Plastifloor® KH motar 050/051T
Test report

PLASTI CHEMIE GMBH

Characteristics of the mortar:

Plastifloor® 050/051T is a high-quality acrylic resin-based mortar system for bonding precast concrete parts and elements, even at low temperatures. The mortar is used in layer thicknesses of 5 to 10 mm or as a repair mortar. Plastifloor® 050/051 is a 2-component mortar based on methyl acrylate resin, which contains the necessary fillers and hardeners. Plastifloor® 050/051 mortar can be processed down to -30 °C if accelerator B 101 is added and is mechanically and chemically fully loadable after just 1 to 3 hours.

Preliminary notes:

The epoxy resin mortars normally used for the installation of precast concrete elements for horizontal joints can only be used at plus temperatures up to 0 °C. Below 0 °C, the reaction is no longer reliable. No reliable reaction takes place below 0 °C. In order to be able to install - 30°C, mortar with a different binder system is required. Due to the required strengths, only synthetic resin mortars are suitable. Below 0 °C, on the other hand, only methyl acrylate resin mortars that harden reliably down to - 30 °C can be considered. The aim of this study was to find out whether the material Plastifloor 050/051 from Plasti-Chemie International GmbH, Plauen, is suitable for this application.

Scope and implementation of the test

The following mixing ratio was selected for the tests: 2,000 g Plastifloor 050 powder component T, 500 g Plastifloor 051 liquid component, 4 ml accelerator B 101. The further tests were to consist of determining the flexural tensile and compressive strength of mortar prisms 160 x 40 x 40 mm³. In addition, the material was to be tested in its later form as a joint material. For this purpose, an approx. 3 - 4 mm thick joint was made from the material between two concrete cylinders that had been sawn open. The concrete cylinders (Ø 150 mm, h =300 mm) were produced on 09.11.09 using a C60/75 mix from the concrete factory. After stripping the formwork after 1 day, two cylinders were sawn off at the top of the filling area to remove any unevenness. Two further cylinders were sawn through at half their height (approx. 150 mm) so that two equally high sections were created. All cylinders and cylinder parts were then stored in a water bath until the seventh day after production. After drying, they were then leveled with a PMMA on the sawn-off surfaces to create plane-parallel printing surfaces. After the adjustment layer had hardened, all cylinders and cylinder parts were stored in a freezer at - 16 °C for two days until the ninth day after production. All tools (trowel, Kaufmann shovel, agitator, bucket, tamper), the prism mold and the material (powder component, liquid component, accelerator) were also stored in the freezer. The grout was mixed on the ninth day after the concrete cylinders were produced. All components and tools were removed from the freezer to mix the material.

Plasti Chemie International GmbH
Klopstockstraße 19
D – 08525 Plauen / Germany
Telefon: +49 (0) 37 41/55 83-0
Telefax: +49 (0) 37 41/55 83-27
Email: info@plasti-chemie.de
Internet: www.plasti-chemie-international.de
freecall: +49 (0) 800/100 71 51

The concrete cylinders and cylinder parts, as well as the prism mold, remained in the freezer. Weighing and mixing took about 10 minutes. First, the prism mold was filled with the very soft material and slightly compacted. Then the lower part of each cylinder half was placed in two corners of the freezer. An approx. 10 mm thick layer of mortar was applied to the surface and the second half of the cylinder was placed on top. The upper half of the cylinder was pressed into the corner of the freezer and guided downwards, ensuring a perpendicular connection between the cylinder parts. The upper half was pressed onto the lower half until an approx. 3 - 4 mm thick joint was created. Temperature sensors were inserted into the joints and the prism in order to measure the temperature development and derive the processing times. The air temperature was also measured. The temperatures were measured every 2 minutes. After 24 h (tenth day after production of the concrete cylinders), the prisms were tested for flexural and compressive strength and the concrete cylinders with and without joints were tested for compressive strength (photos 1 -3).

Test results

The results of the bending tensile and compressive strength tests of the prisms can be seen in Tables 1 and 2:

Prism	Length (mm)	Width (mm)	Height (mm)	Weight (g)	Density (kg/dm³)	Bending tensile breaking load F1 (kN)	Flexural strength Rf (MPa)
1	159,9	39,7	39,7	478,6	1,899	9,53	22,85
2	159,9	39,7	40,6	480,5	1,864	9,60	21,52
3	159,9	39,6	39,7	481,4	1,916	10,92	26,18
				Mittel	**1,893**		**23,52**

Table 1: Results of the bending tensile tests

Prism	Breaking load Fc (kN)	Compressive strength Rc (MPa)
1a	140,4	87,8
1b	147,5	92,2
2a	144,9	90,6
2b	141,5	88,4
3a	149,5	93,4
3b	149,0	93,1
	Mittel	**90,9**

Table 2: Results of the compressive strength tests

The results of the tests on the concrete cylinders can be seen in Table 3. The temperature in the prism peaked after approx. 45 min at approx. + 23 °C, but only after approx. 90 min at approx. - 13 °C in the joints.

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Cylinder	H (mm)	Ø (mm)	Weight (g)	Density (kg/m³)	Breaking load (kN)	Fracture stress (MPa)	Joint density (mm)
with joint							
1	297,9	149,8	12858	2449	1395,7	79,2	3,7
2	299,6	149,9	12825	2426	1486,4	84,2	3,0
					Medium	**81,7**	**3,4**
without joint							
3	288,7	149,9	12523	2458	1423,7	80,7	0,0
4	290,0	149,8	12566	2459	1406,2	79,8	0,0
					Medium	**80,3**	**0,0**

Conclusion:

The Plastifloor 050/051 methacrylate resin mortar showed good processing properties due to the grading curve. The required joint thickness of approx. 3 - 4 mm was achieved without any problems. Overall, the mortar was slightly too "liquid". However, this can be changed by reducing the liquid component. An impairment of the reaction result as with epoxy or polyurethane resins is not to be expected, as a polymerization reaction occurs with methyl acrylate resins. With EPs and PURs, there is a polyaddition reaction, which requires precise weighing of the components, which is often difficult to achieve under construction site conditions, especially outdoors. The different temperature peaks at different times are due to the different quantities. The prism is approx. 40 mm thick, the joint only 3 - 4 mm. This results in different heat developments. On the construction site, a processing time of approx. 1 h at - 10 to - 15 °C can be expected. At higher temperatures, the time is shortened accordingly. The reaction time can be varied by adding the accelerator B 101. The strength already reaches sufficient values after 24 h at - 16 °C, which the EP joint mortar only reaches after 28 days. No difference could be detected on the concrete cylinders between cylinders with and without joints. For technical reasons, Plastifloor 050/051T methacrylate mortar can therefore be used as a grout for joining precast concrete elements. The recommended mixing ratio can be found in the following table:

Material	**Weight parts**
Plastifloor 051 T Pulver component	5
Plastifloor 050 T liquid componene	1
Accelerator B 101	0,01

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Attachment: Photo documentation:

Determination of the suitability of the material Plastifloor® Mortar 050/051 as a joint mortar for joining precast concrete elements at low temperatures:

Photo 1:

Concrete cylinder with joint made of Plastifloor 050/051 T low-temperature mortar

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Photo 2:

Concrete cylinder with joint after the compression test, the wedge-shaped break-out is clearly visible

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Photo 3:

Close-up from photo 2 after removal of the loose parts. You can clearly see the joint in the the center

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