`Correlating and Predicting the Air Infiltration Through the Cracks of Suspended Timber Floors

P.T. McGrath* and E. Lai**

* B.Sc. M.Sc. C.Eng. M.Inst.E., Snr.Lecturer Dept of Building and Environmental Health, Nottingham Trent University

** B.Sc. Ph.D. C.Eng. M.I.Mech.E, Snr.Lecturer, Dept. of Mechanical and Manufacturing. Engineering, Nottingham Trent University

This paper shows that the visible gap length may be used as a physical parameter when correlating pressure difference to volume flow rate (or air velocity) through the cracks between floorboards and can be termed the *Equivalent Crack Length*. The crack widths, which previously have been determined separately from the edge effect coefficient and the laminar flow coefficient, were significantly different. When analysed graphically they can be shown to correlate by an empirical relationship. A generalised equation is proposed that, in conjunction with the empirical relationship, allows predictions to be made of the volume flow rate through the cracks between floorboards for a known pressure difference.

Symbols

Q = volume flow rate,

ΔP = pressure difference

n = exponent

A & B =constants that relate to crack parameters

C_2 is a constant, found by regression analysis,

μ= dynamic viscosity

z = total distance through the crack

L= length of the crack as measured on the horizontal plane of the floor

d= crack width or thickness

ρ= air density

C_b= a constant that relates to the number of bends in the crack.

w_{lam}= equivalent crack length calculated from the Laminar coefficient

w_{edge} = equivalent crack length calculated from the Edge coefficient

1.0 Introduction

It is established that air infiltration from a basement or sub-floor void is a drain on the heat requirement of a building[1] as well as a potential medium for the transportation of ground contaminants[2,3]. In previous work[4] the authors presented the results of an investigation of three methods for correlating air infiltration through timber floors with pressure difference, namely the power relationship, the linear relationship and the quadratic relationship. It was shown that both the power relationship and the quadratic relationship offer an effective means of describing the flow characteristics associated with air infiltration through timber floorboards for the pressure difference range of 2 – 50 Pascals.

In the case of the quadratic relationship, knowledge of its coefficients allows the physical parameters of the crack geometry to be estimated. However, the determination of the coefficients is likely to be affected by (a) the nature and type of the experiment being undertaken; (b) the availability and spread of data; and (c) the method of data analysis. Consequently, the parametric values thus deduced are strictly applicable only to the case under investigation. Furthermore, caution must be exercised when using measurements taken at low flow rates, i.e. for pressures differences less that 5 Pa because of the practical constraints. In extreme cases (where the pressure difference is less that 2 Pa), extrapolation of data offers the only means of analysis. Although the quadratic relationship is well established and its coefficients can be related to crack parameter, the following two items need addressing;

Can the quadratic relationship be made to be independent of case studies?

Can the uncertainty associated with measurements at flow rates be minimised?

The main emphasis of the present study is devoted to tackling these two issues and the purpose of this paper is therefore two-fold

to provide more experimental data to enable the search of a universal quadratic relationship;

to show the effectiveness of using an apparent floorboard crack length for parametric calculations.

2. The Experiment

For this study a purpose-built floor has been constructed to investigate the flow characteristics associated with low flow rates through a suspended timber floor. This would enable the crack dimensions to be readily measured, so that comparison could be made with predicted values from mathematical models. The technique used to construct the floor was typical of that used in current U.K. housing stock.

2.1 Test rig

In order to exercise greater control over the air flow rate and pressure difference across the chamber floor, a rig of 1.8 m x 1.2 m x 0.60 m (Figure 1) was constructed with a suspended timber floor dividing the rig into two 300 mm deep chambers. The rig was constructed of clear 6 mm perspex held together by 25 mm aluminium and mild steel angles. The angle-section/perspex interface and corners of the rig were sealed with silicone sealant to achieve a near perfect air-tight seal. The chamber lid was made of 1.8 m x 1.2 m x 6 mm perspex that was screwed on to the angle sections and a seal achieved by using a silicone sealant bead as the gasket. The floor was built of 125 mm x 25 mm (nom) tongue and groove boards on 50 mm x 50 mm carcassing timber. Air was supplied to the chamber through 51 mm flanged copper tubes and the flow rate was regulated by a variable speed centrifugal fan (250 mm) and a damper connected to a 1000 mm (***l***) x 51 mm(***i.d***.) copper tube. The mean velocity pressure through the inlet pipe was determined by means of a micromanometer connected to a Pitot-static tube located 1 m downstream of the entry point and 20 mm from the exit point where it was anticipated that the air flow would be reasonably developed. Bulk pressure across the floor was measured by an inclined manometer that was connected to pressure tappings above and below the floor, which enabled static pressure differences as low as 0.5 Pascals to be recorded.

2.2 Procedure

The purpose of the investigation was to measure volume flow rates and corresponding pressure differences across the timber floor for a pressure range of 0-50 Pascals

Observations of the flow conditions at the measuring station revealed a flattened velocity profile similar to that pertaining to a turbulent flow. Therefore, it was concluded that the air flow at the measuring station would always be turbulent and fully developed. The volume flow rate was calculated from *the Area of the pipe x Mean Air Velocity* which was found from a single, centre-line velocity pressure reading. Since the air velocity near the pipe wall is lower than that of the mean velocity, the calculated flow rate would slightly differ from the true flow rate. From recorded measurements the difference is estimated to be of the order of 10%.

2.3 Background Theory

Previous work[5] identified that the flow rate through the floorboards could be calculated by subtracting the leakage (Q_{leak1}) from the total flow into the chamber (Q_1). Although infiltration through the floorboards is measured directly, the flow between the skirting board and the floorboards is deduced from the difference between the measured flow rate through the *floor* and the measured flow rate through the *floor and skirting*. Measurement of the infiltration through the floorboards is possible by sealing the gap between the skirting and the floor with plastic tape. Background leakage from the chamber was determined by closing and sealing the chamber lid and comparing the inflow with the outflow. The inflow/outflow velocity pressure was measured in a 22 mm pipe and the measured leakage was calculated as less than 1% of the inflow rate in preliminary investigation and was subsequently neglected in other tests. Four test floors were prepared, each with pre-determined visible gap sizes between the floorboards and were separately tested (tests 1-4). All the tests had a skirting board at the edge of the floor that was sealed to the chamber wall by silicone sealant to prevent unmeasured leakage. This arrangement simulated the typical construction detail of a wooden floor over a basement or floor-void

The results are analysed as the variation of the volume flow rate (through the floor and from the opening between the floor and skirting board) with pressure difference between the chambers and are subjected to regression analysis using the following relationship:

2.3.1 The quadratic equation

$$\Delta P = AQ + BQ^2 + C_2 \qquad (1)$$

where Q = volume flow rate, ΔP = pressure difference, A & B are constants that relate to crack parameters that were defined by Etheridge(6) and subsequently extended by Baker(7) as Equations 2 and 3. C_2 is a constant, found by regression analysis, that is indicative of instrument error at zero pressure difference. By sealing the inlet tube and setting of the instruments to zero before each set of readings, instrument error was assumed to be negligible and set at zero for the analysis.

$$A=12\mu z/Ld^3. \quad \text{(Laminar flow coefficient)} \qquad (2)$$

$$B=\rho C_b/2d^2L^2 \quad \text{(Edge effect coefficient)} \qquad (3)$$

where μ= dynamic viscosity, z = total distance through the crack, L= length of the crack as measured on the horizontal plane of the floor, d= crack width or thickness, ρ= air density and C_b= a constant (described by Baker(7)) that relates to the number of bends in the crack.

3.0 Results and Discussion

3.1 Floorboard Crack Size

The experimental data for this work are plotted (Figures 2 – 5) using the regression technique, based on the volume flow rate - pressure difference quadratic relationship as defined in Equation 1. The results confirm the authors' previous observation[5] that the greatest pressure loss within the joint/crack is attributable to edge effects . Substitution of the regression curve coefficients into Equation 3 enables the calculation of an approximate value of an *equivalent crack width* of the floorboard joint (Table I). Although the term *equivalent crack length* is used to describe the total length of the visible gap between floorboards it does not represent the true crack length because the tongue of one board rests on the lip of the adjoining board. Inspection of the calculated values (Table I) shows that an equivalent crack width determined by using the laminar flow coefficient can result in vastly different values. However, because the laminar flow predominates at lower pressure differences, it is not wise to disregard it completely. When the calculated equivalent crack widths based on the laminar flow coefficient were plotted against those determined from the edge effect coefficient (Figure 7), a relationship is identified which can be represented by the following expression

$$w_{lam} = 0.0711(w_{edge})^{0.2805} \qquad (4)$$

where

w_{lam} = is the equivalent crack length calculated from the laminar flow coefficient

w_{edge} = is the equivalent crack length calculated from the edge effect coefficient. Combining Equations 3 and 4 and substituting into Equation 1 yields

$$\Delta P = (\rho C_b/2(w_{edge})^2L^2)*Q^2 + \{12\mu z/L[0.0711(w_{edge})^{0.2805})]^3\}*Q \qquad (5)$$

Thus, the empirical relationship given by Equation 4 allows the infiltration flow rate Q to be predicted based on a knowledge of the equivalent crack width deduced from the *edge effect coefficient*, which can be calculated from the regression analysis of experimental data. .

The validity of this approach can be quantified as follows. When the pressure difference across the chambers was maintained at 2 Pa, the calculated flow rate (Q) was found to be within 3.5% of the values predicted using the regression analysis coefficients for tests 2- 4 This figure increases to 11 % for a full size test floor. It should be noted that the difference between Equation 5 predictions and those from the regression analysis can vary significantly at very low pressure. For example, the difference in predictions for test No.1 (figure 2) can be as high as 54% at 0.4 Pa and decreases logarithmically to 10 % at 50 Pa. The reason for the large discrepancy is unknown and this may be attributable to practical difficulties in measuring data at low pressures.

3.2 Normalised results

It is generally accepted that the upper pressure difference for testing air flow through building components should be limited to 50 Pa. . Because of the similarity between each curve, the data can be conveniently normalised with respect to a maximum pressure difference of 50 Pascals and the corresponding volume flow rate as follows;-

$$y = \Delta P_i / \Delta P_{50} \qquad (6)$$

$$x = Q_i / Q_{50} \qquad (7)$$

Where the subscript 'i' denotes a quantity measured at a pressure difference less than 50 Pa; and subscript '50' denotes a quantity measured at 50 Pa.

The normalised results of this work are presented in Figure 8, along with the results of British Gas's work on crack flow[6] and the authors' previous work[5] for comparison. Presenting the data in a dimensionless form allows any operational bias from various experimental set-up to be minimised. With most of the data following a definite pattern, a generalised quadratic relationship (Equation 9) can be identified which has achieved a coefficient of Determination of 0 .99.

$$y = 0.7635x^2 + 0.2621x \qquad (8)$$

or

$$0.7635x^2 + 0.2621x - y = 0$$

By solving the generalised quadratic relationship, theoretical infiltration flow rates can be calculated for a given pressure ratio. The validity of Equation 8 has been assessed by comparing the predicted flow rates with measured flow rates. The comparison of all the results over the full range (0 – 50 Pa) appears encouraging although the error in the 0-3 Pascal pressure difference is higher than expected due to practical difficulties when measuring very low pressure differences. However, analysis of the 3 – 10 Pa range showed that out of thirty-five case studies taken from seventeen tests, thirty-one predictions (88%) are within 15% of the measured flow rates (Figure 9), while twenty predictions are within 10%. Thus, given the floorboard dimensions and an equivalent crack width, this approach allows acceptable estimations to be made of the air infiltration through the gaps between floorboards.

4.0 Conclusions

The above discussion examines the results of the present investigation , the authors' previous study and the work of Etheridge's. Some interesting points have been highlighted that enables the following conclusions to be made.

A new parameter known as the *equivalent crack length* has been proposed to describe the total length of the visible gap between floorboards..

An empirical relationship has been proposed for determining floorboard equivalent crack width based on edge effect coefficient, that can be used with Equation 5 to calculate air infiltration across a traditional wooden floor.

The correlation between pressure difference and volume flow rate can be normalised onto a single curve which can be used to predict infiltration, within a range of 3-10 Pa, through a traditional wooden floor with better than 85% agreement.

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TABLE

Table I Comparison of Calculated Crack widths for Differing Floorboard Configurations

Gap width (mm)	Edge Coefficient A	Crack width (mm) $w_{\|A}$	Laminar Coef.* B	Crack width (mm) w_B	Widths Ratio w_B/w_A
0	$1.81*10^8$	0.01	6750	1.4	140
1.25	246466	0.21	1605	2.8	13.3
3.5	600324	0.14	1585	2.9	20.7
Random [1]	21819	0.71	397	5.8	8.2
1.75 [2]	4507.1	0.25	109.3	4.2	16.8

[1] The floor was laid with large non-uniform, random size cracks between the boards and 2.5mm is a reasonable approximation of the average gap size

[2] The tests were performed on a full-size test floor that had settled with non-uniform gap widths. An estimation of the average size of the gap width is approximately 1.75mm

* This is included for comparison with the edge effect coefficient

LIST OF FIGURES

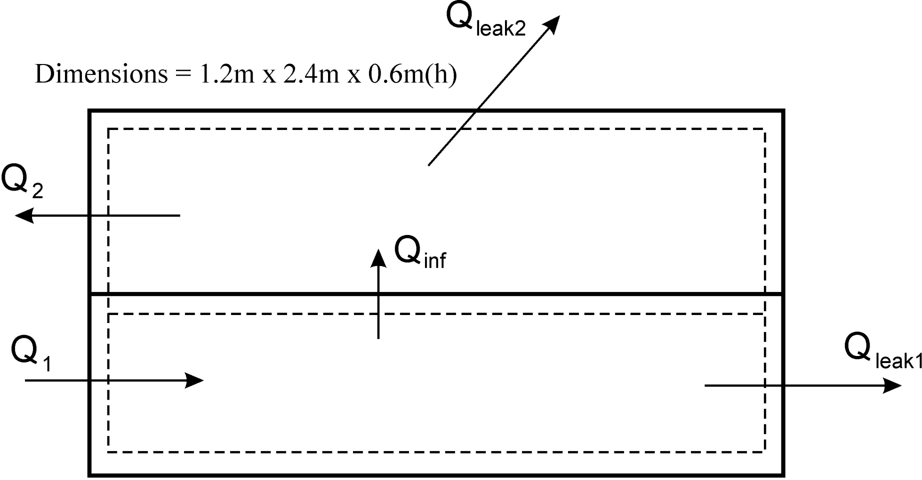
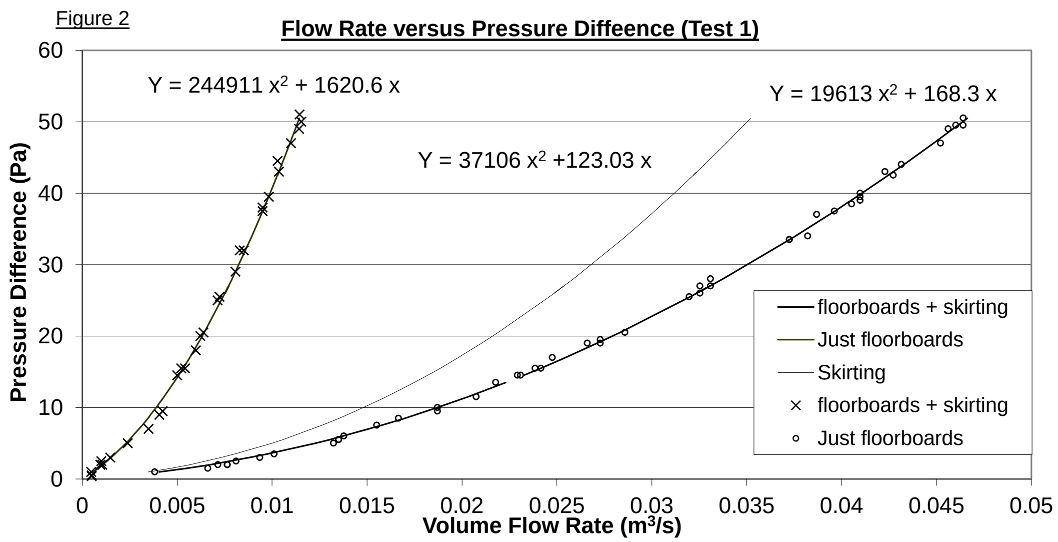


Figure 1 Diagrammatic of Test Chamber

Fig 2:



just fbds	1620.6	244911	
fbds+skts	168.34	19613	
flow rate	Pressure Difference		
0.000503	0.5	0.000295	0.002335
0.001006	2.5	0.001291	0.001006
0.002394	5	0.002292	0.002394
0.00406	9	0.003598	0.00406
0.005218	15.5	0.005307	0.005218
0.006221	20	0.006315	0.006221
0.007133	25	0.007323	0.007133
0.008508	32	0.008591	0.008508
0.009503	37.5	0.0095	0.009503
0.010368	43	0.010349	0.010368
0.011545	50	0.011358	0.011545
0.000503	0.375	0.000224	0.000503
0.000954	2	0.001063	0.000954
0.00148	3	0.001508	0.00148
0.00349	7	0.002979	0.00349
0.004233	9.5	0.003744	0.004233
0.005421	15.5	0.005307	0.005421
0.006391	20.5	0.00642	0.006391

	fbds+ sktng	jst fbds	jst sktng
1	0.00403936	0.000568	0.003471
1.5	0.005449979	0.000823	0.004627
2	0.00668072	0.001063	0.005617
2	0.00668072	0.001063	0.005617
2	0.00668072	0.001063	0.005617
2.5	0.007786695	0.001291	0.006496
3	0.008799566	0.001508	0.007292
3.5	0.00973951	0.001715	0.008024
5	0.012241767	0.002292	0.00995
5.5	0.012995551	0.002471	0.010525
5.5	0.012995551	0.002471	0.010525
6	0.013717814	0.002645	0.011073
7.5	0.015728867	0.003139	0.01259
8.5	0.016964125	0.003448	0.013516
9.5	0.018131437	0.003744	0.014388
10	0.018692871	0.003887	0.014806
11.5	0.020300391	0.004301	0.016
13.5	0.022292971	0.00482	0.017473

Pressure D	Flow Rate	floorboards	Just floorbc	Skirting	floorboards	Just floorboards
1	0.004039	1				
1.5	0.00545	1.5				
2	0.006681	2				
2	0.006681	2				
2	0.006681	2				
2.5	0.007787	2.5				
3	0.0088	3				
3.5	0.00974	3.5				
5	0.012242	5				
5.5	0.012996	5.5				
5.5	0.012996	5.5				
6	0.013718	6				
7.5	0.015729	7.5				
8.5	0.016964	8.5				
9.5	0.018131	9.5				
10	0.018693	10				
11.5	0.0203	11.5				
13.5	0.022293	13.5				

0.008076	29	0.008065	0.008076
0.009503	38	0.00958	0.009503
0.011005	47	0.010934	0.011005
0.011421	49	0.011218	0.011421
0.000468	1	0.000568	0.000468
0.001063	2	0.001063	0.001063
0.005008	14.5	0.005067	0.005008
0.005986	18	0.005881	0.005986
0.007233	25.5	0.007418	0.007233
0.008294	32	0.008591	0.008294
0.009836	39.5	0.009815	0.009836
0.010299	44.5	0.010571	0.010299
0.011452	51	0.011496	0.011452

14.5	0.023235225	0.005067	0.018168
14.5	0.023235225	0.005067	0.018168
15.5	0.024146276	0.005307	0.018839
15.5	0.024146276	0.005307	0.018839
17	0.025460591	0.005656	0.019805
19	0.027127602	0.0061	0.021027
19	0.027127602	0.0061	0.021027
19.5	0.027530713	0.006208	0.021323
20.5	0.02832199	0.00642	0.021902
25.5	0.032020652	0.007418	0.024602
27	0.033058897	0.0077	0.025359
26	0.032370001	0.007513	0.024857
27	0.033058897	0.0077	0.025359
28	0.033735316	0.007884	0.025851
33.5	0.037259248	0.008846	0.028413
33.5	0.037259248	0.008846	0.028413
34	0.037564897	0.00893	0.028635
37	0.039353861	0.00942	0.029934
37.5	0.039644941	0.0095	0.030145
38.5	0.04022139	0.009659	0.030563
39	0.040506833	0.009737	0.03077
39.5	0.040790469	0.009815	0.030975
40	0.041072331	0.009893	0.03118
43	0.042728037	0.010349	0.032379
42.5	0.042456158	0.010274	0.032182
44	0.043267131	0.010497	0.03277
47	0.044848942	0.010934	0.033915
49	0.045875781	0.011218	0.034658
49.5	0.046129224	0.011288	0.034841
49.5	0.046129224	0.011288	0.034841
50.5	0.046632325	0.011427	0.035205

14.5	0.023235	14.5	
14.5	0.023235	14.5	
15.5	0.024146	15.5	
15.5	0.024146	15.5	
17	0.025461	17	
19	0.027128	19	
19	0.027128	19	
19.5	0.027531	19.5	
20.5	0.028322	20.5	
25.5	0.032021	25.5	
27	0.033059	27	
26	0.03237	26	
27	0.033059	27	
28	0.033735	28	
33.5	0.037259	33.5	
33.5	0.037259	33.5	
34	0.037565	34	
37	0.039354	37	
37.5	0.039645	37.5	
38.5	0.040221	38.5	
39	0.040507	39	
39.5	0.04079	39.5	
40	0.041072	40	
43	0.042728	43	
42.5	0.042456	42.5	
44	0.043267	44	
47	0.044849	47	
49	0.045876	49	
49.5	0.046129	49.5	
49.5	0.046129	49.5	
50.5	0.046632	50.5	
	0.000568		1
	0.000823		1.5
	0.001063		2
	0.001063		2
	0.001063		2
	0.001291		2.5
	0.001508		3
	0.001715		3.5
	0.002292		5
	0.002471		5.5
	0.002471		5.5
	0.002645		6
	0.003139		7.5
	0.003448		8.5
	0.003744		9.5
	0.003887		10
	0.004301		11.5
	0.00482		13.5
	0.005067		14.5
	0.005067		14.5

0.005307	15.5	
0.005307	15.5	
0.005656	17	
0.0061	19	
0.0061	19	
0.006208	19.5	
0.00642	20.5	
0.007418	25.5	
0.0077	27	
0.007513	26	
0.0077	27	
0.007884	28	
0.008846	33.5	
0.008846	33.5	
0.00893	34	
0.00942	37	
0.0095	37.5	
0.009659	38.5	
0.009737	39	
0.009815	39.5	
0.009893	40	
0.010349	43	
0.010274	42.5	
0.010497	44	
0.010934	47	
0.011218	49	
0.011288	49.5	
0.011288	49.5	
0.011427	50.5	
0.003471		1
0.004627		1.5
0.005617		2
0.005617		2
0.005617		2
0.006496		2.5
0.007292		3
0.008024		3.5
0.00995		5
0.010525		5.5
0.010525		5.5
0.011073		6
0.01259		7.5
0.013516		8.5
0.014388		9.5
0.014806		10
0.016		11.5
0.017473		13.5
0.018168		14.5
0.018168		14.5
0.018839		15.5
0.018839		15.5
0.019805		17

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0.021027	19	
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0.024602	25.5	
0.025359	27	
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0.025851	28	
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0.028413	33.5	
0.028635	34	
0.029934	37	
0.030145	37.5	
0.030563	38.5	
0.03077	39	
0.030975	39.5	
0.03118	40	
0.032379	43	
0.032182	42.5	
0.03277	44	
0.033915	47	
0.034658	49	
0.034841	49.5	
0.034841	49.5	
0.035205	50.5	
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0.011545		50
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0.00148		3
0.00349		7
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0.008076		29
0.009503		38
0.011005		47
0.011421		49
0.000468		1
0.001063		2
0.005008		14.5
0.005986		18

0.007233	25.5	
0.008294	32	
0.009836	39.5	
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0.003822		1
0.006621		1.5
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0.007645		2
0.007645		2
0.008108		2.5
0.009363		3
0.010113		3.5
0.013241		5
0.013514		5.5
0.013514		5.5
0.013782		6
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0.016661		8.5
0.018726		9.5
0.018726		10
0.020761		11.5
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0.022934		14.5
0.023093		14.5
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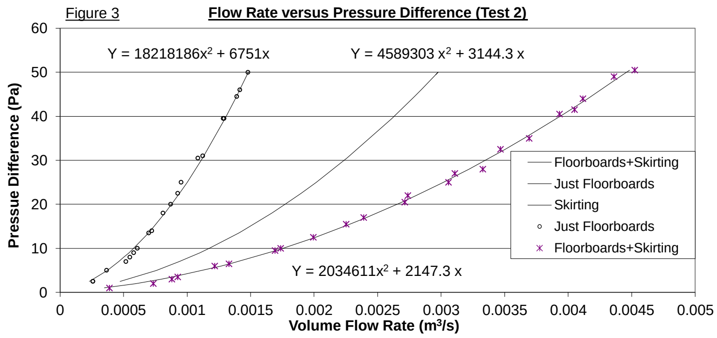
0.024175		15.5
0.024772		17
0.02662		19
0.027297		19
0.027297		19.5
0.028604		20.5
0.03198		25.5
0.032546		27
0.032546		26
0.033103		27
0.033103		28
0.037256		33.5
0.037256		33.5
0.038224		34
0.038699		37
0.039631		37.5
0.040542		38.5
0.04099		39
0.04099		39.5
0.04099		40
0.042306		43
0.042735		42.5
0.043161		44
0.045227		47
0.045629		49
0.046028		49.5

0.046423	49.5
0.046423	50.5

fig 3



just fbds	6751	18218186			
fbds+skts	2147.3	2034611			
Flow Rate	Pressure D	Floorboars	Floorboard	Skirting	
0.00039	1	0.000113	0.00035	0.000236	
0.000734	2	0.000194	0.000595	0.000401	
0.000881	3	0.000261	0.000796	0.000535	
0.000927	3.5	0.000291	0.000886	0.000595	
0.001218	6	0.000418	0.001269	0.000851	
0.00133	6.5	0.00044	0.001336	0.000896	
0.001693	9.5	0.00056	0.001697	0.001136	
0.001737	10	0.000578	0.001751	0.001173	
0.001995	12.5	0.000664	0.002007	0.001343	
0.002253	15.5	0.000756	0.002282	0.001527	
0.002391	17	0.000798	0.002411	0.001612	
0.002714	20.5	0.000892	0.00269	0.001799	
0.002739	22	0.000929	0.002803	0.001874	
0.003059	25	0.001001	0.003017	0.002016	
0.003108	27	0.001046	0.003153	0.002107	
0.003328	28	0.001068	0.003219	0.002151	
0.003467	32.5	0.001163	0.003504	0.002341	
0.003693	35	0.001213	0.003653	0.00244	
0.003932	40.5	0.001317	0.003965	0.002648	
0.00405	41.5	0.001335	0.004019	0.002684	
0.004116	44	0.00138	0.004153	0.002773	
0.004361	49	0.001465	0.004408	0.002943	
0.004524	50.5	0.00149	0.004482	0.002992	
0.00026	2.5	0.000229	0.0007	0.000471	2.5
0.00026	2.5	0.000229	0.0007	0.000471	2.5
0.000367	5	0.00037	0.001126	0.000756	5
0.000519	7	0.000462	0.001401	0.000939	7
0.000551	8	0.000503	0.001524	0.001021	8
0.000581	9	0.000542	0.001641	0.001099	9
0.000609	10	0.000578	0.001751	0.001173	10
0.000699	13.5	0.000695	0.002102	0.001406	13.5
0.000723	14	0.000711	0.002148	0.001437	14
0.000811	18	0.000826	0.002493	0.001667	18
0.000871	20	0.000879	0.002652	0.001773	20
0.000927	22.5	0.000941	0.002839	0.001898	22.5
0.000954	25	0.001001	0.003017	0.002016	25
0.001086	30.5	0.001122	0.00338	0.002258	30.5
0.001124	31	0.001132	0.003411	0.002279	31
0.001285	39.5	0.001299	0.00391	0.002611	39.5
0.001292	39.5	0.001299	0.00391	0.002611	39.5
0.001392	44.5	0.001389	0.004179	0.00279	44.5
0.001416	46	0.001414	0.004256	0.002842	46
0.00148	50	0.001482	0.004458	0.002976	50
0.001509	49.5	0.001473	0.004433	0.002959	49.5

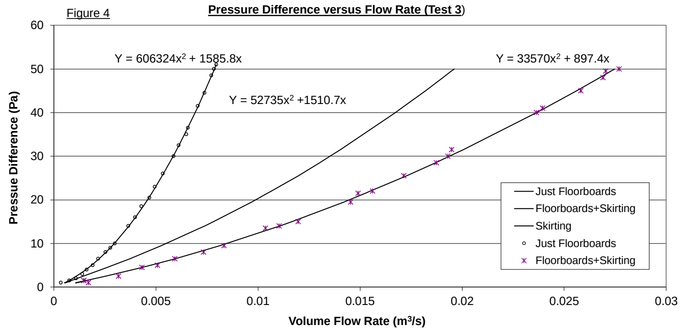
a=	2034611.0	18218186
b=	2147.0	6751
c		
Y	x(tot)	x(floor)
Pa		
Δ P(bulk)		

(-V1+(POWER(((V1*V1)+(4*W1*Z10)),0.5)))/(2*W1)

Flow Rate	Floorboard	Just Floorb	Skirting	Just Floorb	Floorboards+Skirting
0.00035	1				
0.000595	2				
0.000796	3				
0.000886	3.5				
0.001269	6				
0.001336	6.5				
0.001697	9.5				
0.001751	10				
0.002007	12.5				
0.002282	15.5				
0.002411	17				
0.00269	20.5				
0.002803	22				
0.003017	25				
0.003153	27				
0.003219	28				
0.003504	32.5				
0.003653	35				
0.003965	40.5				
0.004019	41.5				
0.004153	44				
0.004408	49				
0.004482	50.5				
0.000229		2.5			
0.000229		2.5			
0.00037		5			
0.000462		7			
0.000503		8			
0.000542		9			
0.000578		10			
0.000695		13.5			
0.000711		14			
0.000826		18			
0.000879		20			
0.000941		22.5			
0.001001		25			
0.001122		30.5			
0.001132		31			
0.001299		39.5			
0.001299		39.5			
0.001389		44.5			
0.001414		46			
0.001482		50			
0.001473		49.5			
0.000471			2.5		
0.000471			2.5		
0.000756			5		
0.000939			7		
0.001021			8		
0.001099			9		
0.001173			10		
0.001406			13.5		
0.001437			14		
0.001667			18		
0.001773			20		
0.001898			22.5		
0.002016			25		
0.002258			30.5		
0.002279			31		
0.002611			39.5		
0.002611			39.5		
0.00279			44.5		
0.002842			46		
0.002976			50		
0.002959			49.5		
0.00026				2.5	
0.00026				2.5	
0.000367				5	
0.000519				7	
0.000551				8	
0.000581				9	
0.000609				10	
0.000699				13.5	
0.000723				14	
0.000811				18	
0.000871				20	
0.000927				22.5	
0.000954				25	
0.001086				30.5	
0.001124				31	
0.001285				39.5	
0.001292				39.5	
0.001392				44.5	
0.001416				46	

0.00148	50
0.00039	1
0.000734	2
0.000881	3
0.000927	3.5
0.001218	6
0.00133	6.5
0.001693	9.5
0.001737	10
0.001995	12.5
0.002253	15.5
0.002391	17
0.002714	20.5
0.002739	22
0.003059	25
0.003108	27
0.003328	28
0.003467	32.5
0.003693	35
0.003932	40.5
0.00405	41.5
0.004116	44
0.004361	49
0.004524	50.5

Fig 4

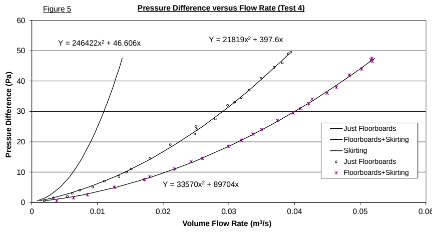


					0.0277	just fbds	1585.8	606324		
						fbds+skts	897.4	33570		
								Flow Rates		
						Flow Rate	Pressure D	Just Floorb	Floorboard	Skirting
1.294409	0.001928524	-0.7121	0.002702	0.048692	0.000774	0.0015	1.5	0.000738	0.001578	0.000841
1.294409	0.001928524	-0.7121	0.002702	0.048692	0.000774	0.0015	1.5	0.000738	0.001578	0.000841
1.700074	0.001474885	-0.92889	0.002067	0.473293	0.000592	0.0017	1.0	0.000525	0.001071	0.000546
0.882453	0.002703683	-0.48928	0.003788	-0.02061	0.001085	0.0032	2.5	0.001108	0.002544	0.001436
0.532174	0.003988347	-0.29444	0.005588	-0.06657	0.0016	0.0043	4.5	0.001714	0.004317	0.002603
0.4818	0.00427619	-0.26582	0.005992	-0.07151	0.001716	0.0051	5.0	0.001848	0.004733	0.002886
0.370864	0.005086501	-0.2022	0.007127	-0.07995	0.002041	0.0059	6.5	0.002218	0.005928	0.00371
0.296554	0.005835283	-0.15919	0.008176	-0.08299	0.002341	0.0073	8.0	0.002553	0.007054	0.004501
0.243197	0.006537694	-0.12818	0.009161	-0.08324	0.002623	0.0083	9.5	0.002861	0.00812	0.005259
0.154425	0.008248234	-0.07674	0.011557	-0.07793	0.003309	0.0104	13.5	0.003589	0.010734	0.007145
0.146652	0.008449039	-0.07228	0.011839	-0.07695	0.00339	0.0110	14.0	0.003672	0.011041	0.007368
0.132576	0.008843516	-0.06424	0.012391	-0.0749	0.003548	0.0120	15.0	0.003835	0.011644	0.007808
0.086563	0.010519306	-0.03847	0.01474	-0.0647	0.00422	0.0145	19.5	0.004512	0.014193	0.009681
0.072251	0.011221037	-0.03074	0.015723	-0.05998	0.004502	0.0149	21.5	0.004789	0.015254	0.010465
0.069088	0.01139296	-0.02906	0.015964	-0.05879	0.004571	0.0156	22.0	0.004856	0.015513	0.010657
0.050563	0.012561569	-0.01947	0.017601	-0.05056	0.00504	0.0171	25.5	0.005308	0.017265	0.011957
0.038551	0.013520495	-0.0136	0.018945	-0.04365	0.005424	0.0187	28.5	0.005672	0.01869	0.013019
0.033544	0.013987053	-0.01127	0.019599	-0.04027	0.005611	0.0193	30.0	0.005847	0.01938	0.013533
0.029081	0.014445774	-0.00927	0.020241	-0.03694	0.005795	0.0195	31.5	0.006018	0.020055	0.014038
0.011213	0.016918455	-0.00237	0.023706	-0.01903	0.006787	0.0236	40.0	0.006919	0.02365	0.016731
0.009723	0.01719703	-0.00192	0.024096	-0.01703	0.006899	0.0239	41.0	0.007019	0.02405	0.017031
0.004674	0.018289127	-0.00065	0.025627	-0.00926	0.007337	0.0258	45.0	0.007406	0.02561	0.018204
0.001683	0.019086714	-0.00015	0.026744	-0.00364	0.007657	0.0269	48.0	0.007685	0.02674	0.019055
0.0004	0.019479154	-2.6E-05	0.027294	-0.0009	0.007815	0.0270	49.5	0.007822	0.027293	0.019471
0	0.019609069	0	0.027476	0	0.007867	0.0277	50.0	0.007867	0.027476	0.019609
						0.000344	1	0.000525		
						0.000757	1.5	0.000738		
						0.001086	2	0.00093		
						0.001392	3	0.001273		
						0.001606	4	0.001575		
						0.001904	5	0.001848		
						0.002173	6.5	0.002218		
						0.002531	8	0.002553		
						0.00277	9	0.002761		
						0.002989	10	0.002959		
						0.003649	14	0.003672		
						0.003981	16	0.003993		
						0.004287	18.5	0.004369		
						0.004681	20.5	0.004652		
						0.004944	23	0.004989		
						0.005338	26	0.00537		
						0.005864	30	0.005847		
						0.006118	32.5	0.006129		
						0.006492	35	0.006402		
						0.006569	36.5	0.006561		
						0.007052	41.5	0.007068		
						0.007379	44.5	0.007358		
						0.007714	48.5	0.007731		
						0.007844	50	0.007867		
						0.007962	51	0.007956		

Pressure D	Flow Rate	Just Floorb	Floorboard	Skirting	Just Floorb	Floorboards+Skirting
	0.001578		1.5			
	0.001578		1.5			
	0.001071		1.0			
	0.002544		2.5			
	0.004317		4.5			
	0.004733		5.0			
	0.005928		6.5			
	0.007054		8.0			
	0.00812		9.5			
	0.010734		13.5			
	0.011041		14.0			
	0.011644		15.0			
	0.014193		19.5			
	0.015254		21.5			
	0.015513		22.0			
	0.017265		25.5			
	0.01869		28.5			
	0.01938		30.0			
	0.020055		31.5			
	0.02365		40.0			
	0.02405		41.0			
	0.02561		45.0			
	0.02674		48.0			
	0.027293		49.5			
	0.027476		50.0			
	0.000525	1				
	0.000738	1.5				
	0.00093	2				
	0.001273	3				
	0.001575	4				
	0.001848	5				
	0.002218	6.5				
	0.002553	8				
	0.002761	9				
	0.002959	10				
	0.003672	14				
	0.003993	16				
	0.004369	18.5				
	0.004652	20.5				
	0.004989	23				
	0.00537	26				
	0.005847	30				
	0.006129	32.5				
	0.006402	35				
	0.006561	36.5				
	0.007068	41.5				
	0.007358	44.5				
	0.007731	48.5				
	0.007867	50				
	0.007956	51				
	0.000841			1.5		
	0.000841			1.5		
	0.000546			1.0		
	0.001436			2.5		
	0.002603			4.5		
	0.002886			5.0		
	0.00371			6.5		
	0.004501			8.0		
	0.005259			9.5		
	0.007145			13.5		
	0.007368			14.0		
	0.007808			15.0		
	0.009681			19.5		
	0.010465			21.5		
	0.010657			22.0		
	0.011957			25.5		
	0.013019			28.5		
	0.013533			30.0		
	0.014038			31.5		
	0.016731			40.0		
	0.017031			41.0		
	0.018204			45.0		
	0.019055			48.0		
	0.019471			49.5		
	0.019609			50.0		
	0.000344				1	
	0.000757				1.5	
	0.001086				2	
	0.001392				3	
	0.001606				4	
	0.001904				5	
	0.002173				6.5	
	0.002531				8	
	0.00277				9	
	0.002989				10	
	0.003649				14	
	0.003981				16	
	0.004287				18.5	
	0.004681				20.5	
	0.004944				23	
	0.005338				26	
	0.005864				30	
	0.006118				32.5	
	0.006492				35	
	0.006569				36.5	
	0.007052				41.5	
	0.007379				44.5	
	0.007714				48.5	
	0.007844				50	
	0.007962				51	
	0.001466					1.5
	0.001466					1.5
	0.001693					1
	0.003168					2.5
	0.004317					4.5
	0.005079					5
	0.005926					6.5
	0.007331					8
	0.008338					9.5
	0.010368					13.5
	0.011038					14
	0.011972					15
	0.01454					19.5
	0.014905					21.5
	0.01561					22

0.017141	25.5
0.018739	28.5
0.019304	30
0.019489	31.5
0.023643	40
0.023944	41
0.025816	45
0.026904	48
0.027037	49.5
0.027691	50

Fig 5



	bx	ax²
just fbds	397.6	21819
fbds+skts	219.7	13229

Ratio calculation

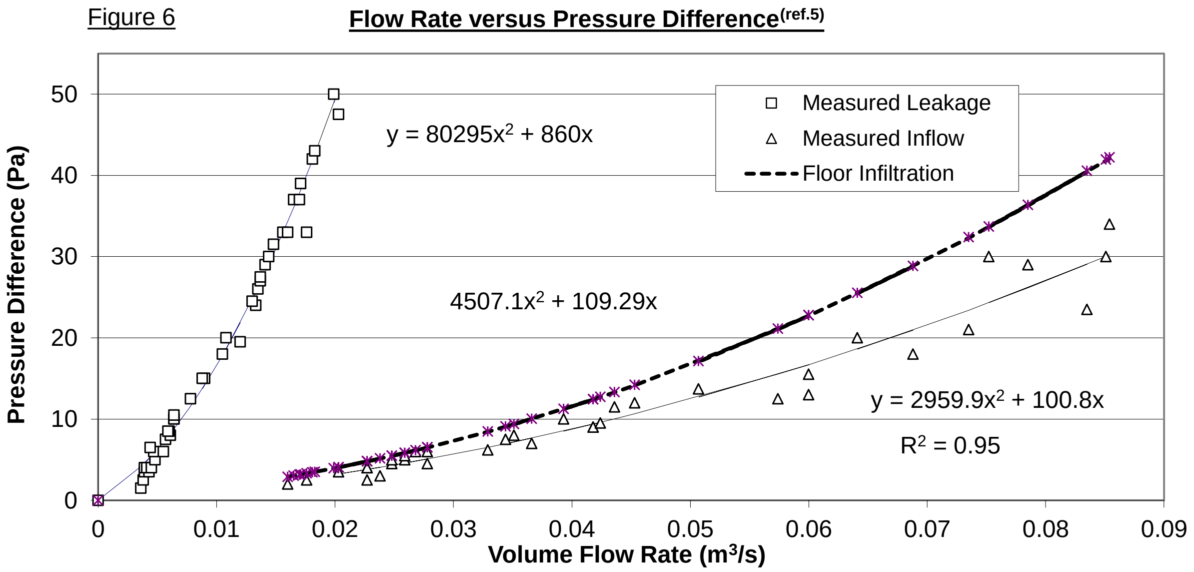
%	Flow Rate	%	Flow Rate	%	Flow Rate	Flow Rate	Pressure [	Just Floorl	Floorboard	Skirting
-0.2008	0.000677	-0.266	0.002568	0.60079	0.001891	0.0038	0.5	0.001181	0.002028	0.000847
-0.297	0.0014	-0.0212	0.00531	0.21879	0.00391	0.006335	1.5	0.003208	0.0052	0.001992
-0.3017	0.001963	0.04025	0.007444	0.10833	0.005481	0.008466	2.5	0.004946	0.007756	0.002811
-0.2745	0.003105	0.08277	0.011774	0.01311	0.008669	0.012556	5	0.008557	0.012837	0.004279
-0.2435	0.00406	0.08973	0.015395	-0.0183	0.011336	0.017141	7.5	0.011547	0.016913	0.005366
-0.232	0.00441	0.08959	0.016724	-0.0248	0.012314	0.017958	8.5	0.012628	0.01837	0.005742
-0.2056	0.00523	0.08617	0.019834	-0.0342	0.014604	0.021748	11	0.01512	0.021704	0.006584
-0.1823	0.005989	0.08065	0.022711	-0.0378	0.016722	0.024242	13.5	0.017379	0.024703	0.007324
-0.1737	0.006278	0.07817	0.02381	-0.0384	0.017531	0.025955	14.5	0.01823	0.025829	0.007598
-0.1427	0.007376	0.06767	0.027973	-0.0375	0.020597	0.02993	18.5	0.021399	0.030003	0.008604
-0.1288	0.007894	0.06233	0.029938	-0.036	0.022043	0.0319	20.5	0.022866	0.031928	0.009062
-0.1159	0.008396	0.05704	0.031839	-0.034	0.023443	0.03365	22.5	0.024269	0.033765	0.009496
-0.1067	0.008762	0.05312	0.033228	-0.0323	0.024466	0.035007	24	0.025283	0.035092	0.009808
-0.0895	0.009472	0.04546	0.035919	-0.0286	0.026448	0.037383	27	0.027227	0.03763	0.010403
-0.0763	0.010043	0.03928	0.038086	-0.0253	0.028043	0.039797	29.5	0.028771	0.039643	0.010872
-0.0687	0.010378	0.03566	0.039356	-0.0232	0.028978	0.040951	31	0.029667	0.040811	0.011144
-0.0615	0.010707	0.0321	0.040606	-0.0211	0.029898	0.042158	32.5	0.030544	0.041952	0.011408
-0.0544	0.011032	0.02862	0.041836	-0.019	0.030804	0.042665	34	0.031402	0.043068	0.011667
-0.0454	0.011457	0.02407	0.043447	-0.0162	0.031991	0.044955	36	0.032517	0.044519	0.012002
-0.0368	0.011874	0.01964	0.045029	-0.0134	0.033155	0.046367	38	0.033604	0.045931	0.012327
-0.0205	0.012686	0.01109	0.048111	-0.0077	0.035424	0.048335	42	0.035699	0.048651	0.012952
-0.0128	0.013083	0.00698	0.049614	-0.0049	0.036531	0.050226	44	0.03671	0.049963	0.013253
-0.0036	0.01357	0.00196	0.051461	-0.0014	0.037891	0.05184	46.5	0.037944	0.051562	0.013619
-0.0018	0.013666	0.00098	0.051826	-0.0007	0.03816	0.051633	47	0.038187	0.051877	0.013691
0	0.013762	0	0.05219	0	0.038428	0.051771	47.5	0.038428	0.05219	0.013762
						0.001893	0.5	0.001181		
						0.003279	1.5	0.003208		
						0.005421	2	0.004105		
						0.006163	3	0.005738		
						0.007331	4	0.007209		
						0.009273	5	0.008557		
						0.011038	7	0.010984		
						0.013251	8.5	0.012628		
						0.014416	10	0.014155		
						0.015144	11	0.01512		
						0.017958	14.5	0.01823		
						0.021079	19	0.021773		
						0.024826	22.5	0.024269		
						0.025113	24	0.025283		
						0.02497	25	0.025943		
						0.027949	27.5	0.027541		
						0.02981	32	0.030254		
						0.030873	33	0.030832		
						0.0319	34.5	0.031683		
						0.033113	37	0.033064		
						0.034904	41	0.035184		
						0.0369	44.5	0.03696		
						0.038142	46	0.0377		
						0.03907	49	0.039146		
						0.039435	49.5	0.039383		

Ratio calculation

%	Flow Rate	%	Flow Rate	%	Flow Rate					
-0.0792	0.00078	-0.5088	0.00306	0.51684	0.001791	0.003786	0.5	0.001181	0.002028	0.000847
-0.0702	0.001852	-0.2561	0.006531	0.19183	0.003823	0.006335	1.5	0.003208	0.0052	0.001992
-0.0276	0.002733	-0.1979	0.009291	0.0998	0.005439	0.008466	2.5	0.004946	0.007756	0.002811
0.16681	0.004993	-0.1678	0.01499	0.02549	0.008775	0.012556	5	0.008557	0.012837	0.004279
0.2964	0.006957	-0.1725	0.01983	0.00535	0.011608	0.017141	7.5	0.011547	0.016913	0.005366
0.3842	0.007948	-0.1769	0.021619	0.00222	0.012656	0.017958	8.5	0.012628	0.01837	0.005742
0.48979	0.009808	-0.1901	0.025829	0	0.01512	0.021748	11	0.01512	0.021704	0.006584
						0.024242	13.5	0.017379	0.024703	0.007324
						0.025955	14.5	0.01823	0.025829	0.007598
						0.02993	18.5	0.021399	0.030003	0.008604
						0.0319	20.5	0.022866	0.031928	0.009062
						0.03365	22.5	0.024269	0.033765	0.009496
						0.035007	24	0.025283	0.035092	0.009808
						0.037383	27	0.027227	0.03763	0.010403
						0.039797	29.5	0.028771	0.039643	0.010872
						0.040951	31	0.029667	0.040811	0.011144
						0.042158	32.5	0.030544	0.041952	0.011408
						0.042665	34	0.031402	0.043068	0.011667
						0.044955	36	0.032517	0.044519	0.012002
						0.046367	38	0.033604	0.045931	0.012327
						0.048335	42	0.035699	0.048651	0.012952
						0.050226	44	0.03671	0.049963	0.013253
						0.05184	46.5	0.037944	0.051562	0.013619
						0.051633	47	0.038187	0.051877	0.013691
						0.051771	47.5	0.038428	0.05219	0.013762

-0.10598	0.046659	Flow Rate	Just Floorl	Floorboard	Skirting	Just Floorl	Floorboards+Skirting
0.218435	0.609218	0.002028		0.5			
0.21928	1.82892	0.0052		1.5			
0.219801	3.049501	0.007756		2.5			
0.220567	6.102834	0.012837		5			
0.221014	9.157604	0.016913		7.5			
0.221148	10.37976	0.01837		8.5			
0.221418	13.43559	0.021704		11			
0.221623	16.49191	0.024703		13.5			
0.221692	17.71454	0.025829		14.5			
0.221921	22.60553	0.030003		18.5			
0.222013	25.05126	0.031928		20.5			
0.222094	27.49711	0.033765		22.5			
0.222149	29.33158	0.035092		24			
0.222247	33.00067	0.03763		27			
0.222318	36.05839	0.039643		29.5			
0.222358	37.89308	0.040811		31			
0.222394	39.72781	0.041952		32.5			
0.222429	41.56258	0.043068		34			
0.222472	44.00899	0.044519		36			
0.222512	46.45545	0.045931		38			
0.222584	51.34853	0.048651		42			
0.222617	53.79513	0.049963		44			
0.222655	56.85345	0.051562		46.5			
0.222662	57.46512	0.051877		47			
0.222669	58.07679	0.05219		47.5			
		0.001181	0.5				
		0.003208	1.5				
		0.004105	2				
		0.005738	3				
		0.007209	4				
		0.008557	5				
		0.010984	7				
		0.012628	8.5				
		0.014155	10				
		0.01512	11				
		0.01823	14.5				
		0.021773	19				
		0.024269	22.5				
		0.025283	24				
		0.025943	25				
		0.027541	27.5				
		0.030254	32				
		0.030832	33				
		0.031683	34.5				
		0.033064	37				
		0.035184	41				
		0.03696	44.5				
		0.0377	46				
		0.039146	49				
		0.039383	49.5				
		0.000847			0.5		
		0.001992			1.5		
		0.002811			2.5		
		0.004279			5		
		0.005366			7.5		
		0.005742			8.5		
		0.006584			11		
		0.007324			13.5		
		0.007598			14.5		
		0.008604			18.5		
		0.009062			20.5		
		0.009496			22.5		
		0.009808			24		
		0.010403			27		
		0.010872			29.5		
		0.011144			31		
		0.011408			32.5		
		0.011667			34		
		0.012002			36		
		0.012327			38		
		0.012952			42		
		0.013253			44		
		0.013619			46.5		
		0.013691			47		
		0.013762			47.5		
		0.003786					0.5
		0.006335					1.5
		0.008466					2.5
		0.012556					5
		0.017141					7.5
		0.017958					8.5
		0.021748					11
		0.024242					13.5
		0.025955					14.5
		0.02993					18.5
		0.0319					20.5
		0.03365					22.5
		0.035007					24
		0.037383					27
		0.039797					29.5
		0.040951					31
		0.042158					32.5
		0.042665					34
		0.044955					36
		0.046367					38
		0.048335					42
		0.050226					44
		0.05184					46.5
		0.051633					47
		0.051771					47.5
		0.001893				0.5	
		0.003279				1.5	
		0.005421				2	
		0.006163				3	
		0.007331				4	
		0.009273				5	
		0.011038				7	
		0.013251				8.5	
		0.014416				10	
		0.015144				11	
		0.017958				14.5	
		0.021079				19	
		0.024826				22.5	
		0.025113				24	
		0.02497				25	
		0.027949				27.5	
		0.02981				32	
		0.030873				33	
		0.0319				34.5	
		0.033113				37	
		0.034904				41	
		0.0369				44.5	
		0.038142				46	
		0.03907				49	
		0.039435				49.5	

Fig 6



Marta data **Rawdata below on lines 101**

Marta data

Table of results for the Quadratic curves (fig.4)
Pressure Diff V's Flow Rate

Floor Infiltration

Flow Rate	leakage Press dif Measured	PressDiff Quadratic Leakage	inflow Press dif Measured	PressDiff Predict	Infiltration PressDiff Predict Floor Infiltr	PressDiff Predict Floor Infiltration
0	0	0			0	0
0.0036	1.5	4.1387832				
0.0038	2.5	4.4297398				
0.0039	3.5	4.57762695				
0.0043	3.5	5.18523455				
0.0039	4	4.57762695				
0.0041	4	4.87821895				
0.0045	4	5.49867375				
0.0048	5	5.9808768				
0.0047	6	5.81853655				
0.0055	6	7.16222375				
0.0044	6.5	5.3411512				
0.0057	7.5	7.51420455				
0.0061	8	8.23743695				
0.006	8.5	8.05422				
0.0059	8.5	7.87260895				
0.0064	10	8.7967232				
0.0064	10	8.7967232				
0.0064	10.5	8.7967232				
0.0078	12.5	11.5978278				
0.009	15	14.249295				
0.0088	15	13.7913248				
0.0105	18	17.88882375				
0.012	19.5	21.88968				
0.0108	20	18.6600888				
0.0133	24	25.64936255				
0.013	24.5	24.757655				

0.0135	26	26.25186375				
0.0137	27	26.86078855				
0.0137	27.5	26.86078855				
0.0141	29	28.09790895				
0.0144	30	29.0426112				
0.0148	31.5	30.3246968				
0.0156	33	32.9659512				
0.016	33	34.32512	2	2.371494	2.902406	2.89426
0.0165	37	36.06021375			3.030289	3.021789
0.017	37	37.835455			3.160426	3.151566
0.0171	39	38.19532095			3.186724	3.177791
0.0176	33	40.0187392	2.5	2.691995	3.319565	3.310264
0.0181	42	41.88230495			3.45466	3.444985
0.0183	43	42.63897255			3.509329	3.499503
0.0203	47.5	50.55894655			4.075849	4.064459
0.0199	50	48.92356295			3.95966	3.948591
0.0227			2.5	3.814729	4.803267	4.789872
0.0238			3	4.077074	5.154019	5.139659
0.0203			3.5	3.267203	4.075849	4.064459
0.0227			4	3.814729	4.803267	4.789872
0.0227			4	3.814729	4.803267	4.789872
0.0248			4.5	4.321785	5.48235	5.467087
0.0278			4.5	5.091437	6.521426	6.503309
0.0248			5	4.321785	5.48235	5.467087
0.0259			5	4.597805	5.853924	5.837641
0.0259			5.5	4.597805	5.853924	5.837641
0.0268			6	4.828967	6.166053	6.148912
0.0278			6	5.091437	6.521426	6.503309
0.0329			6.2	6.522119	8.474041	8.450575
0.0366			7	7.65644	10.03739	10.00965
0.0344			7.5	6.972211	9.09296	9.067801
0.0351			8	7.186812	9.38873	9.362762
0.0418			9	9.387604	12.44313	12.40882
0.0418			9	9.387604	12.44313	12.40882
0.0424			9.5	9.597654	12.7364	12.70129
0.0393			10	8.535334	11.2561	11.22503
0.0436			11.5	10.02415	13.33267	13.29594
0.0453			12	10.64294	14.19961	14.16051
0.0574			12.5	15.54152	21.12277	21.06485
0.06			13	16.70724	22.78265	22.72022
0.0507			13.7	12.722	17.12622	17.07916
0.06			15.5	16.70724	22.78265	22.72022
0.0688			18	20.94968	28.85286	28.77396
0.0641			20	18.62679	25.52397	25.4541
0.0735			21	23.40333	32.38088	32.29241
0.0835			23.5	29.05897	40.54983	40.43925
0.0785			29	26.15715	36.35268	36.25346
0.0752			30	24.32302	33.70601	33.61395
0.0851			30	30.01881	41.94052	41.82617
0.0854			34	30.20047	42.20384	42.08878

		just fbds	109.2	4507.1					
		just fbds	137	4507.1			pred Q		
		A=137	**A=109**		% Flow Rate		from ratio		
		Flow Rate	Flow Rate		**A=137**	**A=109**	Equation	% Diff	
0.016	2.89426	0.014351	0.015973	10.15809	10.31	0.2	**0.0142**	11.53	2.89426
0.0165	3.021789	0.014826	0.016473	9.99768	10.15	0.2	**0.0146**	11.34	3.021789
0.017	3.151566	0.015301	0.016972	9.842138	9.99	0.2	**0.0151**	11.16	3.151566
0.0171	3.177791	0.015397	0.017072	9.811594	9.96	0.2	**0.0152**	11.13	3.177791
0.0176	3.310264	0.015873	0.017571	9.66161	9.81	0.2	**0.0157**	10.95	3.310264
0.0181	3.444985	0.016351	0.018070	9.516039	9.66	0.2	**0.0161**	10.79	3.444985
0.0183	3.499503	0.016542	0.018270	9.459004	9.61	0.2	**0.0163**	10.72	3.499503
0.0203	4.064459	0.018459	0.020267	8.923418	9.07	0.2	**0.0182**	10.10	4.064459
0.0199	3.948591	0.018074	0.019868	9.025728	9.17	0.2	**0.0179**	10.22	3.948591
0.0227	4.789872	0.020770	0.022664	8.354367	8.50	0.2	**0.0206**	9.44	4.789872
0.0238	5.139659	0.021833	0.023762	8.116731	8.26	0.2	**0.0216**	9.17	5.139659
0.0203	4.064459	0.018459	0.020267	8.923418	9.07	0.2	**0.0182**	10.10	4.064459
0.0227	4.789872	0.020770	0.022664	8.354367	8.50	0.2	**0.0206**	9.44	4.789872
0.0227	4.789872	0.020770	0.022664	8.354367	8.50	0.2	**0.0206**	9.44	4.789872
0.0248	5.467087	0.022802	0.024761	7.911956	8.06	0.2	**0.0226**	8.93	5.467087

0.0278	6.503309	0.025715	0.027756	7.354492	7.50	0.2	**0.0255**	8.28	6.503309
0.0248	5.467087	0.022802	0.024761	7.911956	8.06	0.2	**0.0226**	8.93	5.467087
0.0259	5.837641	0.023868	0.025859	7.698145	7.84	0.2	**0.0237**	8.68	5.837641
0.0259	5.837641	0.023868	0.025859	7.698145	7.84	0.2	**0.0237**	8.68	5.837641
0.0268	6.148912	0.024742	0.026758	7.5315	7.68	0.2	**0.0245**	8.49	6.148912
0.0278	6.503309	0.025715	0.027756	7.354492	7.50	0.2	**0.0255**	8.28	6.503309
0.0329	8.450575	0.030692	0.032849	6.566095	6.71	0.2	**0.0305**	7.37	8.450575
0.0366	10.00965	0.034318	0.036544	6.091394	6.24	0.2	**0.0341**	6.81	10.00965
0.0344	9.067801	0.032161	0.034347	6.36509	6.51	0.2	**0.0319**	7.13	
0.0351	9.362762	0.032847	0.035046	6.2754	6.42	0.2	**0.0326**	7.03	
0.0418	12.40882	0.039429	0.041737	5.528784	5.67	0.2	**0.0392**	6.16	
0.0418	12.40882	0.039429	0.041737	5.528784	5.67	0.2	**0.0392**	6.16	
0.0424	12.70129	0.040020	0.042336	5.470437	5.61	0.2	**0.0398**	6.09	
0.0393	11.22503	0.036970	0.039240	5.785805	5.93	0.2	**0.0368**	6.46	
0.0436	13.29594	0.041202	0.043534	5.357336	5.50	0.2	**0.0410**	5.95	
0.0453	14.16051	0.042878	0.045232	5.204836	5.35	0.2	**0.0427**	5.78	
0.0574	21.06485	0.054835	0.057315	4.327025	4.47	0.1	**0.0547**	4.75	
0.06	22.72022	0.057410	0.059912	4.175546	4.32	0.1	**0.0573**	4.57	
0.0507	17.07916	0.048208	0.050624	4.772952	4.91	0.1	**0.0480**	5.27	
0.06	22.72022	0.057410	0.059912	4.175546	4.32	0.1	**0.0573**	4.57	
0.0688	28.77396	0.066135	0.068700	3.732974	3.87	0.1	**0.0660**	4.05	
0.0641	25.4541	0.061473	0.064006	3.95702	4.10	0.1	**0.0613**	4.31	
0.0735	32.29241	0.070800	0.073393	3.532869	3.67	0.1	**0.0707**	3.81	
0.0835	40.43925	0.080736	0.083380	3.171037	3.31	0.1	**0.0807**	3.39	
0.0785	36.25346	0.075767	0.078387	3.342214	3.48	0.1	**0.0757**	3.59	
0.0752	33.61395	0.072489	0.075091	3.465659	3.61	0.1	**0.0724**	3.73	
0.0851	41.82617	0.082326	0.084978	3.119895	3.26	0.1	**0.0823**	3.33	
0.0854	42.08878	0.082625	0.085277	3.110489	3.25	0.1	**0.0826**	3.32	

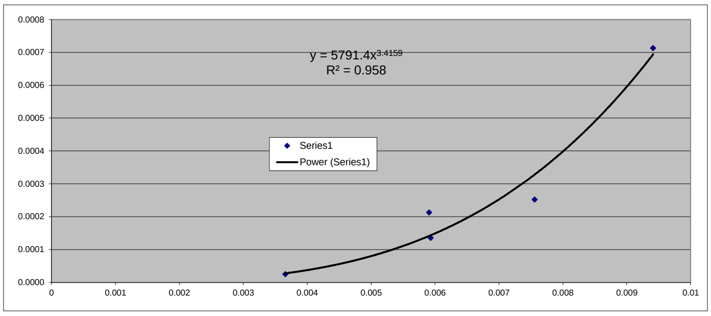
Equation =		0.7423	0.2577	0.05
		0.7423	0.2577	0.05

pressure Difference	Crack Width	Edge Coef	Laminar coef
50	0.000251877	4507	137.22
Lam width =	0.006958998		
Flow Rate at 50 Pa	**0.0912**		
Predicted Flow Rate=	**0.0126**		

x= -0.4858

0.1387

Lam.Coef	Edge Coef	Lam.Coef	Edge=f(Lam)	% diff
0.003661	0.0000247	0.003660965	2.55401E-05	-3.515937171
0.005909	0.00021	0.005909333	0.000140784	33.84110348
0.005934	0.00014	0.005934084	0.000142897	-5.659363511
0.009414	0.00071	0.009413836	0.000740471	-3.86221847
0.007561	0.00025	0.00756062	0.000338908	-34.5530993



Gap size	Edge effect	calculation	crack width	Laminar coef		crack width	Lam.Coef = F(Edge)
0 (test 2)	18218186	6.08738E-10	0.0000246726	6750	4.90667E-08	0.003660965	6933.88
1.25(test 1	244911	4.52822E-08	0.0002127961	1605	2.06355E-07	0.005909333	1131.505
(2 fits) 3.5	606324	1.82907E-08	0.0001352432	1585	2.08959E-07	0.005934084	1656.84
random	21819	5.08278E-07	0.0007129358	397	8.34257E-07	0.009413836	409.1277
1.75(Marta	4507	6.34418E-08	0.0002518765	107	4.32188E-07	0.00756062	137.0922

	Lam.Coef	Edge Coef			
	0.003660965	0.0000247	2.76E-05	2.75594E-05	-11.70
	0.005909333	0.00021	0.000141	0.000141443	33.53
0.003628	0.005934084	0.00014	0.000143	0.000143477	-6.09
0.00664	0.009413836	0.00071	0.000694	0.000694021	2.65
0.005847	0.00756062	0.00025	0.000328	0.000328207	-30.30
0.00932					
0.006961					

Figure 1

Laminar Coeficienet Width versus Edge Effect Coefficient Width

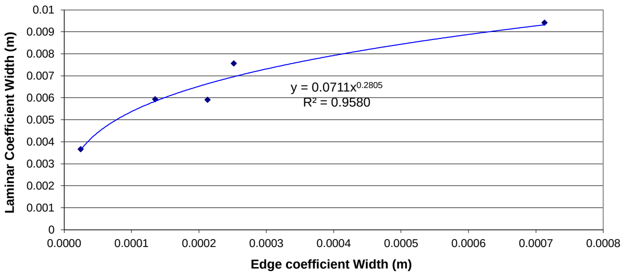


Fig 8

	Ratio flow rate	Current res	British Gas	Previous Work (ref 5)
0.009804	0.043911	0.009804		
0.04902	0.087823	0.04902		
0.098039	0.209083	0.098039		
0.176471	0.354518	0.176471		
0.303922	0.455687	0.303922		
0.392157	0.543214	0.392157		
0.490196	0.622879	0.490196		
0.627451	0.742908	0.627451		
0.735294	0.829774	0.735294		
0.843137	0.905357	0.843137		
0.980392	1.008163	0.980392		
0.007353	0.043911	0.007353		
0.039216	0.083316	0.039216		
0.078431	0.129272	0.078431		
0.107843	0.26653	0.107843		
0.137255	0.304789	0.137255		
0.186275	0.369611	0.186275		
0.303922	0.473333	0.303922		
0.401961	0.5581	0.401961		
0.568627	0.705172	0.568627		
0.745098	0.829774	0.745098		
0.921569	0.960988	0.921569		
0.960784	0.997264	0.960784		
0.019608	0.040879	0.019608		
0.058824	0.092805	0.058824		
0.284314	0.437329	0.284314		
0.352941	0.522708	0.352941		
0.5	0.631591	0.5		
0.627451	0.724286	0.627451		
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0.872549	0.899301	0.872549		
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0.039604	0.164677	0.039604		
0.039604	0.164677	0.039604		
0.049505	0.174667	0.049505		
0.059406	0.201688	0.059406		
0.069307	0.217848	0.069307		
0.09901	0.28523	0.09901		
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0.108911	0.291111	0.108911		
0.118812	0.296876	0.118812		
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0.188119	0.403376	0.188119		
0.19802	0.403376	0.19802		
0.227723	0.447214	0.227723		
0.267327	0.469403	0.267327		
0.287129	0.494032	0.287129		
0.287129	0.497451	0.287129		
0.306931	0.514205	0.306931		
0.306931	0.520756	0.306931		
0.336634	0.533616	0.336634		
0.376238	0.573423	0.376238		
0.376238	0.588016	0.376238		
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0.405941	0.616166	0.405941		
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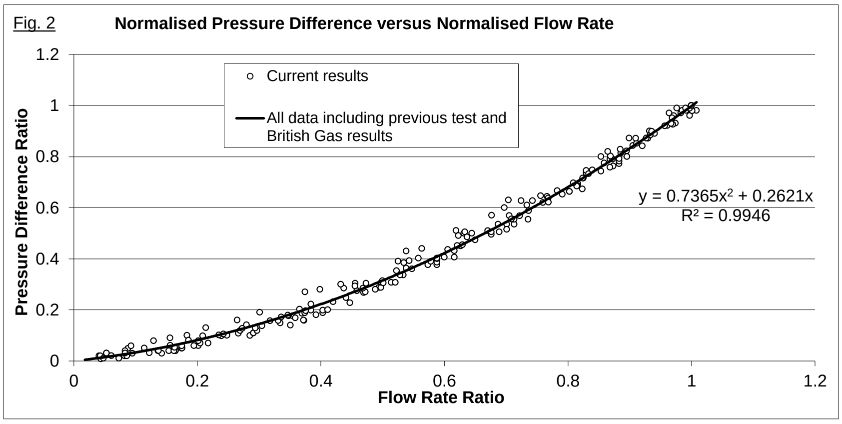
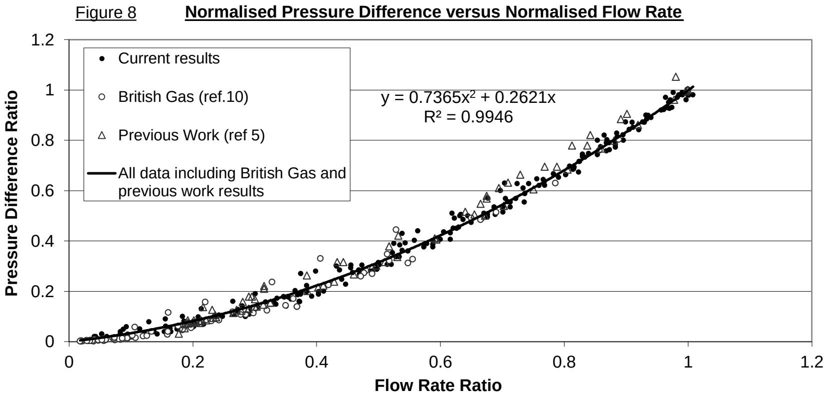
0.534653	0.701089	0.534653		
0.514851	0.701089	0.514851		
0.534653	0.713074	0.534653		
0.554455	0.713074	0.554455		
0.663366	0.802538	0.663366		
0.663366	0.802538	0.663366		
0.673267	0.823387	0.673267		
0.732673	0.833616	0.732673		
0.742574	0.853706	0.742574		
0.762376	0.873334	0.762376		
0.772277	0.882984	0.772277		
0.782178	0.882984	0.782178		
0.792079	0.882984	0.792079		
0.851485	0.911322	0.851485		
0.841584	0.920575	0.841584		
0.871287	0.929735	0.871287		
0.930693	0.974245	0.930693		
0.970297	0.982905	0.970297		
0.980198	0.991489	0.980198		
0.980198	1	0.980198		
1	1	1		
0.05	0.175412	0.05		
0.05	0.175412	0.05		
0.1	0.248069	0.1		
0.14	0.350823	0.14		
0.16	0.372104	0.16		
0.18	0.392232	0.18		
0.2	0.411377	0.2		
0.27	0.47231	0.27		
0.28	0.488325	0.28		
0.36	0.547723	0.36		
0.4	0.588348	0.4		
0.45	0.626345	0.45		
0.5	0.644503	0.5		
0.61	0.733799	0.61		
0.62	0.759555	0.62		
0.79	0.868243	0.79		
0.79	0.872662	0.79		





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0.069307	0.204963	0.069307	
0.118812	0.269235	0.118812	
0.128713	0.294093	0.128713	
0.188119	0.37421	0.188119	
0.19802	0.383988	0.19802	
0.247525	0.440907	0.247525	
0.306931	0.497936	0.306931	
0.336634	0.528434	0.336634	
0.405941	0.599973	0.405941	
0.435644	0.605439	0.435644	
0.49505	0.676141	0.49505	
0.534653	0.687018	0.534653	
0.554455	0.735654	0.554455	
0.643564	0.766365	0.643564	
0.693069	0.816328	0.693069	
0.80198	0.869111	0.80198	
0.821782	0.895256	0.821782	
0.871287	0.909858	0.871287	
0.970297	0.963929	0.970297	
1	1	1	Test 2
0.03	0.05295	0.03	Test 3
0.03	0.05295	0.03	
0.02	0.061142	0.02	
0.05	0.114386	0.05	
0.09	0.155882	0.09	
0.1	0.183425	0.1	
0.13	0.213996	0.13	
0.16	0.264752	0.16	
0.19	0.301088	0.19	
0.27	0.374415	0.27	
0.28	0.398596	0.28	
0.3	0.432338	0.3	
0.39	0.525072	0.39	
0.43	0.538256	0.43	
0.44	0.563699	0.44	
0.51	0.619013	0.51	
0.57	0.676716	0.57	
0.6	0.697124	0.6	
0.63	0.703795	0.63	
0.8	0.853799	0.8	
0.82	0.864675	0.82	
0.9	0.932287	0.9	
0.96	0.971558	0.96	
0.99	0.976356	0.99	
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0.029412	0.095092	0.029412	
0.039216	0.136444	0.039216	
0.058824	0.174886	0.058824	
0.078431	0.201721	0.078431	
0.098039	0.239125	0.098039	
0.127451	0.272888	0.127451	
0.156863	0.317905	0.156863	
0.176471	0.347866	0.176471	
0.196078	0.375443	0.196078	
0.27451	0.458374	0.27451	
0.313725	0.5	0.313725	
0.362745	0.538418	0.362745	
0.401961	0.588001	0.401961	
0.45098	0.620998	0.45098	
0.509804	0.670424	0.509804	
0.588235	0.736582	0.588235	
0.637255	0.768392	0.637255	
0.686275	0.81541	0.686275	
0.715686	0.825137	0.715686	
0.813725	0.885762	0.813725	
0.872549	0.926845	0.872549	
0.95098	0.968932	0.95098	
0.980392	0.985264	0.980392	
1	1	1	test 3
0.010526	0.073127	0.010526	test 4
0.031579	0.122365	0.031579	
0.052632	0.163517	0.052632	
0.105263	0.242536	0.105263	
0.157895	0.331098	0.157895	
0.178947	0.346873	0.178947	
0.231579	0.420084	0.231579	
0.284211	0.468243	0.284211	
0.305263	0.501335	0.305263	
0.389474	0.578122	0.389474	
0.431579	0.616181	0.431579	
0.473684	0.649969	0.473684	
0.505263	0.67618	0.505263	
0.568421	0.722074	0.568421	
0.621053	0.768706	0.621053	
0.652632	0.790992	0.652632	
0.684211	0.814311	0.684211	
0.715789	0.824102	0.715789	
0.757895	0.868338	0.757895	
0.8	0.895622	0.8	
0.884211	0.933626	0.884211	
0.926316	0.970143	0.926316	
0.978947	1.001336	0.978947	
0.989474	0.997323	0.989474	
1	1	1	
0.010101	0.048002	0.010101	
0.030303	0.083141	0.030303	
0.040404	0.137455	0.040404	
0.060606	0.156282	0.060606	

0.080808	0.185909	0.080808		
0.10101	0.235159	0.10101		
0.141414	0.279895	0.141414		
0.171717	0.336011	0.171717		
0.20202	0.365569	0.20202		
0.222222	0.384012	0.222222		
0.292929	0.455383	0.292929		
0.383838	0.534522	0.383838		
0.454545	0.629534	0.454545		
0.484848	0.636812	0.484848		
0.505051	0.633184	0.505051		
0.555556	0.708734	0.555556		
0.646465	0.755929	0.646465		
0.666667	0.782881	0.666667		
0.69697	0.808936	0.69697		
0.747475	0.839684	0.747475		
0.828283	0.885105	0.828283		
0.89899	0.935722	0.89899		
0.929293	0.967204	0.929293		
0.989899	0.990741	0.989899		
1	1	1		Test 4
0.001302	0.019326		0.001302	Etheridge
0.003128	0.030644		0.003128	
0.004878	0.041651		0.004878	
0.007713	0.056842		0.007713	
0.011223	0.077099		0.011223	
0.020646	0.101361		0.020646	
0.082098	0.230073		0.082098	
0.170892	0.362365		0.170892	
0.321654	0.517664		0.321654	
0.514004	0.690219		0.514004	
1	1		1	
0.057406	0.106557		0.057406	
0.115313	0.160494		0.115313	
0.156938	0.220339		0.156938	
0.236843	0.328283		0.236843	
0.330078	0.40625		0.330078	
0.444876	0.528455		0.444876	
1	1		1	
0.003409	0.019461		0.003409	
0.004954	0.028509		0.004954	
0.007898	0.041139		0.007898	
0.011513	0.056034		0.011513	
0.017953	0.079268		0.017953	
0.022625	0.095588		0.022625	
0.06861	0.193452		0.06861	
0.118355	0.264228		0.118355	
0.225266	0.419355		0.225266	
0.490905	0.65		0.490905	
1	1		1	
0.00934	0.04138		0.00934	
0.01455	0.07059		0.01455	
0.02389	0.10000		0.02389	
0.03973	0.13333		0.03973	
0.06145	0.17647		0.06145	
0.08617	0.22222		0.08617	
0.12926	0.30000		0.12926	
0.28143	0.48000		0.28143	
0.48919	0.66667		0.48919	
1.00000	1.00000		1.00000	
0.001654	0.039773		0.001654	
0.00338	0.056452		0.00338	
0.006386	0.074468		0.006386	
0.008628	0.083333		0.008628	
0.02857	0.159091		0.02857	
0.138819	0.368421		0.138819	
1	1		1	
0.001654	0.039773		0.001654	
0.00338	0.056452		0.00338	
0.006386	0.074468		0.006386	
0.008628	0.083333		0.008628	
0.02857	0.159091		0.02857	
0.138819	0.368421		0.138819	
1	1		1	
0.001383	0.022		0.001383	
0.0031	0.035484		0.0031	
0.004512	0.047667		0.004512	
0.010511	0.080337		0.010511	
0.015414	0.107519		0.015414	
0.045935	0.183333		0.045935	
0.11369	0.297917		0.11369	
0.272653	0.476667		0.272653	
0.484511	0.665116		0.484511	
1	1		1	
0.002381	0.020502		0.002381	
0.003925	0.032111		0.003925	
0.006155	0.047172		0.006155	
0.011138	0.073019		0.011138	
0.015714	0.090346		0.015714	
0.054854	0.197422		0.054854	
0.108317	0.28658		0.108317	
0.327472	0.555249		0.327472	
0.803397	0.888399		0.803397	
1	1		1	
0.00603	0.03467		0.00603	
0.01138	0.05627		0.01138	
0.01636	0.07367		0.01636	
0.02471	0.10250		0.02471	
0.06582	0.18860		0.06582	
0.10736	0.27736		0.10736	
0.25973	0.47151		0.25973	
0.62946	0.78585		0.62946	
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0.003866	0.038055		0.003866	
0.006692	0.059406		0.006692	

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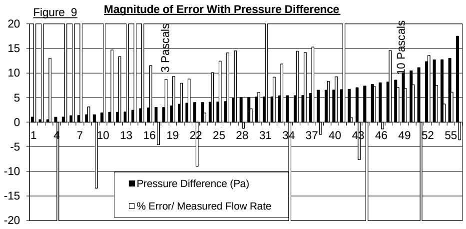
0.048009	0.183673	0.048009		
0.107378	0.285714	0.107378		
0.347906	0.514286	0.347906		
0.760126	0.857143	0.760126		
1	1	1		
0.001383	0.01791	0.001383		
0.002882	0.033803	0.002882		
0.007904	0.059259	0.007904		
0.013946	0.094118	0.013946		
0.021705	0.12	0.021705		
0.040303	0.16	0.040303		
0.124492	0.32	0.124492		
0.269276	0.489796	0.269276		
1	1	1		
0.003087	0.029302	0.003087		
0.006926	0.05339	0.006926		
0.013076	0.086301	0.013076		
0.023056	0.126	0.023056		
0.085266	0.242308	0.085266		
0.14349	0.35	0.14349		
0.311916	0.547826	0.311916		
1	1	1		Etheridge
0.068771	0.187354		0.068771	Marta floor
0.071801	0.193208		0.071801	
0.074885	0.199063		0.074885	
0.075508	0.200234		0.075508	
0.078656	0.206089		0.078656	
0.081857	0.211944		0.081857	
0.083152	0.214286		0.083152	
0.093822	0.233021		0.093822	
0.096575	0.237705		0.096575	
0.096575	0.237705		0.096575	
0.113811	0.265808		0.113811	
0.113811	0.265808		0.113811	
0.113811	0.265808		0.113811	
0.122122	0.278689		0.122122	
0.129902	0.290398		0.129902	
0.129902	0.290398		0.129902	
0.138706	0.303279		0.138706	
0.138706	0.303279		0.138706	
0.146102	0.313817		0.146102	
0.154522	0.325527		0.154522	
0.154522	0.325527		0.154522	
0.200788	0.385246		0.200788	
0.215453	0.40281		0.215453	
0.222462	0.411007		0.222462	
0.237831	0.428571		0.237831	
0.266708	0.460187		0.266708	
0.294834	0.489461		0.294834	
0.301783	0.496487		0.301783	
0.315911	0.510539		0.315911	
0.336453	0.530445		0.336453	
0.405798	0.593677		0.405798	
0.500494	0.672131		0.500494	
0.539824	0.702576		0.539824	
0.539824	0.702576		0.539824	
0.604778	0.750585		0.604778	
0.683655	0.805621		0.683655	
0.76725	0.860656		0.76725	
0.798648	0.880562		0.798648	
0.86136	0.919204		0.86136	
0.960809	0.977752		0.960809	
0.993761	0.996487		0.993761	
1	1		1	Marta floor
0.031579	0.17734		0.031579	Marta Total
0.052632	0.187192		0.052632	
0.073684	0.192118		0.073684	
0.084211	0.192118		0.084211	
0.084211	0.20197		0.084211	
0.073684	0.211823		0.073684	
0.136842	0.216749		0.136842	
0.084211	0.221675		0.084211	
0.126316	0.231527		0.126316	
0.105263	0.236453		0.105263	
0.126316	0.270936		0.126316	
0.157895	0.280788		0.157895	
0.178947	0.29064		0.178947	
0.178947	0.295567		0.178947	
0.168421	0.300493		0.168421	
0.210526	0.315271		0.210526	
0.210526	0.315271		0.210526	
0.221053	0.315271		0.221053	
0.263158	0.384236		0.263158	
0.315789	0.433498		0.315789	
0.315789	0.44335		0.315789	
0.378947	0.517241		0.378947	
0.421053	0.53202		0.421053	
0.410526	0.591133		0.410526	
0.515789	0.640394		0.515789	
0.505263	0.655172		0.505263	
0.547368	0.665025		0.547368	
0.568421	0.674877		0.568421	
0.578947	0.674877		0.578947	
0.610526	0.694581		0.610526	
0.631579	0.70936		0.631579	
0.663158	0.729064		0.663158	
0.694737	0.768473		0.694737	
0.694737	0.788177		0.694737	
0.778947	0.812808		0.778947	
0.778947	0.837438		0.778947	
0.821053	0.842365		0.821053	
0.884211	0.891626		0.884211	
0.905263	0.901478		0.905263	
1.052632	0.980296		1.052632	

1	1		1	Marta

Fig 9



Flow Rate	Pressure Difference
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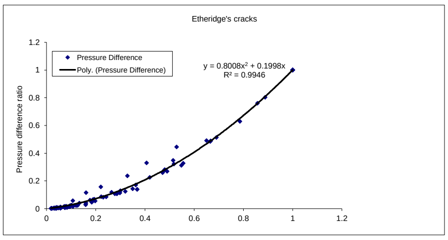
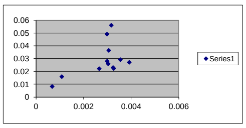
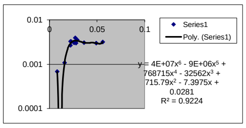
0.030644	0.003128
0.041651	0.004878
0.056842	0.007713
0.077099	0.011223
0.101361	0.020646
0.230073	0.082098
0.362365	0.170892
0.517664	0.321654
0.690219	0.514004
1	1
0.106557	0.057406
0.160494	0.115313
0.220339	0.156938
0.328283	0.236843
0.40625	0.330078
0.528455	0.444876
1	1
0.019461	0.003409
0.028509	0.004954
0.041139	0.007898
0.056034	0.011513
0.079268	0.017953
0.095588	0.022625
0.193452	0.06861
0.264228	0.118355
0.419355	0.225266
0.65	0.490905
1	1
0.04138	0.00934
0.07059	0.01455
0.10000	0.02389
0.13333	0.03973
0.17647	0.06145
0.22222	0.08617
0.30000	0.12926
0.48000	0.28143
0.66667	0.48919
1.00000	1.00000
0.039773	0.001654
0.056452	0.00338
0.074468	0.006386
0.083333	0.008628
0.159091	0.02857
0.368421	0.138819
1	1
0.039773	0.001654
0.056452	0.00338
0.074468	0.006386
0.083333	0.008628
0.159091	0.02857
0.368421	0.138819
1	1
0.022	0.001383
0.035484	0.0031
0.047667	0.004512
0.080337	0.010511
0.107519	0.015414
0.183333	0.045935
0.297917	0.11369
0.476667	0.272653
0.665116	0.484511
1	1
0.020502	0.002381
0.032111	0.003925
0.047172	0.006155
0.073019	0.011138
0.090346	0.015714
0.197422	0.054854
0.28658	0.108317
0.555249	0.327472
0.888399	0.803397
1	1
0.03467	0.00603
0.05627	0.01138
0.07367	0.01636
0.10250	0.02471
0.18860	0.06582
0.27736	0.10736
0.47151	0.25973
0.78585	0.62946
1.00000	1.00000
0.038055	0.003866
0.059406	0.006692
0.094737	0.01329
0.183673	0.048009
0.285714	0.107378
0.514286	0.347906
0.857143	0.760126
1	1
0.01791	0.001383
0.033803	0.002882
0.059259	0.007904
0.094118	0.013946
0.12	0.021705
0.16	0.040303
0.32	0.124492
0.489796	0.269276
1	1
0.029302	0.003087
0.05339	0.006926
0.086301	0.013076
0.126	0.023056
0.242308	0.085266
0.35	0.14349
0.547826	0.311916
1	1





Equation = 0.7423 0.2577 0.05

Edge crack widt	Lam crack widt	crack width
0.00324	0.023023	0.00324
0.003546	0.029195	0.003546
0.002984	0.049164	0.002984
0.003267	0.022273	0.003267
0.003923	0.027161	0.003923
0.003059	0.036388	0.003059
0.003032	0.025936	0.003032
0.003167	0.056059	0.003167
0.001083	0.015984	0.001083
0.002659	0.022183	0.002659
0.000682	0.008268	0.000682
0.002991	0.028023	0.002991



Flow Rate	PressDiff	Factor	PredFloRa	% Diff
0.031576	1.0064	0.062472	0.01911	39.47984
0.069919	4.1972	0.196358	0.060065	14.09322
0.090635	6.5192	0.269022	0.082292	9.205057
0.122358	10.4221	0.369687	0.113085	7.578337
0.033064	1.311491	0.073786	0.019362	41.44
0.063584	4.85019	0.207204	0.054373	14.48741
0.091844	8.162175	0.299107	0.078489	14.54072
0.04537	1.894949	0.116979	0.033171	26.88807
0.090739	5.853287	0.271212	0.076905	15.24612
0.138886	12.66062	0.453227	0.128517	7.466209
0.061833	2.411664	0.134325	0.04522	26.86766
0.096185	5.394016	0.244493	0.082308	14.42731
0.173132	17.47661	0.532688	0.179327	-3.57822
0.054816	3.2910	0.171094	0.049727	9.283749
0.080612	5.3681	0.244467	0.071053	11.85872
0.137041	12.9863	0.442879	0.12872	6.072032
0.071127	2.7427	0.148951	0.053664	24.55206
0.103249	5.4158	0.246002	0.08863	14.15934
0.055776	2.0718	0.114187	0.034739	37.71611
0.090635	5.1276	0.227061	0.069079	23.78356
0.145017	12.2972	0.411927	0.125321	13.58174
0.062786	1.3629	0.088369	0.034875	44.45352
0.145398	6.6225	0.292404	0.115398	20.63332
0.024376	3.6481	0.162441	0.022438	7.94995
0.030695	5.1159	0.208803	0.028842	6.038515
0.041439	7.6742	0.278379	0.038452	7.20686
0.065775	3.8651	0.176498	0.060011	8.763988
0.08984	6.6674	0.261812	0.089018	0.914301
0.142584	12.6901	0.403989	0.13736	3.664097
0.008185	5.3870	0.2451	0.012499	-52.7019
0.011238	7.3316	0.3036	0.015482	-37.7717
0.016743	11.0645	0.3993	0.020367	-21.6464
0.038637	1.032284	0.0481	0.018351	52.50502
0.087701	4.104893	0.1646	0.062755	28.44424
0.138128	8.544614	0.2960	0.112818	18.32346

Pressure I	% Error/ Measured Flow Rate
1.01	39.48
0.50	24.81
0.50	13.00
1.00	-51.53
1.03	33.77
1.31	41.44
1.36	44.45
1.50	3.14
1.50	-13.39
1.89	26.89
2.00	14.70
2.00	13.34
2.07	37.72
2.41	26.87
2.74	24.55
2.89426	11.53
3.00	-4.58
3.00	8.70
3.29	9.28
3.65	7.95
3.87	8.76
4.00	-8.99
4.00	1.86
4.064459	10.10
4.10	12.39
4.20	14.09
4.85	14.49
5.00	-1.26
5.00	2.71
5.12	6.04
5.13	23.78
5.139659	9.17
5.37	11.86
5.39	-52.70
5.39	14.43
5.42	14.16
5.85	15.25
6.50	-2.51
6.503309	8.28
6.52	9.21
6.62	20.63
6.67	0.91
7.00	-7.65
7.33	-37.77
7.67	7.21
8.00	-1.41
8.16	14.54
8.54	7.09
10.00965	6.81
10.42	7.58
11.06	-21.65
12.30	13.58
12.66	7.47
12.69	3.66
12.99	6.07
17.48	-3.58