendix 2: Second defect measurement

Total 574 defects are found in the 20 welds. The characteristic parameters for each defect are measured and listed in the following table.

Table A9 Defect data for the welds

Weld No.	Defect No.	Long axial length, 2a (mm)	Short axial length, 2b (mm)	Distance to edge (mm)	Plate width (mm)	Distance to center (mm)	Defect area (mm^2)	Aspect ratio b/a
A11	1	0.57	0.42	13	53	13.5	0.188024	0.736842
	2	0.57	0.5	12.5	53	14	0.223838	0.877193
	3	0.36	0.14	11.4	53	15.1	0.039584	0.388889
	4	0.28	0.22	8.1	53	18.4	0.04838	0.785714
	5	0.5	0.22	7.8	53	18.7	0.086394	0.44
	6	0.36	0.28	3.7	53	22.8	0.079168	0.777778
	7	0.3	0.2	7.7	53	18.8	0.047124	0.666667
	8	0.28	0.14	3.7	53	22.8	0.030788	0.5
	9	0.32	0.22	3.4	53	23.1	0.055292	0.6875
	10	0.5	0.45	1	53	25.5	0.176714	0.9
	11	0.4	0.4	0.7	53	25.8	0.125664	1
	12	0.6	0.4	2	53	24.5	0.188495	0.666667
	13	1	0.6	1.1	53	25.4	0.471239	0.6
	14	0.9	0.61	0.9	53	25.6	0.431183	0.677778
	15	0.7	0.5	0.9	53	25.6	0.274889	0.714286
	16	0.5	0.4	1.1	53	25.4	0.15708	0.8
	17	0.4	0.3	1.1	53	25.4	0.094248	0.75

A12	1	0.28	0.28	3	53	23.5	0.061575	1
A15	1	0.5	0.5	2	53	24.5	0.196349	1
	2	0.7	0.6	3.5	53	23	0.329867	0.857143
	3	0.6	0.5	2.1	53	24.4	0.235619	0.833333
A21	1	0.45	0.32	2.3	53	24.2	0.113097	0.711111
	2	0.36	0.36	1.1	53	25.4	0.101788	1
A22	1	0.57	0.5	4	53	22.5	0.223838	0.877193
	2	0.64	0.57	2	53	24.5	0.286513	0.890625
A24	1	0.36	0.36	1.6	53	24.9	0.101788	1
A25	1	0.64	0.36	4.9	53	21.6	0.180956	0.5625
	2	0.63	0.54	1.6	53	24.9	0.267192	0.857143
	3	0.28	0.26	0.9	53	25.6	0.057177	0.928571
	4	0.45	0.43	6.3	53	20.2	0.151974	0.955556
	5	0.63	0.5	5.3	53	21.2	0.2474	0.793651
	6	0.54	0.51	3.6	53	22.9	0.216298	0.944444
	7	0.28	0.22	3.8	53	22.7	0.04838	0.785714
	8	0.51	0.4	1.91	53	24.59	0.160221	0.784314
	9	0.32	0.28	1.8	53	24.7	0.070372	0.875
	10	0.36	0.28	1.9	53	24.6	0.079168	0.777778
	11	0.36	0.28	2.7	53	23.8	0.079168	0.777778
	12	0.57	0.42	1.2	53	25.3	0.188024	0.736842
	13	0.5	0.36	3.8	53	22.7	0.141372	0.72
	14	0.36	0.28	4.1	53	22.4	0.079168	0.777778
	15	0.67	0.64	2.6	53	23.9	0.336778	0.955224
	16	0.4	0.2	4.2	53	22.3	0.062832	0.5
	17	0.2	0.2	6.9	53	19.6	0.031416	1
	18	0.45	0.32	7.1	53	19.4	0.113097	0.711111
	19	0.22	0.14	13.6	53	12.9	0.02419	0.636364
	20	0.22	0.22	12.7	53	13.8	0.038013	1
A34	1	0.36	0.28	4.5	38.4	14.7	0.079168	0.777778
A35	1	0.5	0.5	1.9	38.4	17.3	0.196349	1
	2	0.58	0.36	4.21	38.4	14.99	0.163991	0.62069
	3	0.7	0.5	2.6	38.4	16.6	0.274889	0.714286
A41	1	0.41	0.3	7.5	38.3	11.65	0.096604	0.731707
	2	0.28	0.28	4.2	38.3	14.95	0.061575	1
	3	0.4	0.2	8.9	38.3	10.25	0.062832	0.5
	4	0.41	0.32	0.8	38.3	18.35	0.103044	0.780488
	5	0.2	0.2	5	38.3	14.15	0.031416	1
	6	0.3	0.22	5.6	38.3	13.55	0.051836	0.733333
A45	1	0.28	0.14	10.2	38.3	8.95	0.030788	0.5
B11	1	0.67	0.5	12.11	53.1	14.44	0.263108	0.746269
	2	0.2	0.15	9.5	53.1	17.05	0.023562	0.75
	3	0.22	0.2	10.6	53.1	15.95	0.034557	0.909091
	4	0.5	0.36	1.3	53.1	25.25	0.141372	0.72
	5	0.41	0.36	1.4	53.1	25.15	0.115925	0.878049
	6	0.36	0.28	2.3	53.1	24.25	0.079168	0.777778
	7	0.36	0.22	2	53.1	24.55	0.062203	0.611111
	8	0.32	0.22	1.5	53.1	25.05	0.055292	0.6875
	9	0.41	0.22	1.1	53.1	25.45	0.070843	0.536585
	10	0.5	0.36	8.3	53.1	18.25	0.141372	0.72
	11	0.58	0.5	5.5	53.1	21.05	0.227765	0.862069
	12	0.42	0.28	4.5	53.1	22.05	0.092363	0.666667
	13	0.28	0.28	4	53.1	22.55	0.061575	1
	14	0.36	0.28	3.4	53.1	23.15	0.079168	0.777778
	15	0.45	0.36	25	53.1	1.55	0.127234	0.8
	16	0.36	0.36	27.3	53.1	-0.75	0.101788	1
B12	1	0.8	0.6	1.1	53.1	25.45	0.376991	0.75

	2	0.54	0.45	4.3	53.1	22.25	0.190852	0.833333
	3	0.5	0.4	1.4	53.1	25.15	0.15708	0.8
B13	1	0.78	0.58	3.4	53.1	23.15	0.355314	0.74359
	2	0.42	0.42	2.1	53.1	24.45	0.138544	1
	3	0.36	0.36	9.7	53.1	16.85	0.101788	1
	4	0.28	0.16	7.3	53.1	19.25	0.035186	0.571429
B14	1	0.5	0.36	15.4	53	11.1	0.141372	0.72
	2	0.42	0.36	10.3	53	16.2	0.118752	0.857143
	3	0.32	0.28	6.5	53	20	0.070372	0.875
	4	0.36	0.28	4.6	53	21.9	0.079168	0.777778
	5	0.32	0.22	3.1	53	23.4	0.055292	0.6875
	6	0.41	0.32	3.4	53	23.1	0.103044	0.780488
B15	1	0.3	0.2	1.31	53	25.19	0.047124	0.666667
	2	0.41	0.36	2.3	53	24.2	0.115925	0.878049
	3	0.3	0.15	3.2	53	23.3	0.035343	0.5
	4	0.54	0.51	4.9	53	21.6	0.216298	0.944444
	5	0.32	0.22	7.9	53	18.6	0.055292	0.6875
	6	0.3	0.3	4.8	53	21.7	0.070686	1
	7	0.22	0.2	4.3	53	22.2	0.034557	0.909091
	8	0.32	0.32	5.6	53	20.9	0.080425	1
	9	0.4	0.4	4.7	53	21.8	0.125664	1
	10	0.32	0.14	3.3	53	23.2	0.035186	0.4375
	11	0.45	0.41	12.9	53	13.6	0.144906	0.911111
	12	0.3	0.22	8.1	53	18.4	0.051836	0.733333
	13	0.42	0.36	4.2	53	22.3	0.118752	0.857143
	14	0.36	0.36	4.3	53	22.2	0.101788	1
	15	0.5	0.5	3.2	53	23.3	0.196349	1
B21	1	0.5	0.41	18.6	53	7.9	0.161006	0.82
	2	0.32	0.22	5.8	53	20.7	0.055292	0.6875
	3	0.63	0.57	5.1	53	21.4	0.282036	0.904762
	4	0.41	0.41	4.1	53	22.4	0.132025	1
	5	0.4	0.3	3.3	53	23.2	0.094248	0.75
	6	0.28	0.22	3.21	53	23.29	0.04838	0.785714
	7	0.36	0.22	2.2	53	24.3	0.062203	0.611111
	8	0.2	0.2	1.5	53	25	0.031416	1
	9	0.4	0.4	1.7	53	24.8	0.125664	1
	10	0.42	0.42	0.9	53	25.6	0.138544	1
	11	0.3	0.2	1.7	53	24.8	0.047124	0.666667
	12	0.6	0.6	0.7	53	25.8	0.282743	1
	13	0.51	0.4	2.8	53	23.7	0.160221	0.784314
	14	0.1	0.1	5.9	53	20.6	0.007854	1
	15	0.2	0.15	8.3	53	18.2	0.023562	0.75
	16	0.41	0.32	9.4	53	17.1	0.103044	0.780488
B22	1	0.61	0.54	4.5	53	22	0.25871	0.885246
	2	0.4	0.32	12.8	53	13.7	0.100531	0.8
	3	0.4	0.3	10.9	53	15.6	0.094248	0.75
	4	0.41	0.41	10.8	53	15.7	0.132025	1
	5	0.57	0.36	7.2	53	19.3	0.161164	0.631579
	6	0.64	0.58	5.1	53	21.4	0.29154	0.90625
B23	1	0.5	0.36	1	53	25.5	0.141372	0.72
	2	0.4	0.3	1.3	53	25.2	0.094248	0.75
	3	0.41	0.4	4.7	53	21.8	0.128805	0.97561
B24	1	1.55	0.32	7.1	53	19.4	0.389557	0.206452
	2	1.58	0.45	5.6	53	20.9	0.558418	0.28481
	3	0.64	0.5	2.4	53	24.1	0.251327	0.78125
	4	0.2	0.2	4.5	53	22	0.031416	1
B25	1	0.5	0.5	0.8	52.81	25.605	0.196349	1

	2	0.5	0.41	6.4	52.81	20.005	0.161006	0.82
	3	0.5	0.3	0.7	52.81	25.705	0.11781	0.6
	4	0.51	0.4	3	52.81	23.405	0.160221	0.784314
	5	0.45	0.22	8.5	52.81	17.905	0.077754	0.488889
	6	0.4	0.4	1.4	52.81	25.005	0.125664	1
	7	0.41	0.22	6.9	52.81	19.505	0.070843	0.536585
	8	0.41	0.36	4.8	52.81	21.605	0.115925	0.878049
	9	0.5	0.5	2.8	52.81	23.605	0.196349	1
B31	1	0.5	0.5	14.9	38.7	4.45	0.196349	1
	2	0.4	0.3	5.3	38.7	14.05	0.094248	0.75
B32	1	0.5	0.4	7.8	38.9	11.65	0.15708	0.8
B34	1	0.54	0.45	5.1	38.8	14.3	0.190852	0.833333
B35	1	0.5	0.2	2.5	39.1	17.05	0.07854	0.4
	2	0.6	0.4	2.5	39.1	17.05	0.188495	0.666667
	3	0.45	0.32	3.4	39.1	16.15	0.113097	0.711111
B41	1	0.5	0.45	1.9	39	17.6	0.176714	0.9
	2	0.51	0.45	4.1	39	15.4	0.180249	0.882353
	3	0.54	0.22	20.9	39	-1.4	0.093305	0.407407
B42	1	0.6	0.4	1.7	39	17.8	0.188495	0.666667
B45	1	0.5	0.36	1.1	39	18.4	0.141372	0.72
C11	1	0.45	0.28	1.6	52.8	24.8	0.09896	0.622222
	2	0.6	0.4	0.9	52.8	25.5	0.188495	0.666667
	3	0.5	0.42	9	52.8	17.4	0.164933	0.84
	4	0.3	0.22	15.9	52.8	10.5	0.051836	0.733333
	5	0.3	0.3	20.1	52.8	6.3	0.070686	1
	6	0.51	0.36	13.6	52.8	12.8	0.144199	0.705882
	7	0.41	0.36	11.7	52.8	14.7	0.115925	0.878049
	8	0.22	0.2	7.2	52.8	19.2	0.034557	0.909091
	9	0.3	0.22	3.2	52.8	23.2	0.051836	0.733333
C12	1	0.32	0.32	14.1	52.8	12.3	0.080425	1
	2	0.36	0.36	12.5	52.8	13.9	0.101788	1
	3	0.14	0.14	10.2	52.8	16.2	0.015394	1
	4	0.32	0.14	8.9	52.8	17.5	0.035186	0.4375
	5	0.51	0.51	5.2	52.8	21.2	0.204282	1
	6	0.2	0.1	3.5	52.8	22.9	0.015708	0.5
	7	0.3	0.1	0.7	52.8	25.7	0.023562	0.333333
	8	0.3	0.2	2.7	52.8	23.7	0.047124	0.666667
	9	0.63	0.32	1.3	52.8	25.1	0.158336	0.507937
	10	0.32	0.32	4	52.8	22.4	0.080425	1
C13	1	0.32	0.28	0.8	52.7	25.55	0.070372	0.875
	2	0.4	0.2	2.6	52.7	23.75	0.062832	0.5
	3	0.2	0.2	1.5	52.7	24.85	0.031416	1
	4	0.61	0.6	3	52.7	23.35	0.287455	0.983607
	5	0.41	0.22	26.3	52.7	0.05	0.070843	0.536585
	6	0.71	0.6	32	52.7	-5.65	0.334579	0.84507
	7	0.8	0.5	0.7	52.7	25.65	0.314159	0.625
	8	0.41	0.32	1	52.7	25.35	0.103044	0.780488
	9	0.5	0.4	1.7	52.7	24.65	0.15708	0.8
	10	0.71	0.36	0.3	52.7	26.05	0.200748	0.507042
C14	1	0.71	0.51	0.8	52.8	25.6	0.284392	0.71831
	2	0.81	0.5	2.6	52.8	23.8	0.318086	0.617284
	3	0.54	0.36	4.5	52.8	21.9	0.152681	0.666667
	4	0.4	0.2	0.8	52.8	25.6	0.062832	0.5
	5	0.5	0.36	1.1	52.8	25.3	0.141372	0.72
	6	0.32	0.22	2.4	52.8	24	0.055292	0.6875
	7	0.51	0.5	3.5	52.8	22.9	0.200276	0.980392
	8	0.41	0.22	0.8	52.8	25.6	0.070843	0.536585

	9	0.22	0.2	2.2	52.8	24.2	0.034557	0.909091
	10	0.32	0.22	4.9	52.8	21.5	0.055292	0.6875
	11	0.22	0.2	4.2	52.8	22.2	0.034557	0.909091
	12	0.63	0.57	3.2	52.8	23.2	0.282036	0.904762
C15	1	0.8	0.5	14.4	53	12.1	0.314159	0.625
	2	0.5	0.5	10.9	53	15.6	0.196349	1
	3	0.6	0.5	8.4	53	18.1	0.235619	0.833333
	4	0.2	0.1	7.6	53	18.9	0.015708	0.5
	5	0.1	0.1	7.3	53	19.2	0.007854	1
	6	0.5	0.5	5.4	53	21.1	0.196349	1
	7	0.32	0.22	4.5	53	22	0.055292	0.6875
	8	0.4	0.2	3.4	53	23.1	0.062832	0.5
	9	0.32	0.2	3.1	53	23.4	0.050265	0.625
	10	0.45	0.22	0.8	53	25.7	0.077754	0.488889
	11	0.51	0.41	1	53	25.5	0.164227	0.803922
	12	0.1	0.1	0.8	53	25.7	0.007854	1
	13	0.08	0.08	0.8	53	25.7	0.005027	1
	14	0.06	0.06	0.8	53	25.7	0.002827	1
	15	0.5	0.2	2.3	53	24.2	0.07854	0.4
	16	0.7	0.3	0.8	53	25.7	0.164933	0.428571
	17	0.3	0.12	1.2	53	25.3	0.028274	0.4
	18	0.81	0.63	2.8	53	23.7	0.400788	0.777778
	19	0.32	0.22	4.1	53	22.4	0.055292	0.6875
	20	0.41	0.3	2.9	53	23.6	0.096604	0.731707
	21	0.95	0.22	7.4	53	19.1	0.164148	0.231579
	22	0.4	0.4	5.9	53	20.6	0.125664	1
	23	0.32	0.22	5.6	53	20.9	0.055292	0.6875
	24	0.7	0.6	3.2	53	23.3	0.329867	0.857143
	25	0.41	0.36	5.9	53	20.6	0.115925	0.878049
	26	0.4	0.4	6.6	53	19.9	0.125664	1
	27	0.1	0.1	7.2	53	19.3	0.007854	1
	28	0.2	0.2	3.9	53	22.6	0.031416	1
	29	0.4	0.4	4.4	53	22.1	0.125664	1
	30	0.1	0.1	5.3	53	21.2	0.007854	1
	31	0.45	0.14	5.6	53	20.9	0.04948	0.311111
	32	0.22	0.14	6.4	53	20.1	0.02419	0.636364
	33	0.5	0.4	8.6	53	17.9	0.15708	0.8
	34	0.3	0.2	21.3	53	5.2	0.047124	0.666667
	35	0.4	0.3	22.2	53	4.3	0.094248	0.75
	36	0.6	0.5	23	53	3.5	0.235619	0.833333
	37	0.4	0.3	26.3	53	0.2	0.094248	0.75
	38	0.6	0.3	27.7	53	-1.2	0.141372	0.5
	39	0.5	0.4	2.8	53	23.7	0.15708	0.8
	40	0.4	0.4	3.2	53	23.3	0.125664	1
	41	0.42	0.28	3.1	53	23.4	0.092363	0.666667
	42	0.5	0.3	4.9	53	21.6	0.11781	0.6
C21	1	0.5	0.36	2	52.7	24.35	0.141372	0.72
	2	0.8	0.64	7	52.7	19.35	0.402124	0.8
	3	0.6	0.5	9	52.7	17.35	0.235619	0.833333
	4	0.7	0.45	7	52.7	19.35	0.2474	0.642857
	5	0.4	0.4	9.2	52.7	17.15	0.125664	1
	6	0.2	0.2	2.7	52.7	23.65	0.031416	1
	7	0.61	0.36	4.2	52.7	22.15	0.172473	0.590164
	8	0.54	0.42	4.3	52.7	22.05	0.178128	0.777778
	9	0.6	0.4	5.3	52.7	21.05	0.188495	0.666667
	10	0.78	0.5	6.5	52.7	19.85	0.306305	0.641026
	11	0.3	0.2	10.4	52.7	15.95	0.047124	0.666667

	12	0.4	0.3	5.6	52.7	20.75	0.094248	0.75
	13	0.41	0.32	3.9	52.7	22.45	0.103044	0.780488
	14	0.3	0.2	2.4	52.7	23.95	0.047124	0.666667
	15	0.4	0.4	1	52.7	25.35	0.125664	1
	16	0.4	0.3	6.7	52.7	19.65	0.094248	0.75
	17	0.5	0.4	2.4	52.7	23.95	0.15708	0.8
	18	0.5	0.5	0.7	52.7	25.65	0.196349	1
	19	0.45	0.28	4.8	52.7	21.55	0.09896	0.622222
	20	0.3	0.2	2.6	52.7	23.75	0.047124	0.666667
	21	0.5	0.4	1.2	52.7	25.15	0.15708	0.8
	22	0.7	0.3	2.1	52.7	24.25	0.164933	0.428571
C22	1	0.3	0.2	1.6	52.6	24.7	0.047124	0.666667
	2	0.58	0.36	3.9	52.6	22.4	0.163991	0.62069
	3	0.22	0.22	7	52.6	19.3	0.038013	1
	4	0.4	0.3	10	52.6	16.3	0.094248	0.75
	5	0.67	0.45	0.8	52.6	25.5	0.236797	0.671642
	6	0.61	0.4	1.8	52.6	24.5	0.191637	0.655738
	7	0.41	0.36	2.9	52.6	23.4	0.115925	0.878049
	8	0.81	0.54	4.4	52.6	21.9	0.343533	0.666667
	9	0.6	0.5	0.8	52.6	25.5	0.235619	0.833333
	10	0.2	0.2	0.6	52.6	25.7	0.031416	1
	11	0.22	0.2	1.8	52.6	24.5	0.034557	0.909091
	12	0.32	0.25	3.6	52.6	22.7	0.062832	0.78125
	13	0.2	0.2	7.2	52.6	19.1	0.031416	1
	14	0.41	0.32	8.91	52.6	17.39	0.103044	0.780488
	15	0.51	0.51	8.3	52.6	18	0.204282	1
	16	0.41	0.3	10.5	52.6	15.8	0.096604	0.731707
	17	0.45	0.14	0.8	52.6	25.5	0.04948	0.311111
	18	0.5	0.5	1.1	52.6	25.2	0.196349	1
	19	0.51	0.51	2	52.6	24.3	0.204282	1
C23	1	0.41	0.32	1.9	52.7	24.45	0.103044	0.780488
	2	0.4	0.4	3.8	52.7	22.55	0.125664	1
	3	0.3	0.2	6	52.7	20.35	0.047124	0.666667
	4	0.28	0.14	6.3	52.7	20.05	0.030788	0.5
	5	0.5	0.5	1.3	52.7	25.05	0.196349	1
	6	0.63	0.25	2.1	52.7	24.25	0.1237	0.396825
	7	0.61	0.41	2.6	52.7	23.75	0.196428	0.672131
	8	0.2	0.2	3.8	52.7	22.55	0.031416	1
	9	0.36	0.14	5	52.7	21.35	0.039584	0.388889
	10	0.41	0.32	6.9	52.7	19.45	0.103044	0.780488
	11	0.22	0.22	15.7	52.7	10.65	0.038013	1
	12	0.1	0.1	15.5	52.7	10.85	0.007854	1
	13	0.41	0.28	8.1	52.7	18.25	0.090164	0.682927
	14	0.4	0.3	2.5	52.7	23.85	0.094248	0.75
	15	0.4	0.4	2.1	52.7	24.25	0.125664	1
	16	0.6	0.6	1.9	52.7	24.45	0.282743	1
	17	0.2	0.2	3	52.7	23.35	0.031416	1
	18	0.4	0.2	2.4	52.7	23.95	0.062832	0.5
	19	0.6	0.4	2.9	52.7	23.45	0.188495	0.666667
	20	0.4	0.3	3.6	52.7	22.75	0.094248	0.75
C24	1	0.4	0.4	1.8	52.6	24.5	0.125664	1
	2	0.2	0.2	2.2	52.6	24.1	0.031416	1
	3	0.6	0.4	3.3	52.6	23	0.188495	0.666667
	4	0.54	0.32	5.4	52.6	20.9	0.135717	0.592593
	5	0.28	0.22	13.5	52.6	12.8	0.04838	0.785714
	6	0.45	0.32	13.1	52.6	13.2	0.113097	0.711111
	7	0.41	0.36	1.7	52.6	24.6	0.115925	0.878049

	8	0.3	0.14	5.5	52.6	20.8	0.032987	0.466667
	9	0.45	0.22	7.3	52.6	19	0.077754	0.488889
	10	0.85	0.54	0.9	52.6	25.4	0.360497	0.635294
	11	0.67	0.32	1	52.6	25.3	0.168389	0.477612
	12	0.42	0.22	0.8	52.6	25.5	0.072571	0.52381
	13	0.45	0.36	0.6	52.6	25.7	0.127234	0.8
	14	0.6	0.4	0.8	52.6	25.5	0.188495	0.666667
	15	0.3	0.3	0.62	52.6	25.68	0.070686	1
	16	0.22	0.22	0.61	52.6	25.69	0.038013	1
	17	0.3	0.22	0.8	52.6	25.5	0.051836	0.733333
	18	0.2	0.2	2.9	52.6	23.4	0.031416	1
	19	0.4	0.22	6.8	52.6	19.5	0.069115	0.55
C25	1	0.72	0.14	7.5	52.7	18.85	0.079168	0.194444
	2	0.3	0.3	6.9	52.7	19.45	0.070686	1
	3	0.32	0.3	3.7	52.7	22.65	0.075398	0.9375
	4	0.4	0.3	4	52.7	22.35	0.094248	0.75
	5	0.5	0.3	3.2	52.7	23.15	0.11781	0.6
	6	0.5	0.2	5.6	52.7	20.75	0.07854	0.4
	7	0.5	0.3	2.8	52.7	23.55	0.11781	0.6
	8	0.67	0.36	2.3	52.7	24.05	0.189438	0.537313
C31	1	0.28	0.14	0.7	37.9	18.25	0.030788	0.5
	2	0.64	0.36	0.9	37.9	18.05	0.180956	0.5625
	3	0.28	0.14	4.8	37.9	14.15	0.030788	0.5
	4	0.5	0.32	5.6	37.9	13.35	0.125664	0.64
	5	0.71	0.3	1.2	37.9	17.75	0.16729	0.422535
C32	1	0.51	0.32	6.1	39.1	13.45	0.128177	0.627451
C33	1	0.42	0.28	2.6	38.9	16.85	0.092363	0.666667
	2	0.36	0.22	8.1	38.9	11.35	0.062203	0.611111
	3	0.28	0.28	8.6	38.9	10.85	0.061575	1
C34	1	0.6	0.4	5.7	38.7	13.65	0.188495	0.666667
	2	0.5	0.4	5.4	38.7	13.95	0.15708	0.8
	3	0.4	0.2	6.8	38.7	12.55	0.062832	0.5
	4	0.3	0.22	10.4	38.7	8.95	0.051836	0.733333
	5	0.2	0.15	6.7	38.7	12.65	0.023562	0.75
C35	1	0.61	0.61	3.4	38.5	15.85	0.292246	1
	2	0.3	0.25	3.4	38.5	15.85	0.058905	0.833333
	3	0.5	0.28	3.6	38.5	15.65	0.109956	0.56
	4	0.61	0.61	0.8	38.5	18.45	0.292246	1
	5	0.51	0.4	0.7	38.5	18.55	0.160221	0.784314
C41	1	0.22	0.14	7.6	37.7	11.25	0.02419	0.636364
	2	0.58	0.36	10.8	37.7	8.05	0.163991	0.62069
C42	1	0.36	0.28	4.3	38.2	14.8	0.079168	0.777778
	2	0.7	0.6	7	38.2	12.1	0.329867	0.857143
	3	0.5	0.4	9.1	38.2	10	0.15708	0.8
	4	0.7	0.6	13.2	38.2	5.9	0.329867	0.857143
	5	0.5	0.5	14.1	38.2	5	0.196349	1
C43	1	0.3	0.3	0.7	38.8	18.7	0.070686	1
	2	0.6	0.35	0.8	38.8	18.6	0.164933	0.583333
	3	0.3	0.3	3.1	38.8	16.3	0.070686	1
	4	0.1	0.1	4.2	38.8	15.2	0.007854	1
	5	0.1	0.1	4.3	38.8	15.1	0.007854	1
	6	0.3	0.3	6.7	38.8	12.7	0.070686	1
	7	0.3	0.1	9.7	38.8	9.7	0.023562	0.333333
	8	0.3	0.3	11.6	38.8	7.8	0.070686	1
	9	0.6	0.6	7.9	38.8	11.5	0.282743	1
	10	0.2	0.2	0.8	38.8	18.6	0.031416	1
	11	0.5	0.3	0.7	38.8	18.7	0.11781	0.6

C44	1	0.4	0.4	1.3	38.7	18.05	0.125664	1
	2	0.5	0.3	1.4	38.7	17.95	0.11781	0.6
	3	0.2	0.15	14.5	38.7	4.85	0.023562	0.75
	4	0.2	0.2	16.7	38.7	2.65	0.031416	1
	5	0.5	0.22	18.7	38.7	0.65	0.086394	0.44
	6	0.67	0.28	20.6	38.7	-1.25	0.147341	0.41791
	7	0.41	0.3	18.7	38.7	0.65	0.096604	0.731707
	8	0.4	0.3	0.8	38.7	18.55	0.094248	0.75
	9	0.32	0.3	0.9	38.7	18.45	0.075398	0.9375
	10	0.15	0.1	0.8	38.7	18.55	0.011781	0.666667
C45	1	0.4	0.3	1.1	38.5	18.15	0.094248	0.75
	2	0.2	0.2	2	38.5	17.25	0.031416	1
	3	0.4	0.4	6.8	38.5	12.45	0.125664	1
	4	0.2	0.1	5.3	38.5	13.95	0.015708	0.5
D12	1	0.5	0.3	0.8	38.9	18.65	0.11781	0.6
	2	0.45	0.28	2.6	38.9	16.85	0.09896	0.622222
	3	0.4	0.4	2.8	38.9	16.65	0.125664	1
	4	0.45	0.22	4.2	38.9	15.25	0.077754	0.488889
	5	0.2	0.2	1.3	38.9	18.15	0.031416	1
D13	1	0.32	0.32	1.9	39.6	17.9	0.080425	1
	2	0.5	0.28	1.9	39.6	17.9	0.109956	0.56
	3	0.22	0.15	3.1	39.6	16.7	0.025918	0.681818
	4	0.4	0.4	2.2	39.6	17.6	0.125664	1
	5	0.5	0.5	2.8	39.6	17	0.196349	1
	6	0.3	0.25	4	39.6	15.8	0.058905	0.833333
	7	0.22	0.15	4.6	39.6	15.2	0.025918	0.681818
	8	0.3	0.3	4.9	39.6	14.9	0.070686	1
	9	0.5	0.32	4	39.6	15.8	0.125664	0.64
	10	0.32	0.15	4.7	39.6	15.1	0.037699	0.46875
	11	0.5	0.36	4	39.6	15.8	0.141372	0.72
	12	0.32	0.28	4.6	39.6	15.2	0.070372	0.875
	13	0.5	0.5	2.8	39.6	17	0.196349	1
	14	0.36	0.28	6	39.6	13.8	0.079168	0.777778
	15	0.4	0.35	7.4	39.6	12.4	0.109956	0.875
	16	0.4	0.2	8	39.6	11.8	0.062832	0.5
	17	0.45	0.36	9.6	39.6	10.2	0.127234	0.8
	18	0.4	0.4	10.4	39.6	9.4	0.125664	1
D14	1	0.3	0.3	1.2	39.5	18.55	0.070686	1
	2	0.3	0.3	1.7	39.5	18.05	0.070686	1
	3	0.5	0.36	2.8	39.5	16.95	0.141372	0.72
	4	0.1	0.1	2	39.5	17.75	0.007854	1
D15	1	0.51	0.41	2	38.81	17.405	0.164227	0.803922
	2	0.32	0.22	2.7	38.81	16.705	0.055292	0.6875
	3	0.3	0.3	2.9	38.81	16.505	0.070686	1
	4	0.51	0.22	5.4	38.81	14.005	0.088122	0.431373
	5	0.36	0.36	4.9	38.81	14.505	0.101788	1
	6	0.3	0.3	14.3	38.81	5.105	0.070686	1
	7	0.2	0.2	18.2	38.81	1.205	0.031416	1
	8	0.22	0.15	19.7	38.81	-0.295	0.025918	0.681818
D21	1	0.51	0.36	1.4	38	17.6	0.144199	0.705882
	2	0.5	0.4	1.6	38	17.4	0.15708	0.8
	3	0.3	0.3	2.5	38	16.5	0.070686	1
	4	0.3	0.3	6.8	38	12.2	0.070686	1
	5	0.42	0.22	8.1	38	10.9	0.072571	0.52381
	6	0.36	0.28	9.1	38	9.9	0.079168	0.777778
D22	1	0.4	0.22	1.2	38.5	18.05	0.069115	0.55
	2	0.5	0.22	2.2	38.5	17.05	0.086394	0.44

	3	0.42	0.22	4.3	38.5	14.95	0.072571	0.52381
D23	1	0.36	0.22	6.1	39	13.4	0.062203	0.611111
	2	0.36	0.36	5	39	14.5	0.101788	1
	3	0.45	0.36	4.6	39	14.9	0.127234	0.8
	4	0.42	0.36	2.8	39	16.7	0.118752	0.857143
	5	0.3	0.3	1.8	39	17.7	0.070686	1
	6	0.22	0.15	1.5	39	18	0.025918	0.681818
	7	0.22	0.22	1.7	39	17.8	0.038013	1
	8	0.3	0.15	1.7	39	17.8	0.035343	0.5
D24	1	0.4	0.3	2.2	39.1	17.35	0.094248	0.75
	2	0.4	0.4	2.9	39.1	16.65	0.125664	1
	3	0.4	0.4	6.7	39.1	12.85	0.125664	1
	4	0.35	0.3	7.9	39.1	11.65	0.082467	0.857143
	5	0.5	0.4	13.4	39.1	6.15	0.15708	0.8
	6	0.6	0.3	13.1	39.1	6.45	0.141372	0.5
	7	0.2	0.2	3.9	39.1	15.65	0.031416	1
	8	0.4	0.4	0.9	39.1	18.65	0.125664	1
D25	1	0.5	0.4	2.6	38.3	16.55	0.15708	0.8
	2	0.41	0.28	4.7	38.3	14.45	0.090164	0.682927
	3	0.5	0.41	20.4	38.3	-1.25	0.161006	0.82
	4	0.5	0.5	22.1	38.3	-2.95	0.196349	1
D31	1	0.41	0.32	4.2	52.8	22.2	0.103044	0.780488
	2	0.4	0.4	6.7	52.8	19.7	0.125664	1
	3	0.2	0.15	9.6	52.8	16.8	0.023562	0.75
	4	0.6	0.6	12.3	52.8	14.1	0.282743	1
	5	0.5	0.32	8.8	52.8	17.6	0.125664	0.64
	6	0.4	0.3	8.1	52.8	18.3	0.094248	0.75
	7	0.6	0.4	3.3	52.8	23.1	0.188495	0.666667
	8	0.2	0.15	1.5	52.8	24.9	0.023562	0.75
D32	1	0.3	0.25	0.8	52.6	25.5	0.058905	0.833333
	2	0.73	0.51	2.5	52.6	23.8	0.292403	0.69863
	3	0.3	0.3	2.4	52.6	23.9	0.070686	1
	4	0.36	0.32	3.8	52.6	22.5	0.090478	0.888889
	5	0.61	0.5	3.1	52.6	23.2	0.239546	0.819672
	6	0.2	0.1	4.4	52.6	21.9	0.015708	0.5
	7	0.5	0.36	5.6	52.6	20.7	0.141372	0.72
	8	0.3	0.3	7.3	52.6	19	0.070686	1
	9	0.4	0.3	7.7	52.6	18.6	0.094248	0.75
	10	0.35	0.3	9.8	52.6	16.5	0.082467	0.857143
	11	0.32	0.3	11	52.6	15.3	0.075398	0.9375
	12	0.3	0.3	13	52.6	13.3	0.070686	1
	13	0.3	0.3	10.3	52.6	16	0.070686	1
	14	0.5	0.32	4.4	52.6	21.9	0.125664	0.64
	15	0.41	0.41	0.9	52.6	25.4	0.132025	1
	16	0.6	0.6	0.8	52.6	25.5	0.282743	1
D33	1	0.42	0.36	3.2	52.5	23.05	0.118752	0.857143
	2	0.45	0.45	3.6	52.5	22.65	0.159043	1
	3	0.3	0.25	3.8	52.5	22.45	0.058905	0.833333
	4	0.3	0.3	4.5	52.5	21.75	0.070686	1
	5	0.32	0.32	9.7	52.5	16.55	0.080425	1
	6	0.3	0.15	21.1	52.5	5.15	0.035343	0.5
	7	0.3	0.3	22.9	52.5	3.35	0.070686	1
	8	0.45	0.36	24.3	52.5	1.95	0.127234	0.8
	9	0.3	0.3	22.1	52.5	4.15	0.070686	1
	10	0.4	0.22	7.5	52.5	18.75	0.069115	0.55
	11	0.4	0.4	3.81	52.5	22.44	0.125664	1
	12	0.41	0.28	2.6	52.5	23.65	0.090164	0.682927

D34	1	0.7	0.4	2.1	52.6	24.2	0.219911	0.571429
	2	0.8	0.7	3.4	52.6	22.9	0.439823	0.875
	3	0.8	0.8	3.7	52.6	22.6	0.502654	1
	4	0.5	0.5	2.2	52.6	24.1	0.196349	1
	5	0.4	0.3	2.6	52.6	23.7	0.094248	0.75
	6	0.36	0.22	1.6	52.6	24.7	0.062203	0.611111
	7	0.4	0.3	2.8	52.6	23.5	0.094248	0.75
	8	0.36	0.2	3	52.6	23.3	0.056549	0.555556
	9	0.4	0.3	6.1	52.6	20.2	0.094248	0.75
D35	1	0.54	0.3	5.1	52.8	21.3	0.127234	0.555556
	2	0.3	0.3	10	52.8	16.4	0.070686	1
	3	0.5	0.5	10.1	52.8	16.3	0.196349	1
D41	1	0.3	0.2	5.6	53.1	20.95	0.047124	0.666667
	2	0.1	0.1	7.2	53.1	19.35	0.007854	1
	3	0.14	0.1	8.7	53.1	17.85	0.010996	0.714286
D42	1	0.7	0.4	0.7	52.9	25.75	0.219911	0.571429
	2	0.4	0.35	1.4	52.9	25.05	0.109956	0.875
	3	0.3	0.3	2.5	52.9	23.95	0.070686	1
	4	0.3	0.3	0.7	52.9	25.75	0.070686	1
	5	0.4	0.4	1.4	52.9	25.05	0.125664	1
	6	0.3	0.3	2.9	52.9	23.55	0.070686	1
	7	0.3	0.2	9.4	52.9	17.05	0.047124	0.666667
	8	0.4	0.4	8.3	52.9	18.15	0.125664	1
	9	0.4	0.4	7.3	52.9	19.15	0.125664	1
	10	0.41	0.41	5.6	52.9	20.85	0.132025	1
	11	0.32	0.15	6	52.9	20.45	0.037699	0.46875
	12	0.4	0.4	3.7	52.9	22.75	0.125664	1
	13	0.4	0.3	2.9	52.9	23.55	0.094248	0.75
	14	0.5	0.5	2	52.9	24.45	0.196349	1
	15	0.5	0.4	1.1	52.9	25.35	0.15708	0.8
D43	1	0.32	0.2	16.8	52.7	9.55	0.050265	0.625
	2	0.5	0.5	11.3	52.7	15.05	0.196349	1
	3	0.32	0.32	11.2	52.7	15.15	0.080425	1
	4	0.6	0.5	9.6	52.7	16.75	0.235619	0.833333
	5	0.3	0.3	9.4	52.7	16.95	0.070686	1
	6	0.4	0.3	8.7	52.7	17.65	0.094248	0.75
	7	0.3	0.3	8.1	52.7	18.25	0.070686	1
	8	0.4	0.3	7.9	52.7	18.45	0.094248	0.75
	9	0.4	0.3	6.5	52.7	19.85	0.094248	0.75
	10	0.3	0.3	5.7	52.7	20.65	0.070686	1
	11	0.41	0.2	6.2	52.7	20.15	0.064403	0.487805
	12	0.3	0.2	5.1	52.7	21.25	0.047124	0.666667
	13	0.2	0.15	6.1	52.7	20.25	0.023562	0.75
	14	0.58	0.5	6.2	52.7	20.15	0.227765	0.862069
	15	0.45	0.3	5.3	52.7	21.05	0.106029	0.666667
	16	0.5	0.45	5.8	52.7	20.55	0.176714	0.9
	17	0.4	0.4	3.8	52.7	22.55	0.125664	1
	18	0.32	0.3	3.2	52.7	23.15	0.075398	0.9375
	19	0.36	0.3	3.8	52.7	22.55	0.084823	0.833333
	20	0.2	0.2	3.2	52.7	23.15	0.031416	1
	21	0.6	0.5	3.1	52.7	23.25	0.235619	0.833333
	22	0.41	0.3	2.2	52.7	24.15	0.096604	0.731707
	23	0.3	0.3	4.1	52.7	22.25	0.070686	1
	24	0.4	0.4	3.4	52.7	22.95	0.125664	1
	25	0.36	0.2	2	52.7	24.35	0.056549	0.555556
	26	0.3	0.3	0.7	52.7	25.65	0.070686	1
	27	0.22	0.2	1.2	52.7	25.15	0.034557	0.909091

	28	0.41	0.41	24.5	52.7	1.85	0.132025	1
	29	0.3	0.2	1.2	52.7	25.15	0.047124	0.666667
	30	0.3	0.2	1.6	52.7	24.75	0.047124	0.666667
	31	0.4	0.2	2.1	52.7	24.25	0.062832	0.5
	32	0.4	0.4	3.4	52.7	22.95	0.125664	1
	33	0.4	0.3	11.4	52.7	14.95	0.094248	0.75
	34	0.36	0.3	13.4	52.7	12.95	0.084823	0.833333
D44	1	0.5	0.4	0.6	52.9	25.85	0.15708	0.8
	2	0.4	0.4	0.71	52.9	25.74	0.125664	1
	3	0.32	0.2	1.2	52.9	25.25	0.050265	0.625
	4	0.3	0.3	4	52.9	22.45	0.070686	1
	5	0.2	0.2	5.1	52.9	21.35	0.031416	1
	6	0.3	0.3	8.3	52.9	18.15	0.070686	1
	7	0.3	0.3	19.7	52.9	6.75	0.070686	1
	8	0.4	0.3	8.6	52.9	17.85	0.094248	0.75
	9	0.41	0.3	5.4	52.9	21.05	0.096604	0.731707
	10	0.41	0.4	8.4	52.9	18.05	0.128805	0.97561
	11	0.4	0.4	7.3	52.9	19.15	0.125664	1
	12	0.32	0.25	6.2	52.9	20.25	0.062832	0.78125
	13	0.51	0.4	5.9	52.9	20.55	0.160221	0.784314
	14	0.5	0.4	3.5	52.9	22.95	0.15708	0.8
D45	1	0.54	0.4	0.8	52.9	25.65	0.169646	0.740741
	2	0.22	0.15	1.5	52.9	24.95	0.025918	0.681818
	3	0.3	0.3	5.1	52.9	21.35	0.070686	1
	4	0.41	0.41	1.2	52.9	25.25	0.132025	1
	5	0.4	0.4	4.1	52.9	22.35	0.125664	1
	6	0.3	0.3	0.8	52.9	25.65	0.070686	1
	7	0.3	0.3	26.2	52.9	0.25	0.070686	1
	8	0.4	0.3	22.8	52.9	3.65	0.094248	0.75
	9	0.32	0.2	18.1	52.9	8.35	0.050265	0.625
	10	0.28	0.2	14.3	52.9	12.15	0.043982	0.714286
	11	0.42	0.3	12.7	52.9	13.75	0.09896	0.714286
	12	0.3	0.3	8.1	52.9	18.35	0.070686	1
	13	0.4	0.3	8.3	52.9	18.15	0.094248	0.75
	14	0.2	0.1	7.8	52.9	18.65	0.015708	0.5
	15	0.3	0.3	7.9	52.9	18.55	0.070686	1
	16	0.2	0.2	7	52.9	19.45	0.031416	1
	17	0.3	0.3	7	52.9	19.45	0.070686	1
	18	0.7	0.4	5.7	52.9	20.75	0.219911	0.571429
	19	0.5	0.5	5.2	52.9	21.25	0.196349	1
	20	0.2	0.15	5.6	52.9	20.85	0.023562	0.75
	21	0.2	0.2	6.2	52.9	20.25	0.031416	1
	22	0.5	0.4	3.6	52.9	22.85	0.15708	0.8
	23	0.5	0.5	1.9	52.9	24.55	0.196349	1