Report No. 826

Ultrasonic

Proficiency Testing Program

Round Two

October 2013

ACKNOWLEDGMENTS

PTA wishes to gratefully acknowledge the technical assistance in the design and operation provided for this program by Mr B Gaven, Industrial Imaging Pty Ltd, Australia.

P O Box 7507, Silverwater NSW 2128, Australia

CONTENTS

1. Foreword

This report summarises the results of the second round of an interlaboratory comparison on the ultrasonic examination of welded joints.

The exercise was conducted from March 2012 to September 2013 by Proficiency Testing Australia (PTA). The Program Coordinator was Dr M Li. The technical adviser was Mr B Gaven, Industrial Imaging Pty Ltd, Australia. This report was authorised by Mr Philip Briggs, General Manager, PTA.

The main aim of the program was to assess laboratories' abilities to competently perform the prescribed testing. Interlaboratory comparison provides objective evidence that laboratories are competent and that they can achieve the level of accuracy for which they have nominated. It also provides a means for improving the quality and performance of laboratories.

2. Program Features and Design

2.1 Each laboratory was randomly allocated a unique code number for the program to ensure confidentiality of results. Reference to each laboratory in this report is by code number only. Please note that where laboratories reported more than one set of results, the laboratory code number is reported with letters "a", "b", and "c" etc.

2.2 Laboratories were provided with the "Instructions to Participants" (see Appendix C). Participants were provided with one pipe, one plate and/or one tee test specimen.

2.3 Forty-three laboratories from Australia and one laboratory from the United Arab Emirates participated in the testing. Forty-nine reports were submitted.

2.4 Results (as reported by participants) are presented in Appendix A for each laboratory.

3. Reporting by Participants

Laboratories were asked to test the relevant specimen and report their test results in accordance with AS 2207 and AS 4037.

4. Reference Values

A total of four test pieces were used, consisting of three plates and one pipe. The reference values for each of the test specimen were provided by Advanced Technology Testing and Research (ATTAR), and are presented in Appendix B.

5. Summary of Results

A summary of the results returned by participating laboratories for each test appears in Appendix A. Each participating laboratory was provided with a Summary Report detailing its performance. An example of the Summary Report is included in Appendix D.

6. PTA and Technical Adviser's Comments

The majority of participant results are consistent with the reference values, as shown in Appendix A.

A number of the reports issued by participating laboratories did not adequately address the reporting requirements specified by AS 2207-2007.

The number of reports that were deficient of information indicates that there is room for improvement in this area. Individual laboratories, and the non-destructive testing (NDT) industry in general, should consider reporting standardisation and simplification and place greater emphasis and importance on report details and terminology.

It should be noted that most participating laboratories presented reports and work sheets which were of a very high standard. A minority of participants submitted responses which had significant deficiencies and this raises concerns regarding the technical control of those laboratories.

The overall failure rate of 26% for this program indicates that there is room for improvement in the application of the ultrasonic test method.

7. References

[1] *Guide to Proficiency Testing Australia (2012).* (This document is located on the PTA website at www.pta.asn.au under Programs/Documents).

[2] *AS 2207-2007: Non-destructive testing - Ultrasonic testing of fusion welded joints in carbon and low alloy steel.*

[3] *AS 4037-1999: Pressure equipment - Examination and testing*.

APPENDIX A

Summary of Reported Results

LABORATORY RESULTS (TEST PIECE ID: PTA0012-PLATE)

Lab Code	Flaw No.	Type	Length (mm)	Location along the weld (mm)	Comments
6	1	LS	17	31	PASS
	2	PG	12	112	
	3	LR	12	230	
10	1	Side Fusion	20	38	PASS
	2	Crack	16	118	
	3	Root Fusion	14	240	
11	1	Crack	28	35	PASS
	2	Porosity	19	115	
	3	LR	18	239	
13	1	IL/LF	22	37	PASS
	2	KL	16	238	
	3	IL	16	119	
14	1	IL	28	33	PASS
	2	PG	23	110	
	3	LR	18	235	
18	1	Slag	33	30	FAIL
	2	Porosity	15	120	
	3	Root Crack	35	230	
27	1	Inclusion	24	34	FAIL
	2	Porosity	20	111	
34	1	IL	20	30	FAIL
	2	PG	20	110	
	3	KL	20	230	
39	1	LS	22	35	PASS
	2	Porosity	20	116	
	3	LR	18	240	
41	1	IL	20	30	FAIL
	2	PG	20	110	
	3	KL	20	230	

LABORATORY RESULTS (TEST PIECE ID: PTA0013-PLATE)

Lab Code	Flaw No.	Type	Length (mm)	Location along the weld (mm)	Comments
3A	1	KL	32	59	PASS
	2	LS	29	130	
	3	IL	32	266	
3B	1	KL (Root)	31	60	PASS
	2	LS	27	132	
	3	IL	31	268	
3C	1	Crack	29	60	PASS
	2	LS	27	132	
	3	IL	28	266	
7	1	Root Crack	30	60	PASS
	2	LS	25	135	
	3	IL	15	270	
15	1	Crack	26	50	PASS
	2	LR	18	128	
	3	Slag	16	260	
17	1	Toe Crack	30	64	PASS
	2	Lack of Fusion	28	132	
	3	Linear Inclusion	15	270	
24	1	Crack	33	58	PASS
	2	Side Fusion	32	130	
	3	LP	22	265	
25	1	Crack	25	65	PASS
	2	LS	28	135	
	3	IL	15	270	
32	1	Crack	26	61	PASS
	2	LS	28	130	
	3	IL	18	263	

LABORATORY RESULTS (TEST PIECE ID: PTA0013-PLATE) cont.

Lab Code	Flaw No.	Type	Length (mm)	Location along the weld (mm)	Comments
33A	1	Crack	30	60	PASS
	2	Side Fusion	25	135	
	3	LOF	15	192	
	4	Slag	20	265	
33B	1	Root Crack	28	60	PASS
	2	Side Fusion	30	130	
	3	Slag	24	265	
33C	1	Crack	23	67	FAIL
	2	Side Fusion	22	137	
36	1	Root Crack	27	59	PASS
	2	LS	24	135	
	3	IL	13	267	
40	1	Slag	25	65	PASS
	2	LOF	41	133	
	3	LS	17	268	
43A	1	Side Wall	32	57	PASS
	2	Side Wall	26	136	
	3	Slag	22	268	
43B	1	Side Wall	32	57	PASS
	2	Side Wall	26	136	
	3	Slag	22	268	
44	1	Root Crack	32	58	PASS
	2	Side Wall	28	130	
	3	Side Wall	20	265	

LABORATORY RESULTS (TEST PIECE ID: PTA0014-PLATE)

Lab Code	Flaw No.	Type	Length (mm)	Location along the weld (mm)	Comments
2	1	Lamination	25	66	PASS
	2	Inclusion	18	175	
	3	Toe Crack	20	256	
4	1	Lamination	24	62	PASS
	2	Interun Fusion	16	175	
	3	Toe Crack	22	254	
8	1	Lamination	25	65	PASS
	2	Slag	15	175	
	3	Toe Crack	20	260	
9	1	Lamination	25	66	PASS
	2	Slag	18	175	
	3	Toe Crack	20	256	
12A	1	Lamination	27	61	PASS
	2	Inclusion	22	172	
	3	Toe Crack	19	255	
12B	1	Lamination	25	60	PASS
	2	Side Fusion	16	175	
	3	Toe Crack	15	260	
12C	1	Lamination	25	65	PASS
	2	Side Fusion	20	175	
	3	Toe Crack	18	260	
12D	1	Toe Crack	15	257	PASS
	2	Side Fusion	17	175	
	3	Lamination	27	58	
12E	1	Lamination	25	65	PASS
	2	Side Fusion	20	175	
	3	Toe Crack	18	260	
19	1	Lamination	25	65	PASS
	2	Root Crack	16	178	
	3	Toe Crack	20	264	
20	1	Lamination	25	60	PASS
	2	Slag	23	173	
	3	Toe Crack	25	250	
22	1	Lamination	25	65	PASS
	2	Inclusion	22	175	
	3	KL	20	255	
28	1	PL Inclusion	25	65	PASS
	2	IL	20	180	
	3	HAZ KL	20	260	
31	1	Lamination	25	63	PASS
	2	Slag (Inclusion)	15	175	
	3	Toe Crack	19	255	
42	1	Lamination	28	61	PASS
	2	LS/Slag	24	170	
	3	Toe Crack	16	251	

LABORATORY RESULTS (TEST PIECE ID: PTA0015-PIPE)

Lab Code	Flaw No.	Type	Length (mm)	Location along the weld (mm)	Comments
1	1	IL, LS	20	17	PASS
	2	LF	15	132	
	3	LP	17	197	
4	1	Lack of Side Wall	16	18	PASS
	2	Incomplete Root	14	130	
	3	Lack of Side Wall	16	199	
16A	1	Root Fusion	24	10	PASS
	2	Incomplete Penetration	18	132	
	3	Side Wall	22	195	
16B	1	Root Fusion	22	10	PASS
	2	Incomplete Penetration	20	130	
	3	Side Wall	15	200	
23	1	Root Crack	24	16	PASS
	2	Late of Penetration	20	130	
	3	Side Wall Fusion	24	195	
29	1	Root Crack	27	10	PASS
	2	Incomplete Root	21	126	
	3	LS	19	195	

APPENDIX B

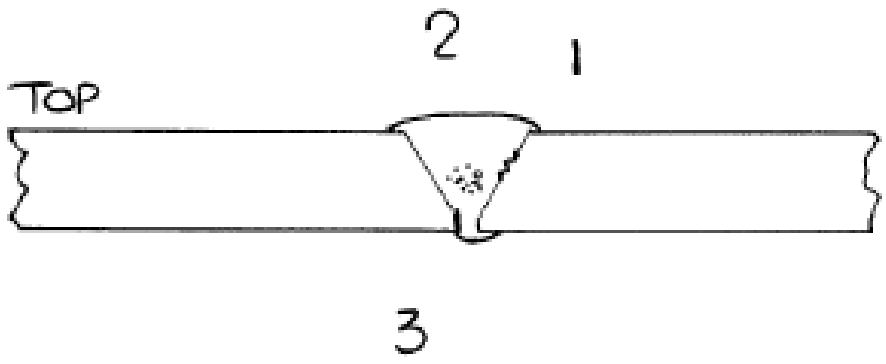
Conformance Certificate and Inspection Reports

Test Specimen Report

Specimen ID: PTA0012

Specimen :	Plate 12mm Thick x 300mm Long
Acceptance Criteria:	AS2207 Level 2, Record all cracks and all other discontinuities exceeding 10mm in length.
Test Method:	AS2207, UMB-2, Positions 1,2 & 4

Specimen Cross Section:



No.	Type	Length (mm)	Distance from 0 (mm)	Max Indication Angle	Mandatory Detection
1	Side Wall Crack	22	37	60	Yes
2	Porosity	19	115	70	Yes
3	Lack of Root Fusion	15	238	70	Yes

Test Specimen Report

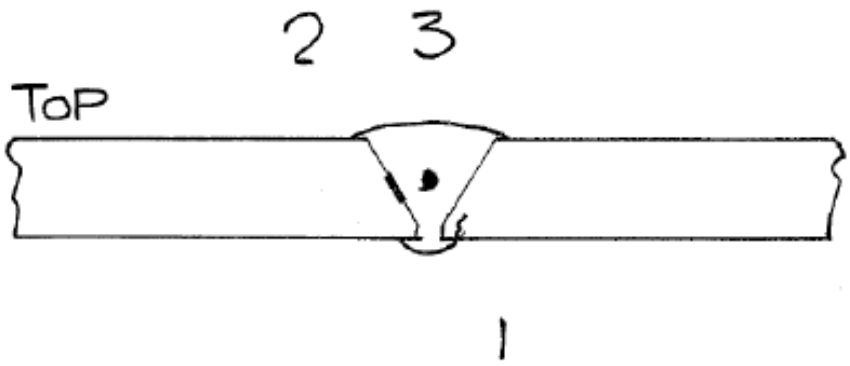
Specimen ID: PTA0013

Specimen : Plate 12mm Thick x 300mm Long

Acceptance Criteria: AS2207 Level 2, Record all cracks and all other discontinuities exceeding 10mm in length.

Test Method: AS2207, UMB-2, Positions 1,2 & 4

Specimen Cross Section:



No.	Type	Length (mm)	Distance from 0 (mm)	Max Indication Angle	Mandatory Detection
1	Root Crack	30	60	70°	Yes
2	Lack of Side Wall Fusion	25	134	60°	Yes
3	Slag	13	268	60°	Yes

Test Specimen Report

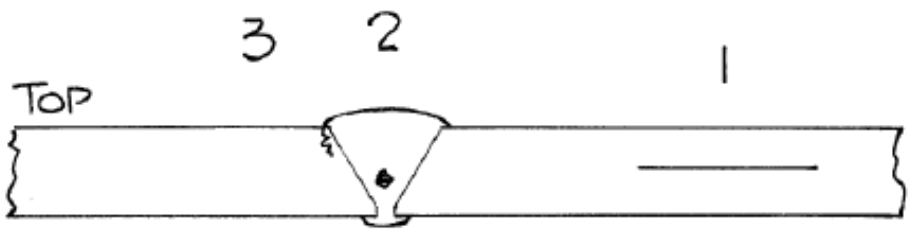
Specimen ID: PTA0014

Specimen : Plate 12mm Thick x 300mm Long

Acceptance Criteria: AS2207 Level 2, Record all cracks and all other discontinuities exceeding 10mm in length.

Test Method: AS2207, UMB-2, Positions 1,2 & 4

Specimen Cross Section:



No.	Type	Length (mm)	Distance from 0 (mm)	Max Indication Angle	Mandatory Detection
1	lamination	25	63	0°	Yes
2	Slag	19	173	70°	Yes
3	Toe Crack	19	268	60°	Yes

Test Specimen Report

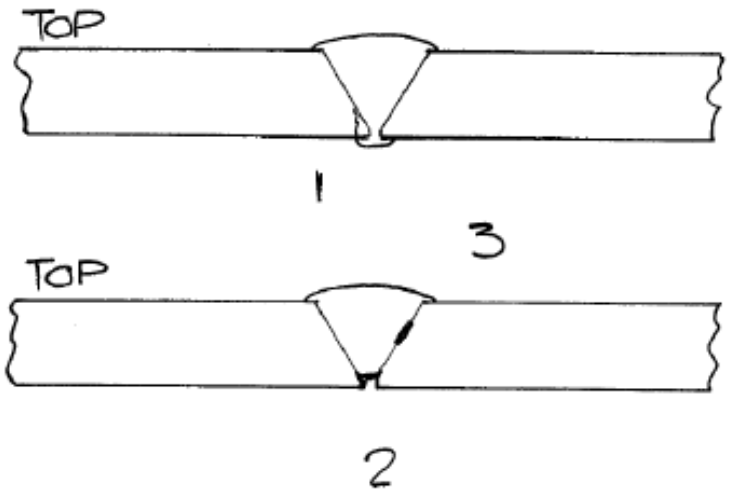
Specimen ID: PTA0015

Specimen : Pipe 12mm Thick x 80mm Diameter

Acceptance Criteria: AS2207 Level 2, Record all cracks and all other discontinuities exceeding 10mm in length.

Test Method: AS2207, UMB-2, Positions 1,2 & 4

Specimen Cross Section:



No.	Type	Length (mm)	Distance from 0 (mm)	Max Indication Angle	Mandatory Detection
1	Root Crack	27	12	70°	Yes
2	Incomplete Root Penetration	15	132	70°	Yes
3	Lack of Side Wall Fusion	18	200	60°	Yes

ULTRASONIC INSPECTION REPORT

Prepared For:	Proficiency Testing Australia
Attention:	Dr Michael Li
Description:	Ultrasonic Inspection of Ultrasonic Test Samples
Purchase Order:	TBA
Date of Test:	January 10, 2012
Location:	ATTAR, Keysborough, Australia
Equipment:	EPOCH 100i Serial # 100065803
Probes:	KK 8mmx9mm, 2MHz, 45° 60° & 70° KD 8mmx9mm, 4MHz, 45° 60° & 70° Panametrics 12mm, 5MHz, 0°
Couplant:	Light Oil
Technique:	AS2207, Refer to following for UM Method
NDT Procedure:	ATTAR UT004
Surface Condition:	SP4
Material:	Carbon steel, not further nominated
Temperature:	Ambient
Evaluation Sensitivity:	AS 2207 Level 2 Note: Additional 6dB curvature correction added for pipe only.
Scanning Sensitivity:	Evaluation Sensitivity plus 6dB.
Scanning Positions:	Refer to following pages.
Sizing Technique	6dB drop (laminations only) & 20dB drop.
Acceptance Criteria:	AS2207 Level 2 Record all cracks and all other discontinuities exceeding 10mm in length.
Technicians:	Paul Grosser, Ken Williamson and Mark Welland

APPENDIX C

Instructions to Participants

PROFICIENCY TESTING AUSTRALIA

ULTRASONIC PROFICIENCY TESTING PROGRAM

ROUND TWO

INSTRUCTIONS TO PARTICIPANTS

Participants are requested to carefully note the following **BEFORE** commencing their testing.

1. General

(i) The test specimen is not to be damaged or altered in any way. The use of grinders, files, linishers or sharp objects of any kind is prohibited.

(ii) The ultrasonic test should be considered as a routine inspection and, as such, all normal recording and reporting requirements shall apply.

(iii) Recordable discontinuities only are to be reported on an appropriate drawing, which is to be provided as part of the work sheet.

2. Test Method

(i) The test specimen, manufactured from carbon steel, is to be tested using ultrasonic A scan pulse echo technique.

(ii) The couplant shall be non-corrosive.

(iii) Inspection of the test specimen is to be conducted in accordance with AS 2207 Level 2.

3. Recording and Reporting

(i) On an appropriate drawing, record recordable discontinuities, giving their type, length of defect, and location from datum point (disregard all discontinuities with a length of $\leq$ 5mm).

(ii) A test report and the laboratory work sheets shall be submitted to Proficiency Testing Australia (PTA).

(iii) Record of test results and the report data shall comply with stipulated requirements of AS 2207 and AS 4037.

Note:

PTA expects the work sheets and test report for this proficiency test to meet the same standard required of any other job, for which your laboratory issues a test report. The majority of marks will be awarded for information provided in the work sheets.

4. Nominated Construction Code

Nominated construction code is AS 4458 Class 1.

5. Return of Test Specimen and Results

(i) The test specimen is to be thoroughly cleaned on completion of test.

(ii) The test specimen, together with completed test report and laboratory work sheets are to be returned **within two weeks after receipt** to:

Dr Michael Li

Proficiency Testing Australia

Phone: 61 2 9736 8397
Fax: 61 2 9743 6664
Email: michael.li@pta.asn.au

Post Address:

P O Box 7507 Silverwater

NSW 2128 Australia

Delivery Address:

7 Leeds Street, Rhodes

NSW 2138 Australia

APPENDIX D

Summary Report to Participants

PROFICIENCY TESTING AUSTRALIA

ULTRASONIC PROFICIENCY TESTING PROGRAM

SUMMARY REPORT - ROUND 2

LAB CODE :

LABORATORY :

ADDRESS :

TEST PIECE ID :

LABORATORY REPORT No. :

PART A DOCUMENTATION ASSESSMENT - Work Sheets

	MAX SCORE	ACHIEVED SCORE
1. Name of laboratory or testing authority	**1**	
2. Test plate / pipe identification	**1**	
3. The relevant product specification or application code	**1**	
4. The reference to Australian Standard number, ie. AS 2207, the specific technique used, and any departures from the requirements of this Standard	**1**	
5. The method of establishing evaluation sensitivity	**1**	
6. The area tested, and the sizing method used	**1**	
7. Surface condition - including type of preparation and whether the surface condition complies with clause 3.3 of AS 2207	**1**	
8. Serial number or unique identification of equipment and all accessories	**1**	
9. Couplant used	**1**	
10. Test results and whether they comply with the acceptance standard	**1**	
11. Date and place of test	**1**	
12. Report number and date of test	**1**	
13. Identification of testing personnel	**1**	

NOTE:

PROFICIENCY TESTING AUSTRALIA

ULTRASONIC PROFICIENCY TESTING PROGRAM

SUMMARY REPORT - ROUND 2

LAB CODE :

LABORATORY :

ADDRESS :

TEST PIECE ID :

LABORATORY REPORT No. :

PART B DOCUMENTATION ASSESSMENT - Test Report

	MAX SCORE	ACHIEVED SCORE
1. Name of laboratory or testing authority	**1**	
2. Test plate / pipe identification	**1**	
3. The relevant product specification or application code	**1**	
4. The reference to Australian Standard number, AS 2207, the specific technique used, and any departures from the requirements of this Standard	**1**	
5. The sizing method used	**1**	
6. Surface condition - including type of preparation and whether the surface condition complies with clause 3.3 of AS 2207	**1**	
7. Test results and whether they comply with the applicable code	**1**	
8. Date and place of test	**1**	
9. Report number and date of issue	**1**	
10. Identification and qualifications of officer carrying out the test	**1**	
11. Identification of the officer responsible of the test report	**1**	

NOTE:

PROFICIENCY TESTING AUSTRALIA

ULTRASONIC PROFICIENCY TESTING PROGRAM

SUMMARY REPORT - ROUND 2

LAB CODE :

LABORATORY :

ADDRESS :

TEST PIECE ID :

LABORATORY REPORT No. :

PART C PRACTICAL ASSESSMENT

(As per API Recommended Practice 2X, Fourth Edn, APRIL 2004
REAFFIRMED, OCTOBER 2010)

Type Test Piece Examined:

ACTUAL

Flaw No.	Type	Length (mm)	Location along the weld (mm)	MAX SCORE
1 2 3				

LABORATORY RESULT

Flaw No.	Type	Length (mm)	Location along the weld (mm)	ACHIEVED SCORE
1 2 3				

OVERALL RATING	MAX SCORE	ACHIEVED SCORE
Part A - Work Sheets Part B - Test Report Part C - Practical Assessment		
TOTAL SCORES		

Score	86 - 100	Satisfactory	
	71 - 85	Fair	
	0 - 70	Unsatisfactory	

NOTE: This summary report should be read in conjunction with the final report, which will be found at www.pta.asn.au when the program is completed. The above results are from one proficiency program and may not be fully representative of a laboratory's overall performance. Therefore, this summary report should not be used solely to evaluate laboratory competence.

Date of issue:

End of Report

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