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Evaluation Report for DURABOND Traffic Bearing Waterproofing (**Durex**® **Uraflex** 360/361)

To

ASTM C957-17 (Standard Specification for High-Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane with Integral Wearing Surface)

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2018-12-11

Report No.: 18-06-P0210 and P0075

Date:

Testing. Advising. Assuring.

Summary Letter

Durabond 6178 Netherhart Rd. Mississauga, Ontario

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Email: Asad.Zafar@durabond.com

Asad Zafar / Technical Director, Canada

Tel: 905 565 9283

Attn:

At the request of Durabond, Exova was retained to evaluate a waterproofing membrane for physical properties in accordance with ASTM C957-17 "Standard Specification for High-Solids Content, Cold Liquid- Applied Elastomeric Waterproofing Membrane with Integral Wearing Surface". Samples were prepared in two phases by the client and were shipped to Exova Mississauga Facility for testing. Asad Zafar Technical Director of Durabond provided a letter (dated on 3rd December 2018) stating that the two submitted test samples were of the same formulation and composition.

Upon receipt the samples were assigned the following Identification Numbers:

Client Sample Identification	Exova Sample No.
Durex®Uraflex360/Uraflex361 – Sample 1	18-06-P0075
Durex®Uraflex360/Uraflex361 – Sample 2	18-06-P0210

Testing performed on the samples are as below:

- Weight Loss of the base coat
- Low temperature crack bridging
- Adhesion in peel (water immersion)
- Chemical resistance
- Weathering resistance*
- Abrasion resistance

*Passing results with 2nd phase of test samples submitted

The "Durex®Uraflex360/Uraflex361" material submitted by Durabond for performance evaluation meets the "Pass" criterion when tested in accordance with ASTM C957/C957M-17. Detailed test results are reported in Exova Reports No. 18-06-P0075- A to G and 18-06-P0210.

Reported by:

Muhammad Ahsan, B.Eng. Ext. 11221

Building Products Specialist

Products Testing Group

Approved by:

Rubaiyat Khondker, P.Eng, Ext. 11662

Supervisor, Building Products

Products Testing Group

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EVALUATION OF "URAFLEX360" MATERIAL FOR WEIGHT LOSS OF BASE COAT IN ACCORDANCE WITH ASTM C957/C957M-17, REFERENCING ASTM D6511-18

A Report to:

Durabond

55 Underwriters Rd.

Toronto, ON M1R 3B4

Attention:

Anthony Rapone

Telephone:

Email:

905 565 9283 ext. 131

Anthony.Rapone@durabond.com

Proposal No.:

18-006-546376

Report No.:

18-06-P0075-F-Revision 1

3 Pages

Date:

September 19, 2018

At the request of *Durabond*, Exova was retained to evaluate a waterproofing membrane material for Weight Loss of the Base coat in accordance with ASTM C957/C957-17section 5.11, referencing ASTM D6511-18. The samples were provided by the client and mixing ratio was as instructed by the client.

Upon receipt, the sample was assigned the following Exova Sample Number:

Client Sample Identification	Exova Sample No.
BASECOAT (URAFLEX360)	18-06-P0075-F

2.0 PROCEDURE

The sample was tested as below:

Test Description	Test Method	
Standard Test Method for Solvent Bearing Bituminous Compounds- "Non Volatile Content"	ASTM D6511/D6511M-18 Section 7	

Number of Specimen:

2 (Two)

Substrate:

Metal Dish , 65 mm dia

Exposure:

 70 ± 2 °C for 72 hours. Oven

Equipment:

MII#A02759

Logger

MII# B10864

Digital Weight Balance

MII#A13956

Test Date:

2018-09-11 to 2018-09-14

Observation:

The mixing ratio of the Topcoat and the Basecoat was instructed by

the client.

A summary of results is presented below in Table. SI units are the primary units of measure.

Table 1 – Summary of Abrasion Resistance Test Results Exova Sample No. 18-06-P0075-F ASTM C957-17					
Specimen	Initial Mass, g	Mass after 72 Hours Exposure,	Weight loss % Initial m - Final m Initial m	Requirement of ASTM C957 Table 1 Maximum %	Pass/Fa il
1	10.230	10.209	0.20	40%	Pass
2	10.260	10.240	0.19	4070	Pass

4.0 CONCLUSIONS

The smaple material submitted by *Durabond* for weight loss of base coat evaluation meets the "Pass" criterion when tested in accordance with ASTM C957/C957M-17, referencing ASTM D6511-18, as described in this report.

5.0 REPORT REVISION SUMMARY

Revision No.:	<u>Date:</u>	<u>Description of Revisions</u>
Original Revision1	2018-09-18 2018-09-19	Final Report Change in Client Sample Identification
Reported by:		Approved by:

Muhammad Ahsan, B.Eng., E.I.T, Ext 11221

Building Products Specialist

Products Division

Rubaiyat Khondker, P. Eng Ext. 11662

Supervisor, Building Products

Products Division

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EVALUATION OF "BASE COAT" MATERIAL FOR CRACK BRIDGING PEFORMANCE IN ACCORDANCE WITH ASTM C957/C957M-17, REFERENCING C1305/C1305M - 16

A Report to:

Durabond

55 Underwriters Rd.

Toronto, ON M1R 3B4

Attention:

Anthony Rapone

Telephone:

Email:

905 565 9283 ext. 131

Anthony.Rapone@durabond.com

Proposal No.:

18-006-546376

Report No.:

18-06-P0075-A

3 Pages

Date:

July 12, 2018

At the request of *Durabond*, Exova was retained to evaluate a waterproofing membrane material applied on specified concrete blocks for crack bridging testing performance in accordance with ASTM C957/C957-17, referencing ASTM C1305 / C1305M-16.

Upon receipt, the sample was assigned the following Exova Sample Number:

Client Sample Identification	Exova Sample No.
BASECOAT – greyish colored membrane	18-06-P0075-A

2.0 PROCEDURE

The sample was tested as below:

Test Description	Test Method
Standard Test Method for Crack Bridging Ability of Liquid- Applied Waterproofing Membrane	ASTM C1305 / C1305M-16

No. of Specimens:

5

Equipment:

Applied Testing System, Inc. Series 520 Sealing Compound Tester,

MII# A15025

Thermocouple,

MII# B10864

Thermotron Env. chamber,

MII# B04271

Pre Conditioning:

23 ± 2°C; 50 ± 2% Relative Humidity, 14 days

Pre Conditioning:

70°C for 7 days

Test Temperature:

-26 °C ± 2°C

Test Cycles:

10 cycles

Rate:

Extension or compression of the two cement supports at a rate 1.6 mm/h (m)

Test duration:

10 cycles in 24 hours

Test Date:

2018-05-31 to 2018-06-02

A summary of results is presented below in Table and Photo 1.

Table 1 – Crack Bridging Test ASTM C957/C957M-17, referencing ASTM C1305/C1305M -16 Exova Sample No.: 18-06-P0075-A				
Sample ID	Number of Exposed Specimen	Test parameters	Observation	Comments
А	5	10 cycles at -26°C	Observed after completion of test cycles for visible cracking, blistering, pinhole or other defects	No cracks (5/5)



Photo 1: After 10 cycle of expansion and contraction specimen surface - no cracks

4.0 CONCLUSIONS

The "Basecoat" material submitted by *Durabond* for Crack Bridging ability performance evaluation meets the "Pass" criterion when tested in accordance with ASTM C957/C957M-17, referencing ASTM C1305/C1305M-16, as described in this report.

5.0 REPORT REVISION SUMMARY

Revision No.: Date:

Description of Revisions

Original

2018-07-12

Original document

Reported by:

Approved by:

Rubaiyat Khondker, M.A.Sc., P.Eng., Ext 11662 Sr. Technical Advisor, Building Products Products Division Franz Bauer, Ext. 11403

Tech. Manager, Building Products

Products Division

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EVALUATION OF "WATER PROOFING MEMBRANE" MATERIAL FOR ADHESION IN PEEL AFTER WATER IMMERSION IN ACCORDANCE WITH ASTM C957/C957M-17, REFERENCING ASTM C794-18

A Report to:

Durabond

55 Underwriters Rd.

Toronto, ON M1R 3B4

Attention:

Anthony Rapone

Telephone:

Email:

905 565 9283 ext. 131

Anthony.Rapone@durabond.com

Proposal No.:

18-006-546376

Report No.:

18-06-P0075-D

3 Pages

Date:

September 10, 2018

At the request of *Durabond*, Exova was retained to evaluate a waterproofing membrane material for adhesion in peel performance in accordance with ASTM C957/C957-17, referencing ASTM C794-18. Samples were prepared by the client and shipped to Exova facility.

Upon receipt, the sample was assigned the following Exova Sample Number:

Client Sample Identification	Exova Sample No.
BASECOAT (URAFLEX360)	18-06-P0075-D

2.0 PROCEDURE

The sample was tested as below:

Test Description	Test Method
Standard Test Method for Adhesion in Peel of Elastomeric Joint Sealants	ASTM C794-18

Number of Specimen:

4 (Four)

Specimen Width:

25 mm (nominal)

Crosshead Speed

50 mm / min

Substrate:

Cement Mortar

Test Temperature:

23°C

Load Cell:

5 kN

Pre Conditioning:

14 days at 23 ± 2°C & 50± 5% RH

7 days at 70°C

Water Immersion:

7 days in distilled water conditioned at 23 ± 2°C

Equipment:

Instron Frame MII# A04407

10

Load Cell

MII# B06348

Callipers

MII# B13123

Test Date:

2018-09-05

Observation:

Due to stiffness of the material, it was difficult to bend the test specimen at 180 degree to the test fixture, which showed variation

in the test result

A summary of results is presented below in Table.SI units are the primary units of measure.

Table 1 – Adhesion in Peel After Water Immersion Testing ASTM C957/C957M-17, referencing ASTM D794-18 Exova Sample No.: 18-06-P0075-D			
Sample ID	Maximum Load N	Requirement of ASTM C957 min. Average N	Pass/Fail
1	114		Pass
2	106		Pass
3	237	22.2	Pass
4	44		Pass
Avg	126		Pass

4.0 CONCLUSIONS

The "Basecoat-Uraflex360" material submitted by *Durabond* for adhesion in peel after water immersion performance evaluation meets the "Pass" criterion when tested in accordance with ASTM C957/C957M-17, referencing ASTM C794-18, as described in this report.

5.0 REPORT REVISION SUMMARY

Revision No.:

Date:

Description of Revisions

Original

2018-09-10

Final Report

Reported by:

Approved by:

Muhammad Ahsan, B.Eng., E.I.T, Ext 11221

Building Products Specialist

Products Division

Rubaiyat Khondker, P.Eng Ext. 11662

Supervisor, Building Products

Products Division

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EVALUATION OF "BASECOAT-URAFLEX 360" MATERIAL FOR CHEMICAL RESISTANCE

IN ACCORDANCE WITH ASTM C957/C957M-17, REFERENCING ASTM D412 - 16

A Report to:	Durabond 55 Underwriters Rd. Toronto, ON M1R 3B4
Attention:	Anthony Rapone
Telephone: Email:	905 565 9283 ext. 131 Anthony.Rapone@durabond.com
Proposal No.:	18-006-546376
Report No.:	18-06-P0075-C 3 Pages , 1 Appendix

Aug 09, 2018

Date:

At the request of *Durabond*, Exova was retained to evaluate a waterproofing membrane material for Chemical Resistance performance in accordance with STM C957/C957-17, referencing ASTM D412-16 Method A Die C .

Upon receipt, the sample was assigned the following Exova Sample Number:

Client Sample Identification	Exova Sample No.
BASECOAT – Uraflex 360	18-06-P0075-C

2.0 PROCEDURE

The sample was tested as below:

Test Description	Test Method
Standard Test Method for Vaulcanized Rubber and Thermoplastic Elastomers Tension	ASTM D412-16 Method A Die C

No. of Specimens: 10 Control Specimens

5 Each Exposure

Specimen Size: Dumbbell Shape Die C specimens

Cross Head Speed: 500 mm/min

Equipment: Instron Frame MII# A04407

Load Cell MII# B06348 Callipers MII# B13123

Grip Separation: 51 mm Specimen width: 6 mm

Average Thickness: 1.3 mm (Nominal Average)

Pre Conditioning: $23 \pm 2^{\circ}$ C; $50 \pm 2^{\circ}$ Relative Humidity, 21 days

Pre Conditioning: 70°C for 7 days

Test Liquid Exposure: 14 days in Water, Ethylene Glycol and Mineral Spirits

Test Date: 2018-07-23

A summary of results is presented below in Table and Photo 1.

Table 1 – Chemical Resistance Testing ASTM C957/C957M-17, referencing ASTM D412-16 Exova Sample No.: 18-06-P0075-C					
Sample ID	Exposure	Tensile Strength at Maximum Load kPa	Tensile Retention of Control Specimens	Requirement of ASTM C957 min. Average	Pass/Fail
A Ten (10)Control Specimens		3148	-		-
B 5 Water Specimens		3661	116%	70%	Pass
C Five (5) Mineral Spirit Specimens		3273	104%	45%	Pass
D	Five (5) Ethylene Glycol Specimens	3227	103%	70%	Pass

4.0 CONCLUSIONS

The "Basecoat-Uraflex360" material submitted by *Durabond* for chemical resistance performance evaluation meets the "Pass" criterion when tested in accordance with ASTM C957/C957M-17, referencing ASTM D416-16, as described in this report.

5.0 REPORT REVISION SUMMARY

Revision No.:

Date:

Description of Revisions

Original

2018-08-09

Final Report

Reported by:

Approved by:

Muhammad Ahsan, B.Eng., E.I.T, Ext 11221

Building Products Specialist

Products Division

Franz Bauer, Ext. 11403

Tech. Manager, Building Products

Products Division

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APPENDIX A

Detailed Test Results of Chemical Resistance Testing

(4 Pages)

A1- Test Results of Control Specimens:

	Table A1: Summary of Tensile Test Results-Control Specimens ASTM D412-16 Method A Die C Exova Sample No.: 18-06-P0075 (Control Specimens)					
No.	Width mm	Tensile Stress at Maximum Load kPa				
1	6	7.8	25	3186		
2	6	7.8	24	3087		
3	6	7.8	26	3307		
4	6	7.8	24	3099		
5	6	7.8	24	3099		
6	6	7.8	21	2671		
7	6	7.8	29	3664		
8	6	7.8	24	3097		
9	6	7.8	21	2724		
10	6	7.8	28	3546		
Avg. 6 7.80 25 3148						

ASTM D412 18-06-P0075 - Durabond Initial As Recieved

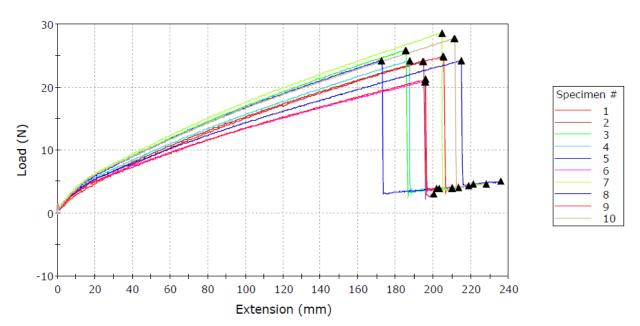


Figure A1: Load Vs Extension Graph - Control Samples

A2 - Test Results of Water Specimens:

	Table A2: Summary of Tensile Test Results-Water Exposed Specimens ASTM D412-16 Method A Die C Exova Sample No.: 18-06-P0075 (Water Specimens)				
No.	No. Width Area Maximum Load Maximum Load Maximum Load kPa				
1	6	7.8	31	4016	
2	6	7.8	27	3480	
3	3 6 7.8		31	4010	
4	6	7.8	29	3709	
5	5 6 7.8		24	3091	
Avg.	6	7.80	29	3661	

ASTM D412 18-06-P0075 - Durabond Water Exposed

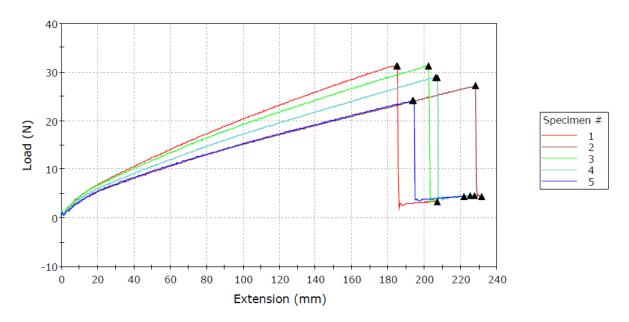


Figure A2: Load Vs Extension Graph – Water Exposed Samples

A3 - Test Results of Mineral Spirit Specimens:

Table A3: Summary of Tensile Test Results-Mineral Spirit Exposed Specimens

ASTM D412-16 Method A Die C

Exova Sample No.: 18-06-P0075 (Mineral Spirit Specimens)

No.	Width mm	Area mm²	Maximum Load N	Tensile Stress at Maximum Load kPa
1	6	7.8	27	3441
2	6	7.8	26	3308
3	6	7.8	26	3396
4	6	7.8	26	3384
5	6	7.8	22	2838
Avg.	6	7.80	26	3273

ASTM D412 18-06-P0075 - Durabond Mineral Spirit Exposed

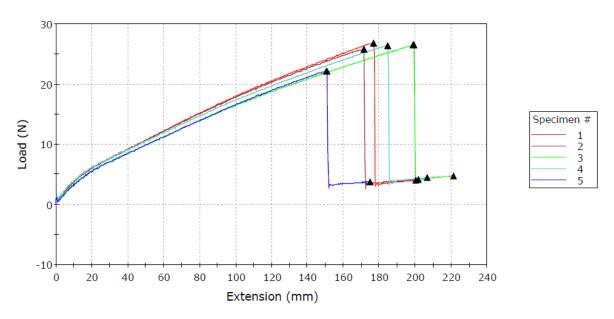


Figure A2: Load Vs Extension Graph – Mineral Spirit Samples

A4 - Test Results of Ethylene Glycol Specimens:

Table A4: Summary of Tensile Test Results-Ethylene Glycol Exposed Specimens
ASTM D412-16 Method A Die C
Exova Sample No.: 18-06-P0075 (Ethylene Glycol Specimens)

No.	Width mm	Area mm²	Maximum Load N	Tensile Stress at Maximum Load kPa
1	6	7.8	29	3718
2	6	7.8	25	3152
3	6	7.8	25	3199
4	6	7.8	24	3118
5	6	7.8	23	2950
Avg.	6	7.80	25	3227

ASTM D412 18-06-P0075 - Durabond Gloycol Exposed

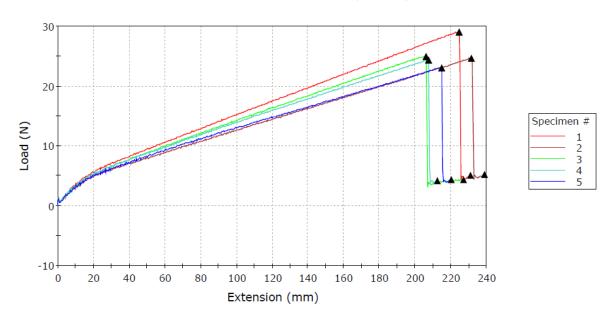


Figure A4: Load Vs Extension Graph – Mineral Spirit Samples

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EVALUATION OF "TOPCOAT-URAFLEX 361" MATERIAL FOR ABRASION RESISTANCE IN ACCORDANCE WITH ASTM C957/C957M-17, REFERENCING ASTM C501

A Report to:

Durabond

55 Underwriters Rd.

Toronto, ON M1R 3B4

Attention:

Anthony Rapone

Telephone:

Email:

905 565 9283 ext. 131

Anthony.Rapone@durabond.com

Proposal No.:

18-006-546376

Report No.:

18-06-P0075-G

3 Pages,

Date:

September 25, 2018

At the request of *Durabond*, Exova was retained to evaluate a waterproofing membrane material for Abrasion Resistance performance in accordance with ASTM C957/C957-17 Section 5.9, referencing ASTM C501. Samples were prepared by the client and shipped to Exova Mississauga Facility.

Upon receipt, the sample was assigned the following Exova Sample Number:

Client Sample Identification	Exova Sample No.
TOPCOAT – Uraflex 361	18-06-P0075-G

2.0 PROCEDURE

The sample was tested as below:

Test Description	Test Method
Standard Test Method for Relative Resistance to Wear of	ASTM C501-84
Unglazed Ceramic Tile by the Taber Abreaser	(Reapproved 2009)

Specimen No.:

4 (Four) specimens were tested

Sample Dimensions:

100 mm x 100 mm x thickness of the sample (Nominal)

Pre Conditioning and Testing:

14 days at 23 ± 2 °C and 50 ± 5% RH followed by 7 days at

70 ± 2 °C

Equipment:

Digital Balance,

MII# A13956

Environ. Controller,
Taber Rotary Abraser,

Ref MII# B14944 Ref MII# A10122

(5150 Abraser)

Wheel Type Used:

CS-17 Abrasion Wheel

Vacum Nozzle Height:

1.5 mm above the specimen surface

Vacum suction setting:

100

Load per Wheel:

1000g

Number of wear cycles:

1000 for each specimen, weight loss was calculated

Test Date:

2018-09-24

Test results are presented in Table 1.SI unites are the primary unite of measure.

	Table 1 – Summary of Test Results Exova Sample No. 18-06-P0075-G ASTM C957-17					
Specimen	Initial Mass, g	Mass after 1000 cycles, g	Requirement in ASTM C957 Table 1,mg	Weight Loss after 1000 cycles, mg		
Specimen 1	85.478	85.466		12		
Specimen 2	87.295	87.279	Max.50	16		
Specimen 3	84.707	84.682		25		
Specimen 4	88.154	88.130		24		
Average	86.409	86.389	5	19		

4.0 CONCLUSIONS

The "Topcoat-Uraflex361" material submitted by *Durabond* for abrasion resistance evaluation meets the "Pass" criterion when tested in accordance with ASTM C957/C957M-17, referencing ASTM C501, as described in this report.

5.0 REPORT REVISION SUMMARY

Revision No.:

Date:

Description of Revisions

Original

2018-09-25

Final Report

Reported by:

Approved by:

Muhammad Ahsan, B.Eng., E.I.T, Ext 11221

Building Products Specialist

Products Division

Franz Bauer, Ext. 11403

Tech. Manager, Building Products

Products Division

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