

## Water-dispersive film-forming solutions (VPS-D)

### for concrete curing

Water-dispersive film-forming solutions (VPS-D) based on paraffins are developed by VNIIZHELEZOBETON (All-Russian research institute of reinforced concrete) and SOYUSDORNII (Union road research institute), together with AO "CENTRODORSTROY", NIIZHB (Research institute of reinforced concrete), "AEROPROJECT", AO "MOSTOZHELEZOBETONCONSTRUCTION" and other organizations. Being used at temperatures above +3°C, they form colorless or snowy steam-tight covering during 1-8 hours. If properly used, they comply with American (ATSM C156, ASTM C309) and British (BS 81 10, BS 7542) standards requirements. Scientific and technological department of the "TRANSSTROY" corporation recommends them for wide application.

### Destination

- Curing of cast-in-place concrete of highways and aerodromes, coating of canals, tunnels, bridges and building constructions.
- Dehydration protection of precast concrete at thermal treatment, heating-free concrete hardening and after steaming.
- Production of frost and salt resistant (P>600) precast road constructions and corrosion-resistant reinforced concrete pipes.

### Method of application

- To be dispersed on newly placed concrete after finishing of its surface.
- To be applied by dispersion or by a roller or a brush on hardening concrete right after form removal.
- To be applied on exposed surface of steamed concrete right after product removing from chamber.
- Suggested consumption (P) is 400-500 g/m<sup>2</sup> taking into account amount of non-volatile matter (Mnv) in solutions and concrete hardening conditions.

### Advantages

- Ready to use clear antifoaming liquids with relative viscosity from 15 up to 30°C.
- Ecologically clean (Certificate of research institute of hygiene named after F.F. Erisman), nonflammable, explosion-proof.
- Reduce water losses (AW) of protected concrete up to 0.001-0.051 g/sm<sup>2</sup> at permissible water losses less than 0.055 g/ sm<sup>2</sup>.
- Prevent evaporation cooling of concrete, hydrophobizate and mud its surface. Create favorable conditions for cement hydration even in the surface layer of concrete and prevent cracks formation.
- Provide concrete durability and frost-resistance design indexes; reduce its water absorption (Wn), permeability and shrinkage.
- Comparative indexes of concrete after 450 cycles of frost-resistance tests according to the second method of GOST (State Standard) 10060.2-95 (see the table).

Provide saving of energy resources and cement, reduction of concrete thermal treatment.

Composition	Mnv%	P g/m <sup>2</sup>	ΔW g/ sm <sup>2</sup> .	Wn mass.%	Δ m* %
VPS-D	35	200	0.012	0.8	-

VPS-D	35	300	0.005	0.5	+0.3
VPS-D	25	300	0.030	1.0	+0.2
VPS-D	15	500	0.051	1.6	-
Pomarol (Lithuania)	30	300	0.039	3.2	+0.5
Concur (Ireland)	32	300	0.027	2.8	-5.1
Concrete without curing	-	-	0.290	3.9	destroyed

#### **Modification of water-dispersive film-forming solutions (VPS-D)**

1. VPS-D (summer formula, storing temperature from + 5°C, usage temperature from + 5°C)
2. VPS-D (winter formula, storing temperature from - 5°C, usage temperature from + 5°C)
3. VPS-D for horizontal surfaces
4. VPS-D for vertical surfaces

#### **Storing**

Warranty storage time in closed pack is 1 year. Summer formulas must not be frozen.

#### **VPS-D was used in construction and reconstruction of**

Landing strips in the following airports: Domodedovo, Sheremetyevo, Pulkovo, Borispol (kiev), Koltsovo (Ekaterinburg), Chelyabinsk, Bratsk, Sochi, Syktyvkar, Nikolaevsk-on-Amur, Elista, Kubinka, Mineralnye Vody, Novosibirsk, Iraq, Ulan-Ude, Hotilovo.

Highways in Sochi, MKAD-Kashira, MKAD, bridges in Voronezh, Rostov-on-Don, Moscow, Lipetsk, dock container platforms in Saint-Petersburg, engineering reinforced concrete construction in "Moscow- City".

**AT AIR-DRY, CONDUCTIVE (IN THERMOFORMS), ELECTROINDUCTIONAL, ELECTRO- AND HELIOTHERMAL TREATMENT OF PRECAST REINFORCED CONCRETE (see Concrete and reinforced concrete. 1998 #2, p.10)**

**VPS-D QUALITY WARRANTIES** [Mnv 15...25%) are produced in pilot lots according to Technical Conditions 21-33-119-92 an 2241-166-00284807-96 with certification tests of each lot.

#### **Delivery**

Delivery is performed by motor and railroad transport in cisterns and barrels.

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#### **Curing of cement concrete pavement of roads and aerodromes**

Curing of newly placed concrete with film-forming VPS-D solution must be started right after finishing of its surface and be continued until design durability is reached.

Film-forming VPS-D solution is applied on wet surface of newly placed concrete at concrete temperature from +3 up to +35°C.

**Comment.** Increase of the time interval between finishing of concreting and application of film-forming solution leads to plastic shrinkage that breaks concrete structure and spoils its main physical and mechanical properties and causes early concrete cracking, especially in dry hot weather (>25°C). That is why time interval between finishing of cement concrete pavement concreting and application of film-forming solution VPS-D must be minimal.

**Film-forming VPS-D solution must be applied at newly placed concrete by means of mechanized method:**

- At construction by machines with sliding shuttering - by multiple-jet distributors;
- At construction by track-riding concrete-placing machine - by distribution machines.

Slot-type nozzles must be used for even distribution of film-forming solution.

Suggested optimal VPS-D consumption is 400-500 g/m<sup>2</sup>. Consumption of more than 600 g/m<sup>2</sup> is inadmissible.

Resistant to atmospheric impact water retention film of VPS-D solution is formed on concrete surface within several hours after application depending on air temperature and humidity. Film resistant to mechanical impact is created during several days depending on weather conditions and product consumption. The foregoing must be taken into account when opening construction transportation.

While working with VPS-D special attention must be paid to the quality of artificial coarse finishing of cement concrete pavement.

VPS-D solution must be stirred at regular intervals, and it is necessary to stir it before usage. Stirring is done by bubbling, by mechanical rolling of barrels or by other means. It is recommended to deliver material in barrels that will ease the following activities (storing, stirring and other).

- Application of film-forming VPS-D solution on the newly placed concrete must be performed at one passage of distribution machine.
- VPS-D solution must not be applied on concrete with water on its surface.

Water can be removed from newly placed concrete by water-absorbing carton, cloth or other.