

## ABRASION TESTING REPORT

Reference was made to:

**I.S. EN 295-3:2012 – Vitrified clay pipe systems for drains and sewers – Part 3: Test Methods  
&  
JAMME – Journal of Achievements in Materials and Manufacturing  
Engineering: Volume 25 Issue 2 (December 2007)  
TH Darmstadt Abrasion Test**

### Sample Information:

(A) Company Name:	Pipe & Buoy Australia Pty Ltd
(B) Mailing Address:	17 David Muir Street
(C) Mailing Address:	Slade Point
(D) Mailing Address:	Qld 4740
(E) Attn:	Nick Cubbit
(F) Phone:	07 49554644
(G) Fax:	07 49554639
(H) Client Job ID:	Abrasion Testing of Pipes (1 Million Cycles)
(I) Test Conditions:	Ambient
(J) Pipe Nominal Diameter:	100mm
(K) Number of Cycles:	1,000,000
(L) Machine Frequency:	17 cycles per minute
(M) Test Dates:	04-05-2012 ~ 02-07-2012
(N) Testing Technician:	W. Crowell

### Test Equipment Details:

Test Machine:	As per referenced standards
Location:	P11 Structures Laboratory, CEEFC, USQ
Thickness Measurement:	Digital Vernier Calipers

**Test Results:**

Sample #	Sample Description	Average Initial Wall Thickness (mm)	Average Wall Thickness After 1000k cycles (mm)	Average Reduction in Wall Thickness (mm)	% Reduction in Wall Thickness (%)
1	P.E. (PPI DN110 PN10 SDR17)	6.67	6.37	0.30	4.48
2	Steel (see attached)	5.57	5.54	0.03	0.37
3	UHMWPE	6.84	6.84	0.00	0.00

**Testing Officer:**

**Wayne Crowell**

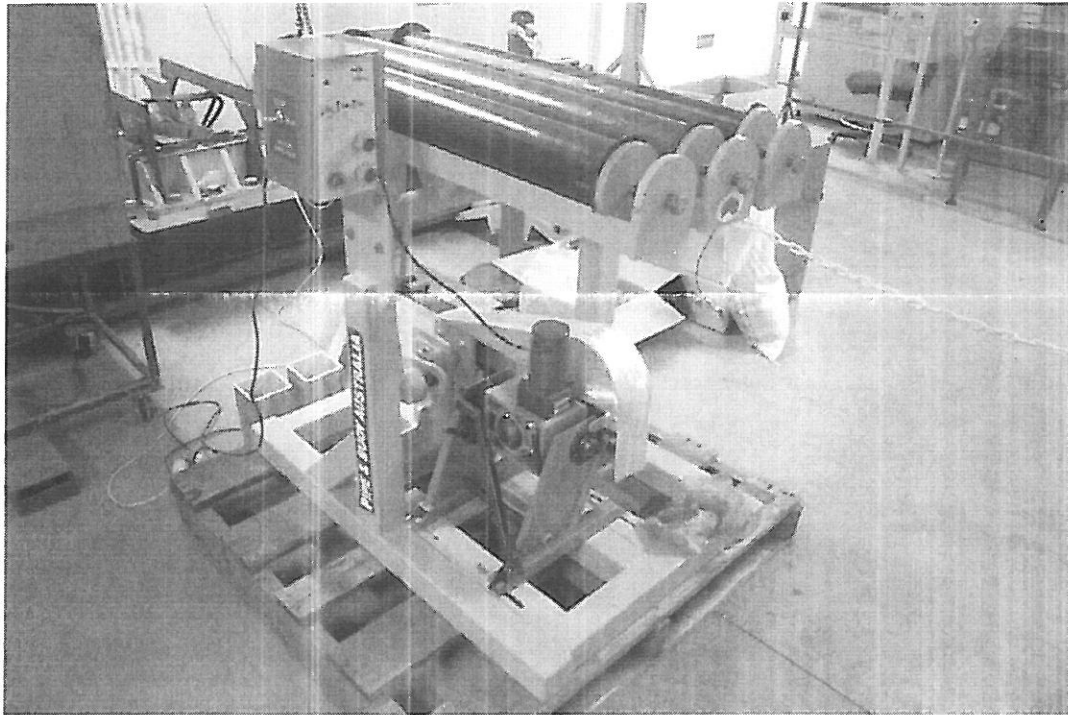
W.Crowell

Digitally signed by Wayne Crowell  
DN: cn=Wayne Crowell, o=Structural Testing  
Services, ou=University of Southern Qld,  
email=crowellw@usq.edu.au, c=AU  
Date: 2012.07.10 18:01:24 +10'00'

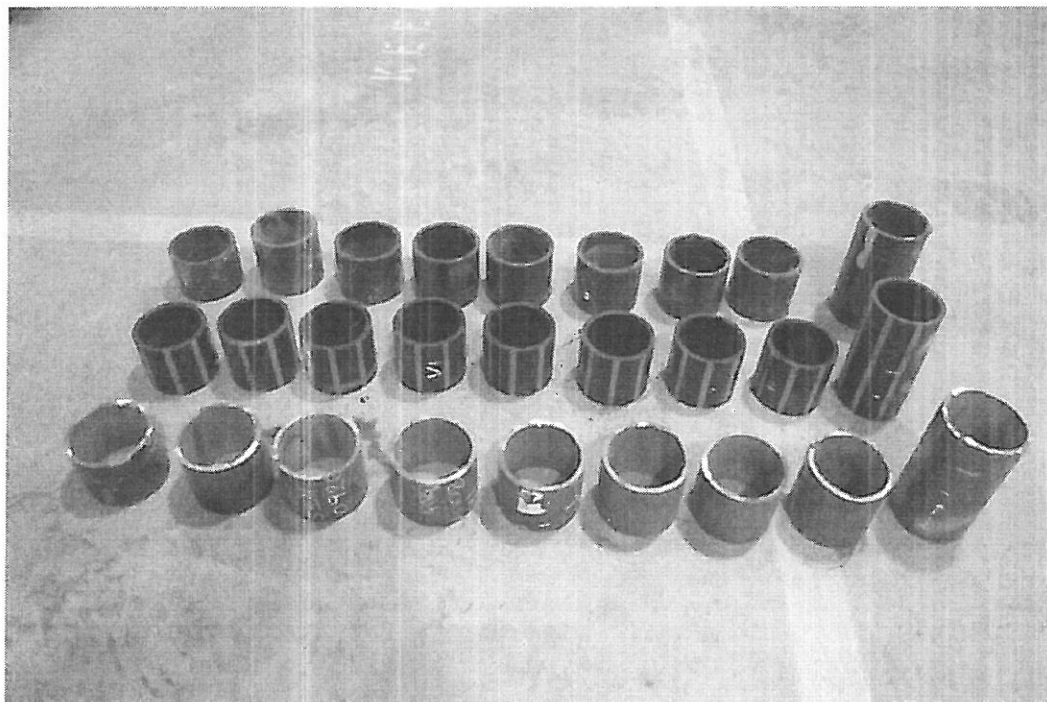
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**Photographs:**



**Photograph 1 – Abrasion Tester with samples ready for abrasion testing**



**Photograph 2 – Pipe samples cut ready for thickness measurement**

End of the Report

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증명서번호	DATE OF ISSUE 2011.09.08
CERTIFICATE NO.: E201109-0041-02025(5006898)	계약서번호
제 품 명	L/C No. (P/O No.) SD3BW560392
COMMODITY	수 요 기
제 품 규 격	CUSTOMER ONESTEEL TRADING PTY LTD
SPECIFICATION	주 문 자
API 5L X42/B(PSL1)/A53B	SHIPPER DAERYANG P AND T

INSPECTION CERTIFICATE  
**SeAH** Steel Corp.  
(주)세 아 제 강

HEAD OFFICE : BONGNAE-DONG 16A, JUNG-GU, SEOUL, KOREA  
POHANG PLANT : 14-1, JANGHEUNG-DONG, NAM-GU, POHANG

NO.	HEAT NO. (BATCH NO.)	관 단 TYPE		주 문 치 수 ORDER SIZE		수 량 QUANTITY			비 고 REMARK	
		≡1		PCS	총 길이 TOTAL LENGTH	중량(M/T) WEIGHT				
1	1-6398 (SAL7083090)	BBE		114.30 MM	X 6.00 MM	X 12.000 M	3	36.000 M	0.577	
2	S809263 (SAL7083100)	BBE		114.30 MM	X 6.00 MM	X 12.000 M	96	1,152.000 M	18.455	

NO.	HEAT NO. (BATCH NO.)	HYDROSTATIC TEST		ZINC COATING TEST		CHEMICAL COMPOSITION(%)												TENSILE TEST (Gage Length : 50mm)				IMPACT TEST (°C)		HARD- NESS TEST	HEAT TREAT- MENT																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
		5 Sec	psi	WEIGHT OF ZINC COAT- ING	C.S.ALK	DES I G	C	SI	Mn	P	S	Cu	Ni	Cr	Mo	V	Nb	Ti	CEQ	D I R	TENSILE STRENGTH	YIELD STRENGTH	E.L %			ENR- SHEAR RGT AREA																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
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\* THIS CERTIFICATE IS ISSUED ACCORDING TO EN 10204 3.1 (ISO 10474 3.1.B)

\*1-BBE:Black Beveled End(30°)  
\*2-U:Weld Seam Ultrasonic Test  
\*6-H:Heat(Ladle) Analysis, P:Product Analysis \*7-2:X100, 3:X1000  
\*9-L:Base Metal Longitudinal \*10-E.L:Elongation \*11-S.N:Seam Normalizing \*G:GOOD \*Tr:Trace

WE HEREBY CERTIFY THAT THE MATERIAL HEREIN HAS BEEN MADE AND TESTED IN ACCORDANCE WITH ABOVE SPECIFICATION AND THE RESULTS OF ALL TEST ARE ACCEPTABLE.  
THE USE OF THE MATERIAL OUTSIDE THE SPECIFICATIONS INDICATED ON THIS CERTIFICATE MAY CAUSE SAFETY AND/OR MONETARY PROBLEMS. FURTHERMORE, ANY ORGANIZATION OR PERSON(S) WHO DELIBERATELY MODIFIES THE CERTIFICATE WILL BE PROSECUTED FOR FORGING AN OFFICIAL DOCUMENT (ACCORDING TO THE PROVISIONS OF THE CRIMINAL CODE 231)

Surveyor : N. J. Baek  
Manager of Q.M Dept.

