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Mass Loss and Heat Resistance during Heating of "Hydroizol-K" Waterproofing Material

Khamidov Basit Nabievich
Professor of the Institute of General and Inorganic Chemistry of the Academy of Sciences of the Republic of Uzbekistan

Kodirov Sarvar Azamatovich
Independent researcher of the Institute of General and Inorganic Chemistry of the Academy of Sciences of the Republic of Uzbekistan

Abstract:

Heat resistance of Hydroisol-K waterproofing material used as a pillow for the foundations of buildings and structures in construction and mass loss during heating of waterproofing material have been determined. When heating hydroisol-K waterproofing material with a thickness of 5 mm, it was found necessary to recommend its production, since its length increased by a minimum of 19.4% and the cost of mass loss was 2.42%.

Keywords: Waterproofing, length of waterproofing material, mass loss of waterproofing material, building and structure, heat resistance.

Introduction. It is known that one of the most common and aggressive factors affecting all construction sites in the world is water and air temperature. It helps to reduce the strength properties of many building materials, the development of corrosion processes in metal and concrete, the rotting of wood, the appearance of cracks, mold and moisture, and the destruction of protective layers of structures. Therefore, it is necessary to ensure waterproofing, that is, to protect structures during construction. There are other measures that help to quickly remove water or protect it from absorption, for example, great attention is paid to work such as polishing the surface of construction parts, polishing, forming a protective layer [1-3].

To date, the quality indicators of waterproofing materials mainly depend on its composition. The basis of the material plays an important role, and it is, of course, construction bitumen. BN 90/10 construction bitumen and its compositions are used as waterproofing coating. To obtain high-quality waterproofing material Hydroisol-K, we have developed a new BN 90/10 + 3K construction

bitumen composition based on oil slurry, gossypol resin and lime. Samples of waterproofing materials were taken based on the new BN 90/10+3K construction bitumen composition and tested according to the following methods [4-6].

Research methods. The sample was made in three samples with dimensions (100±1)x(50±1) mm, cut horizontally using test instruments.

Test preparation. The sample of the material is weighed (m_3), the initial length (L_1) is measured with an error of no more than 2 mm and hangs in a vertical position (the sample of the base material must be mounted on wood along the entire width of the clamp) should be at least 50 mm from the walls of the cabinet. The furnace is heated to the temperature specified in the standards or specifications for the material being tested.

Testing. Samples are stored in the oven at a certain temperature for the time specified in the standards or specifications for the material being tested. The samples are then removed from the cabinet, cooled to a temperature of K /(20±2) ± S in the excicator (293°2), measured in length (L_1) and weighed (m_2).

Research results and discussion. It was determined that the waterproofing material of Hydroizol-K, which is used as a pillow for the foundations of buildings and structures in construction, has heat resistance and mass loss during the heating of the waterproofing material.

1- Increase in material length during heating of waterproofing material:

If no changes occur on the surface of the material during a certain period of time, that is, swellings on the surface of the sample, displacement of the packing layer and stretching above the norm are not observed, then the material is considered to have been tested.

The increase in length (ΔL) was calculated as a percentage of 0.1% according to the following formula:

$\Delta L = \frac{L_1 - L_3}{L_3} \cdot 100\%$, (1);

here L_1- sample length after testing, mm;

L_3- sample length before testing, mm.

Hydroisol-K with a thickness of 3mm, 5mm and 10mm, when heating samples of waterproofing material, its length increased according to formula 1 as follows:

1. When the hydroisol-K waterproofing material sample is 3mm thick:

$$\Delta L = \frac{L_1 - L_3}{L_3} \cdot 100\% = \frac{121{,}5 - 100}{100} \cdot 100 = 21{,}5\%$$

2. When the hydroisol-K waterproofing material sample is 5mm thick:

$$\Delta L = \frac{L_1 - L_3}{L_3} \cdot 100\% = \frac{119{,}4 - 100}{100} \cdot 100 = 19{,}4\%$$

3. When the hydroisol-K waterproofing material sample is 10mm thick:

$$\Delta L = \frac{L_1 - L_3}{L_3} \cdot 100\% = \frac{132{,}2 - 100}{100} \cdot 100 = 32{,}2\%$$

Indicators of the value of increasing the length when heating the material were included in Table 1.

From the results presented in Table 1 and Figure 1, it can be analyzed as follows: When heating a 3mm thick hydroisol-K sample, it has a good indicator compared to the Hydrostecloisol material,

that is, the value of increasing the length of the material sample during heating is 21.5 % it was found that it increased.

Table 1. Results of the value of increasing the length when heating waterproofing material samples

Indicator name	Experiments			Requirements for waterproofing material	
	The thickness of the 1-sample is 3mm	The thickness of the 2nd sample is 5mm	The thickness of the 3rd sample is 10mm	Hydrostec-loisol TSh 400-1-51-83	Filizol TSh 400-1-409-5-92
1	2	3	4	6	7
Increased length when heating the material (ΔL), %: L_1- sample length after testing, mm; L_3- sample length before testing, mm.	21,5 121,5 100	19,4 119,4 100	32,2 132,2 100	≤ 30	≤ 20

Similarly, when heating a 5mm thick hydroisol-K sample, when calculating the value of increasing the length, it has a good indicator compared to Hydrostecloisol and Filizol materials, that is, the value of increasing the length of the material sample during the heating process has increased by 19.4%.

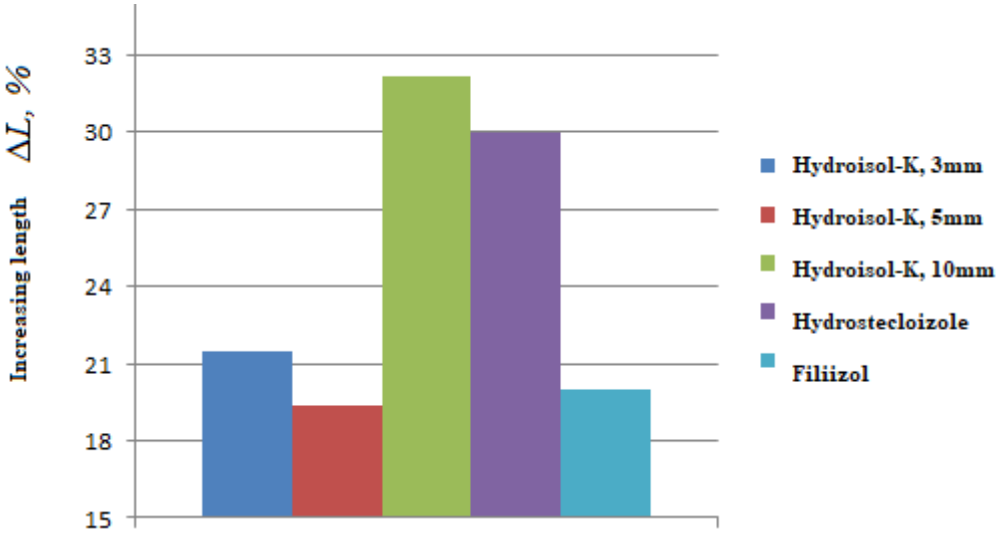

Figure 1. Hydrostecloisol, Filizol and Hydroisol-K waterproofing material samples (ΔL) with a thickness of 3mm, 5mm, 10mm are increasing in length

When heating a 10mm thick hydroisol-K sample, when calculating the value of increasing the length, it has a bad indicator compared to Hydrostecloisol and Filizol materials, that is, the value of increasing the length of the material sample during the heating process has increased by 32.2%.

When analyzing the value of increasing their length compared to samples of hydrostecloisol, Filizol and 3 hydroisol-K waterproofing materials, the second sample, i.e. Hydroisol-K, when the thickness of the material is 5 mm, the value of increasing the length compared to samples with a thickness of 3 mm and 10 mm gave a much better indicator, and gave a good indicator than the standard requirements for hydrostecloisol and Filizol materials. Because the value of increasing the length of the 5mm thick Hydroisol-K sample is 2.1% less elongated than the 3mm thick Hydroisol-K sample, the length of the 10mm thick Hydroisol-K sample is increasing and the value of increasing the thickness is shown in Figure 1 that Hydroisol-K with a thickness of 5mm is 12.8% longer than the sample.

2- Mass loss during heating of waterproofing material:

Mass loss (Q) is calculated in percentages with an accuracy of 0.1% according to the following formula:

$Q = \frac{m_1 - m_2}{m_1} \cdot 100\%$, (2);

here m_2 is the mass of the sample after the test, g;

m_1- the mass of the sample before the test, g.

When heating samples of waterproofing material with a thickness of 3mm, 5mm and 10mm, the mass loss value is calculated according to formula 2 as follows:

1. When the hydroisol-K waterproofing material sample is 3mm thick:

$$Q = \frac{m_1 - m_2}{m_1} \cdot 100\% = \frac{310{,}09 - 298{,}15}{310{,}09} \cdot 100 = 3{,}85\%$$

2. When the hydroisol-K waterproofing material sample is 5mm thick:

$$Q = \frac{m_1 - m_2}{m_1} \cdot 100\% = \frac{410{,}08 - 400{,}14}{410{,}08} \cdot 100 = 2{,}42\%$$

3. When the hydroisol-K waterproofing material sample is 10mm thick:

$$Q = \frac{m_1 - m_2}{m_1} \cdot 100\% = \frac{810{,}11 - 769{,}27}{810{,}11} \cdot 100 = 5{,}04\%$$

Indicators of the value of mass loss when heating the material are included in Table 2.

From the results presented in Table 2 and Figure 2, it can be analyzed as follows: When heating a 3mm thick hydroisol-K sample, when calculating the mass loss value, it has a good indicator compared to Hydrostecloisol and Filizol material, that is, the mass loss of the material sample during heating it was found that the value decreased by 3.85%.

Similarly, when calculating the mass loss value when heating a 5mm thick hydroisol-K sample, it has a good performance compared to Hydrostecloisol and Filizol materials, that is, the mass loss value of the material sample during heating has decreased by 2.42%.

Table 2. Results of mass loss value when waterproofing material heats samples

Indicator name	Experiments			Requirements for waterproofing material	
	The	The	The	Hydrostec-	Filizol TSh

	thickness of the 1-sample is 3mm	thickness of the 2nd sample is 5mm	thickness of the 3rd sample is 10mm	loisol TSh 400-1-51-83	400-1-409-5-92
1	2	3	4	6	7
Mass loss when heating the material (Q), %: m_2- sample mass after testing, g; m_1- sample mass before testing, g.	3,85 298,15 310,09	2,42 400,14 410,08	5,04 769,27 810,11	≤ 6	≤ 4,5

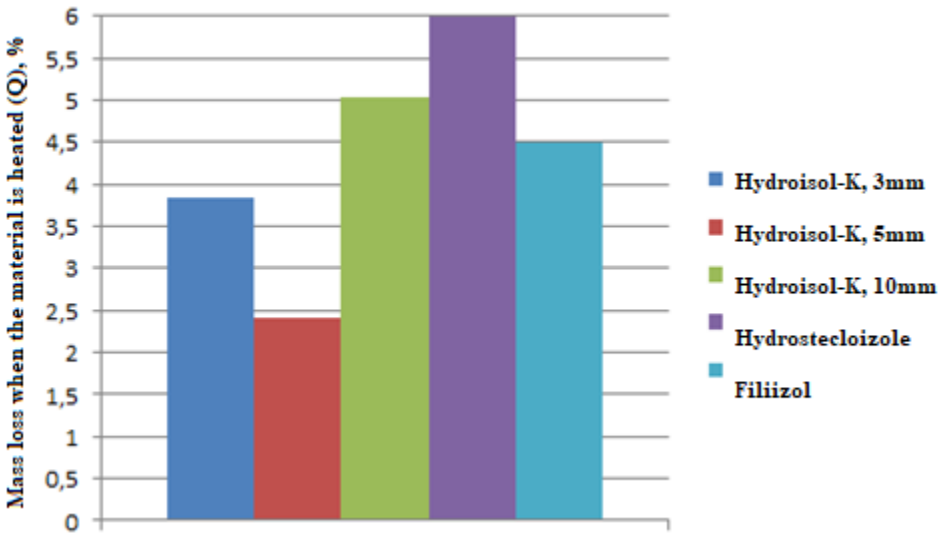

Figure 2. Mass loss graph of hydrostecloisole, Filizol and hydroisol-K waterproofing material samples (Q) with a thickness of 3mm, 5mm, 10mm

When calculating the mass loss value when heating a 10mm thick hydroisol-K sample, it has a good indicator compared to the Hydrostecloisol material, that is, the mass loss value of the material sample during heating has decreased by 5.04%.

When analyzing the value of their mass loss compared to samples of hydrostecloisole, Filizol and 3 hydroisol-K waterproofing materials, the second sample, i.e. Hydroisol-K, compared to samples with a mass loss value of 5 mm thick, thickness of 3 mm and 10 mm gave a much better indicator.

Conclusion. Based on the above analysis, it can be concluded as follows that one of the main requirements for the waterproofing material is the value of mass loss, and the experimental analyzes obtained in our laboratory showed that when heating the waterproofing material of Hydroisol-K with a thickness of 5 mm, it was found that it is necessary to recommend its production, since its length increase value has increased by at least 19.4% and the cost of mass loss is 2.42%.

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