TALLINN UNIVERSITY OF TECHNOLOGY
Department of Civil Engineering and Architecture
RESEARCH AND TESTING LABORATORY OF BUILDING MATERIALS
Accredited by the Estonian Accreditation Centre reg nr L004

Customer:
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Experimental Report N° 819A/25

Assignment: Testing of frost resistance of concrete dry mix specimens for 56 cycles with 3% NaCl solution.

Product designation: **UNINAKS Jootebetoon NAKS JC70, 08.03.25 liin 06**
Forwarded to the laboratory by customer on 20.05.2025, 50 kg.

Test method: EVS 814 Frost resistance of normal-weight concrete.
Definitions, specifications and test method

Concrete cubes with dimensions 150x150x150 mm were cast on 01.07.2025, w = 0.18. Cubes were hardened at (20±2) °C 24 h in mould and after that without mould in water at (20±2) °C.

From concrete cubes the test specimens with measures 50x150x150 mm were cut on 22.07.2025.

Test specimens were cut out perpendicular to upper suface of cube so that the upper surface of specimen during testing was cut from the centre of initial concrete cube. The specimens were numbered, weighed and measured. The results of measures and densities of specimens are presented in Table 1.

Up to the beginning of freeze-thaw test the specimens were cured at temperature +(20±2)°C and relative humidity (65±5) %. On the 3...5th day of curing around the specimens the rubber was glued so that its edge overlapped the edge of specimens and enabled to hold the cooling substance on the surface of specimens. Also the sides and bottoms were isolated with thermal insulating material. On the 7th day of curing to the test surfaces 3 mm layer of distillated water with temperature (20±2) °C was poured and remained for (72±2) h at temperature (20±2) °C.

15 min before the beginning of freeze-thaw test the distilled water was replaced with cooling substance – 3% NaCl solution layer with temperature (20±2) °C. To avoid the escape of cooling substance by evaporation, the specimens were covered with polyethylene foil. Freezing and thawing of concrete specimens took place in freezer in air according the regime required by standard. Hence the duration of one freezing-thawing cycle was 24 h.

After 7, 14, 28, 42 and 56 freeze-thaw cycles the quantity of crumbling material from the surface of the test specimens was determined. For that the crumbling material with cooling substance was poured to the vessel and the surface of specimens was cleaned with water. The crumbling material was separated from liquid by filtration, dried and weighed. Then the new quantity of cooling substance was poured on the surfaces for the next cycles.

After above mentioned cycles the mass loss of every specimen was determined and the total mass of crumbled material Σ M (g) and total mass loss from square unit – Σ S (kg/m²) were calculated. Mass change test results are given as mean of the 4 results.

The test results of mass loss during freeze-thaw resistance test up to 56 cycles are presented in Table 2.

Test results:

Table 1: Dimensions and densities of test specimens cut from dry mix concrete cubes marked as **„UNINAKS Jootebetoon NAKS JC70, 08.03.25 liin 06”** before freeze-thaw testing

Specimen designation	Dimensions of specimen, mm							Mass, g	Density, kg/m³	
	a	b	h_1	h_2	h_3	h_4	$h_{average}$		indi-vidual	average
NAKS JC70 - 1	151.0	143.0	50.3	49.5	48.8	49.3	49.5	2387	2230	2250
NAKS JC70 - 2	150.0	143.5	49.9	49.3	48.8	49.2	49.3	2393	2260	
NAKS JC70 - 3	150.0	143.5	50.8	49.5	49.6	50.0	50.0	2404	2230	
NAKS JC70 - 4	150.0	145.5	49.5	50.3	48.9	49.1	49.5	2444	2260	

Table 2: Mass change of dry mix concrete specimens marked as **„UNINAKS Jootebetoon NAKS JC70, 08.03.25 liin 06”** during the freeze-thaw testing

Freeze-thawing test was started on 01.08.2025.

Specimen designation	Dimensions, mm		A, cm²	Mass loss unit	Mass loss of specimen after				
					7	14	28	42	56
	a	b			freeze-thaw cycles				
NAKS JC70 1	151.0	143.0	215.9	Σ M, g	1.2	4.6	17.3	30.0	38,8
				Σ S, kg/m²	0.06	0.21	0.80	1.39	1,80
NAKS JC70 2	150.0	143.5	215.3	Σ M, g	1.0	5.3	21.5	45.0	56,0
				Σ S, kg/m²	0.05	0.25	1.00	2.09	2,60
NAKS JC70 3	150.0	143.5	215.3	Σ M, g	1.5	5.3	13.0	19.6	24,8
				Σ S, kg/m²	0.07	0.25	0.60	0.91	1,15
NAKS JC70 4	150.0	145.5	218.3	Σ M, g	1.7	4.3	9.0	12.4	15,9
				Σ S, kg/m²	0.08	0.20	0.41	0.57	0,73
Mean				Σ M, g	1,4	4,9	15.2	26.8	33.9
				Σ S. kg/m²	0,07	0.23	0.70	1.24	1.57

The average mass loss of dry mix concrete specimens, cut out from concrete cubes, marked as **„UNINAKS Jootebetoon NAKS JC70, 08.03.25 liin 06”**, forwarded to the laboratory on 20.05.2025, and tested according to standard EVS 814 with 3% NaCl solution, was after 28 freeze-thawing cycles 0.70 kg/m² and after 56 freeze-thawing cycles 1.57 kg/m².

Test results are valid to the described test samples only.

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