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UKRAINIAN SCIENTIFIC RESEARCH INSTITUTE OF FIRE SAFETY UNDER THE
MINISTRY OF EMERGENCY SITUATIONS OF UKRAINE

SCIENTIFIC RESEARCH CENTER FOR
RESEARCH AND TESTING FOR FIRE HAZARDS
Accreditation Certificate No. UA 6.001.T.176 dated January 15, 2001

APPROVED

Head of Ternopil SEPRObud
Product Certification Organ

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UKRBUDMATERIALY CORPORATION
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State Regional Testing Center for
Certification of Construction materials
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REPORT No. 310/1Ц-2004

on certification testing to determine the
combustibility class (per DSTU Б B.2.7-19-95),
the ignitability class (per DSTU Б B.1.1-2-97 (GOST 30402-96))
and the flame propagation class (per DSTU Б B.2.7-70-98 (GOST 30444-97))
of Liquid Rubber roofing material samples
made by LAFARGE NORTH AMERICA (Canada)

Kyiv-2004

TESTING CENTER:

Scientific Research Center for Research and Testing for Fire Hazards (SRC) under the Ukrainian Scientific Research Institute of Fire Safety under the Ministry of Emergency Situations of Ukraine.

Center address: 18 Rybalska St., Kyiv, Ukraine, Tel.: 290-39-78

TESTING LOCATION:

Market-Zbut TOV

Address: 11 Trolleybus St., Ternopil, 46001, Ukraine
Tel./fax: (0352) 53-61-63, (0352) 43-38-69

Certification testing is performed pursuant to commercial agreement No. 256-04 dated July 14, 2004 and decision No. 084/003-04 of the Ternopil SEPRObud certification organ dated July 8, 2004.

SUBJECT OF TESTING:

The Liquid Rubber roofing material made by LAFARGE NORTH AMERICA (Canada) is an asphalt emulsion that is applied to the roof surface while in a liquid state where it then hardens. The material is of a black color. The material must be applied in a layer at least 2 mm thick.

- 1. Certification testing to determine the ignitability class (pursuant to DSTU Б B.1.1-2-97 (GOST 30402-96)) of Liquid Rubber roofing material samples. Manufacturer: LAFARGE NORTH AMERICA (Canada).**

1.1 TESTING METHOD:

The testing method to determine ignitability pursuant to DSTU Б B.1.1-2-97 (GOST 30402-96), "Building Materials. Ignitability Testing Method" involves determining the ignitability parameters of the material by subjecting its surface to a radiant heat current and flame from an ignition source at standardized levels. The effect of the radiant heat current must be between 10 and 50 kWt/m². This standard is used for all homogeneous and layered combustible (per DSTU Б B.2.7-19-95) building materials.

For materials classification by ignitability class, critical surface density of the heat current (CSDHC) and ignition time are used.

CSDHC is the minimum value of surface density of the heat current (SDHC) at which combustion occurs that lasts until the next exposure of the sample to flame from an ignition source.

According to the test results, combustible building materials are divided into three ignitability classes depending on their CSDHC value: B1, B2, B3 (Table 1).

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Table 1 – Classification of combustible building materials per DSTU Б B.1.1-2-97 (GOST 30402-96)

Material Ignitability Class	CSDHC, kWt/m ²
B1	$35 \leq \text{CSDHC}$
B2	$20 \leq \text{CSDHC} < 35$
B3	$\text{CSDHC} < 20$

1.2 SAMPLES FOR TESTING:

Tests were performed on samples of the Liquid Rubber roofing material made by LAFARGE NORTH AMERICA (Canada), black in color, dimensions 165 mm x 165 mm, which was applied to asbestos cement sheets 165 mm x 165 mm, 10 mm thick. Average layer thickness of the material subjected to testing was 4 mm.

The appearance of a sample of the Liquid Rubber roofing material made by LAFARGE NORTH AMERICA (Canada) before and after testing is shown in Fig. 1.

The client did not provide either the physical and chemical composition or component percentages in the Liquid Rubber roofing material made by LAFARGE NORTH AMERICA (Canada).

Testing samples were provided by the client on July 15, 2004. Before the testing began, the samples were conditioned for 48 hours at 23°C and 52% relative humidity.

[Image]

Fig. 1 Appearance of one of the samples of Liquid Rubber roofing material made by LAFARGE NORTH AMERICA (Canada) before and after testing to determine the ignitability class per DSTU Б B.1.1-2-97 (GOST 30402-96).

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1.3 TESTING EQUIPMENT AND MEASURING INSTRUMENTS:

Measurements were done using the UZM-1 unit per DSTU Б B.1.1-2-97 (Certificate No. 355 valid until June 2005) and the measuring instruments listed in Table 2.

Table 2 – Measuring instruments

No.	Instrument Name	Mfg. No.	Measuring range	Precision class or instrument error	Next inspection date
1.	Thermocouples TXA	-	From 0 to 334°C; From 334 to 1350°C	$\pm 2.5^{\circ}\text{C}$ $\pm 0.0075 \times T_{\text{meas}}$	09.2004
2.	Stop-watch Agate SOS pr. 26-2-000	7107	From 0 to 3600 sec	Precision Class 2 ± 0.4 sec per 60 sec ± 1.9 sec per 3600 sec	03.2005
3.	Measuring ruler	-	From 0 to 1000 mm	± 1.0 mm	01.2005
4.	Adjustable trammels IIIU-1	859758	From 0 to 125 mm	Precision Class 2; ± 0.1 mm	03.2005
5.	Aspiration Psychrometer MB-4M	14689	From -10 to 50°C ; From 10% to 100%	$\pm 0.2^{\circ}\text{C}$ $\pm 4\%$	02.2005
6.	Aneroid Barometer M67	909	From 600 to 800 mm Hg	± 1 mm Hg	02.2005

1.4 TEST RESULTS:

Testing date:

July 22, 2004

Conditions on the premises:

Temperature 22°C
Atmospheric pressure 750 mm Hg
Relative humidity 62%

The results of tests to determine the ignitability class of samples of Liquid Rubber roofing material made by LAFARGE NORTH AMERICA (Canada) are shown in Table 3.

Table 3 – Results of tests to determine the ignitability class of samples of Liquid Rubber roofing material made by LAFARGE NORTH AMERICA (Canada).

Sample No.	Value of SDHC affecting the sample, kWt/m^2	Time to sample ignition from start of test, sec
1.	25	None
2.	25	None
3.	25	None
4.	30	142
5.	30	130
6.	30	148
7.	35	65
8.	35	62
9.	35	68

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2. Certification testing to determine the combustibility class (per DSTU Б B.2.7-19-95 (GOST 30244-94)) of samples of Liquid Rubber roofing material made by LAFARGE NORTH AMERICA (Canada).

2.1 TESTING METHOD:

The method of testing to determine the combustibility class of combustible building materials per DSTU Б B.2.7-19-95 (GOST 30244-94), "Building Materials. Combustibility Testing Methods", involves determining the parameters of three groups of four samples each of the tested material. During testing, four samples fixed in a special holder and simultaneously introduced into the combustion chamber are exposed for 10 minutes to a flame from an ignition source with preset parameters (fixed gas and air consumption rate). The following parameters are set for each test:

- temperature of combustion gases
- duration of self-maintained combustion
- length of damaged sections on samples
- sample weight before and after testing.

Based on the test results, the building materials are divided into four combustibility groups depending on the material combustibility parameter values, as indicated in Table 4.

Table 4. Classification of combustible building materials per DSTU Б B.2.7-19-95 (GOST 30244-94)

Materials Combustibility Class	Combustibility parameters			
	Temperature of combustion gas— T, °C	Degree of damage by length, S _l , %	Degree of damage by weight, S _m , %	Duration of self-maintained combustion
C 1	≤ 135	≤ 65	≤ 20	0
C 2	≤ 235	≤ 85	≤ 50	≤ 30
C 3	≤ 450	> 85	≤ 50	≤ 300
C 4	> 450	> 85	> 50	> 300

Note: For combustibility Classes C1-C3 materials, it is not acceptable to have molten drops forming, which burn during tests.

2.2 SAMPLES FOR TESTING:

Tests were performed on 12 identical samples of Liquid Rubber roofing material made by LAFARGE NORTH AMERICA (Canada), black in color, dimensions 1000 mm x 190 mm, which was applied to asbestos cement sheets 1000 mm x 190 mm, 10 mm thick. Average layer thickness of the material subjected to testing was 4 mm.

The client did not provide either the physical and chemical composition or component percentages in the Liquid Rubber roofing material made by LAFARGE NORTH AMERICA (Canada).

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The appearance of samples of the Liquid Rubber roofing material made by LAFARGE NORTH AMERICA (Canada) before the beginning of tests to determine the combustibility class is shown in Fig. 2.

Testing samples were provided by the client on July 15, 2004. Before the testing began, the samples were conditioned for 48 hours at 23°C.

[Image]

Fig. 2 Appearance of samples of the Liquid Rubber roofing material made by LAFARGE NORTH AMERICA (Canada) before the beginning of tests to determine the combustibility class per DSTU Б B.2.7-19-95 (GOST 30244-94).

2.3 TEST EQUIPMENT AND MEASURING INSTRUMENTS:

Measurements were done using the UVGBM-1 unit per DSTU Б B. 2.7-19-95 (Certificate No. 313 valid until August 2004) and the measuring instruments listed in Table 5.

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Table 5 – Measuring instruments

No.	Instrument Name	Mfg. No.	Measuring range	Precision class or instrument error	Next inspection date
1.	IBC Thermocont	-	From 0 to 1200°C	± 0.35%	07.2005
2.	Thermocouples TXA	-	From 0 to 334°C; From 334 to 1350°C	± 2.5°C ± 0.0075 x T _{meas}	09.2004
3.	Stop-watch Agate SOS pr. 26-2-000	7107	From 0 to 3600 sec	Precision Class 2 ± 0.4 sec per 60 sec ± 1.9 sec per 3600 sec	03.2005
4.	Measuring ruler	-	From 0 to 1000 mm	± 1.0 mm	01.2005
5.	Adjustable trammels IIIQ-1	859758	From 0 to 125 mm	Precision Class 2; ± 0.1 mm	03.2005
6.	Scales PH-10Q13V	18876	From 100 g to 10 kg	± 0.005 kg from 100 g to 2.5 kg ± 0.0075 kg from 2.5 kg to 10 kg	04.2005
7.	Aspiration Psychrometer MB-4M	14689	From -10 to 50°C; From 10% to 100%	± 0.2°C ± 4%	02.2005
8.	Aneroid Barometer M67	909	From 600 to 800 mm Hg	± 1 mm Hg	02.2005

2.4 TEST RESULTS:

Testing date:

July 23, 2004

Conditions on the premises:

Temperature 23 °C
Atmospheric pressure 747 mm Hg
Relative humidity 60%

The results of tests performed on samples of the Liquid Rubber roofing material made by LAFARGE NORTH AMERICA (Canada) are shown in Table 6.

While testing samples of the Liquid Rubber roofing material made by LAFARGE NORTH AMERICA (Canada), the roofing material ignited within the first minute of testing, forming molten drops that burned and fell off during tests. Pursuant to p. 5.3, DSTU Б B.2.7-19-95 (GOST 30244-94), the testing was discontinued.

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Table 6 – Results of tests performed on samples of the Liquid Rubber roofing material made by LAFARGE NORTH AMERICA (Canada).

Test No.	Test sample Nos.	Initial temperature in the unit	Maximum temperature of combustion gases	Arithmetic mean of max. temp. of combustion gases	Sample damage length	Arithmetic mean of sample damage by length	Degree of damage to samples by length	Sample weight, with base, before testing	Sample weight, with base, after testing	Arithmetic mean of sample damage by weight	Degree of damage to samples by weight	Duration of self-maintained combustion of samples	
		T _i , °C	T _c , °C	T _{comp} , °C	L _d , mm	ΔL _{comp} , mm	S _L , %	m ₁ , g	m ₂ , g	Δm _{comp} , g	S _m , %	T, sec	
1	1	22.0	88	91				4125					
	2	22.4	92						4135				
	3	23.0	95						4010				
	4	21.8	90						3950				
2	5	22.2	94	95				3670					
	6	23.1	98						3810				
	7	23.0	93						3830				
	8	22.8	94						3805				
3	9	23.2	91	94				3900					
	10	23.1	95						3850				
	11	23.4	96						3790				
	12	22.9	92						3910				
Arithmetic mean values for three tests				93									

Note: The testing was discontinued during the 1st minute from the start of tests because of the ignition of the roofing material with formation of molten drops that burned and fell off. Due to the need to extinguish the flame, the weight, length of damage and duration of self-maintained combustion of samples were not measured after the test.

The maximum permissible error in the measurement of the initial temperature within the unit is ± 2.6 °C

The maximum permissible error in the measurement of the temperature of combustion gases is ± 2.7 °C

The maximum permissible error in the measurement of sample weight is = 0.0075 kg

3. Certification testing to determine the flame propagation class (per DSTU Б B.2.7-70-98 (GOST 30444-97)) of samples of Liquid Rubber roofing material made by LAFARGE NORTH AMERICA (Canada).

3.1 TESTING METHOD:

The method of testing to determine the flame propagation class of combustible building materials per DSTU Б B.2.7-70-98 (GOST 30444-97), "Building Materials. Flame Propagation Testing Methods", involves determining the critical surface density of heat current (CSDHC), which is determined by the extent of flame propagation lengthwise along the sample as a result of its exposure to a heat current and ignition source.

At the outset of each of five tests, a horizontally positioned sample was exposed for 120 seconds to a heat current from a radiant panel set at a 30° angle to the sample. After that, a gas burner with a flame of a specified size is brought to point zero located along the central axis of the sample. The burner is left in that position for 600 sec ±12 sec and then it is turned off. If the sample does not ignite during the 600 seconds following the initial exposure to gas burner flame, the test is deemed completed. In the event that the sample does ignite, the test is ended once the flame stops burning or is forcibly extinguished after 1,800 seconds from the moment of exposure to the gas burner.

During the test, the time to ignition and duration of flame combustion are recorded. At the end of testing, the length of the damaged section of the sample is measured along its central axis for each of the 5 samples and then the arithmetic mean of the length of the damaged section is determined.

The value of CSDHC is determined according to the results of flame propagation length measurements based on the SDHC distribution pattern on the sample surface obtained during the unit calibration procedure. If the sample does not ignite or the flame propagation length is under 100 mm, the CSDHC of the material should be understood to exceed 11 kWt/m². In the event that the sample needs to be forcibly extinguished, the SDHC is determined by the results of flame propagation length measurements at the moment of extinguishment and this value is then conventionally assumed to be equal to the critical value.

Based on test results, combustible building materials are divided into four flame propagation classes – RP 1, RP 2, RP 3, RP 4 – as shown in Table 7.

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Table 7 – Classification of combustible roofing materials according to flame propagation class.

Flame propagation class	Critical surface density of the heat current kWt/m ²	Flame propagation length according to SDHC distribution pattern, L, mm
RP 1	11.0 and higher	From 0 to 100
RP 2	Over 8.0 but under 11.0	From 100 to 257
RP 3	Over 5.0 but under 8.0	From 257 to 410
RP 4	Under 5.0	From 410 to 900

3.2 SAMPLES FOR TESTING:

Tests were performed on five samples of the Liquid Rubber roofing material made by LAFARGE NORTH AMERICA (Canada), black in color, dimensions 100 mm x 250 mm, which were applied to asbestos cement sheets 1100 mm x 250 mm, 10 mm thick. Average layer thickness of the material subjected to testing was 4 mm.

The client did not provide either the physical and chemical composition or component percentages in the Liquid Rubber roofing material made by LAFARGE NORTH AMERICA (Canada).

Testing samples were provided by the client on July 15, 2004. Before the testing began, the samples were conditioned for 72 hours at 23°C and 60% relative humidity..

3.3 TEST EQUIPMENT AND MEASURING INSTRUMENTS:

Measurements were done using the UVPP-1 unit per DSTU Б B. 2.7-19-95 (Certificate No. 362 valid until September 2005) and the measuring instruments listed in Table 8.

Table 8 – Measuring instruments

No.	Instrument Name	Mfg. No.	Measuring range	Precision class or instrument error	Next inspection date
1.	IBC Thermocont	-	From 0 to 1200°C	± 0.35%	07.2005
2.	Stop-watch Agate SOS pr. 26-2-000	7107	From 0 to 3600 sec	Precision Class 2 ± 0.4 sec per 60 sec ± 1.9 sec per 3600 sec	03.2005
3.	Thermocouples TXA	-	From 0 to 334°C; From 334 to 1350°C	± 2.5°C ± 0.0075 x T _{meas}	09.2004
4.	Adjustable trammels	859758	From 0 to 125 mm	Precision Class 2; ± 0.1 mm	03.2005
5.	Measuring ruler	-	From 0 to 1000 mm	± 1 mm	01.2005
6.	Aspiration Psychrometer MB-4M	14689	From -10 to 50°C; From 10% to 100%	± 0.2°C ± 4%	02.2005
7.	Aneroid Barometer M67	909	From 600 to 800 mm Hg	± 1 mm Hg	02.2005
8.					

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Testing date:

July 23, 2004

Conditions on the premises:

Temperature 23 °C
 Atmospheric pressure 747 mm Hg
 Relative humidity 60%

The results of tests performed on samples of the Liquid Rubber roofing material made by LAFARGE NORTH AMERICA (Canada) to determine the flame propagation class (per DSTU B B.2.7-70-98 (GOST 30444-97)) are shown in Table 9.

The appearance of a sample of the Liquid Rubber roofing material made by LAFARGE NORTH AMERICA (Canada) before testing and samples of the same material that produced the best and the worst results after the test are shown in Fig. 2.

Table 9. Results of tests performed on samples of the Liquid Rubber roofing material made by LAFARGE NORTH AMERICA (Canada) to determine the flame propagation class

Sample No.	Time to sample ignition τ_i , sec	Duration of flame combustion, τ_{comb} , sec	Length of damaged section of sample, L, mm	Arithmetic mean of damaged section length L_{mean} , mm	Critical surface density of heat current, kWt/m^2
1.	15	270	68	150	Over 8.0 but under 11.0
2.	18	555	270		
3.	16	260	45		
4.	14	425	315		
5.	12	280	50		

Maximum errors in time measurement was ± 0.85 sec

Maximum error in measuring the damaged section length of the sample was ± 4 mm.

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[Image]

Fig. 2 Appearance of a sample of the Liquid Rubber roofing material made by LAFARGE NORTH AMERICA (Canada) before testing and samples of the same material that produced the best and the worst results after the test to determine the flame propagation class per DSTU Б B.2.7-70-98 (GOST 30444-97).

FINDINGS:

Based on the results of certification testing, the following has been determined:

1. According to p. 5.1, DSTU Б B.1.1-2-97 (GOST 30402-96), samples of the Liquid Rubber roofing material made by LAFARGE NORTH AMERICA (Canada), black in color, dimensions 165 mm x 165 mm, which was applied to asbestos cement sheets 165 mm x 165 mm, 10 mm thick, with an average material layer thickness of 4 mm, are classified as Ignitability Class B 2 materials (CSDHC of 20 kWt/m² or more, but not more than 35 kWt/m²).

2. According to p. 5.3, DSTU Б B.2.7-19-95 (GOST 30244-94), samples of the Liquid Rubber roofing material made by LAFARGE NORTH AMERICA (Canada), black in color, dimensions 1000 mm x 190 mm, which was applied to asbestos cement sheets 1000 mm x 190 mm, 10 mm thick, with an average material layer thickness of 4 mm, are classified as Combustibility Class C 4 materials.

3. According to p. 5.1, DSTU Б B.2.7-70-98 (GOST 30444-97), samples of the Liquid Rubber roofing material made by LAFARGE NORTH AMERICA (Canada), black in color, dimensions 1100 mm x 250 mm, which was applied to asbestos cement sheets 1100 mm x 250 mm, 10 mm thick, with an average material layer thickness of 4 mm, are classified as Flame Propagation Class RP 2 materials (critical surface density of heat current over 8.0 kWt/m² but under 11.0 kWt/m²).

NOTE:

1. Report No. 310/1Ц-2004 refers only to tested samples of the Liquid Rubber roofing material made by LAFARGE NORTH AMERICA (Canada), which were provided by "Market-Zbut" TOV (Ternopil).

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Within the meaning of Section 26 of Law No. 90/1998 of the Law Index concerning construction products, in the wording of later amendments.

Business Product Name	Liquid Rubber
Product Type	
Manufacturer	Lafarge North America Lafarge Asphalt Engineering 16-2283 Argentia Rd. Mississauga, Ontario L5N 5Z2 Canada
Place of Manufacture	Lafarge Asphalt Engineering Division of Lafarge Materials & Construction Inc. 16-2283 Argentia Rd. Mississauga, Ontario L5N 5Z2 Canada
Type and Use of the Construction Product	Liquid Rubber is used for hydro-insulation and protection of surfaces, foundations and basement walls, and in spaces between construction panels