



Repair of Rigid Pavement using Micro Concrete Material

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Introduction



- Heavy traffic and a high volume of vehicles.
- One of the main obstacles should not be closed for very long during the repair process.

- Many high-early-strength cementitious repair materials are vulnerable to cracking, poor bonding, and premature deterioration.
- Rapid setting criteria: high compressive strength and flexure strength (in order to make longer service life).
- This research developed micro concrete material in accordance with the criteria needed for effective repair work in the rigid pavement. This development was accomplished by adding admixture (Polycarboxylate Ether-PCE) and polypropylene fibers (PPF) to existing commercially available repair materials.



Materials

- **Rapid Setting Micro Concrete Materials:** Estopatch RSP (A0) and Patchroc RSP (B0)
- **Fiber:** Polypropylene fibers-PPF (fibre length: 12 mm, diameter: 18 micron, tensile strength: 300-400 MPa, elastic modulus: 6000-9000 N/mm², and specific gravity: 0.91 g/cm³). Superplasticizier used is Polycarboxylate ether (PCE).
- **Mix Proportion of Specimens**

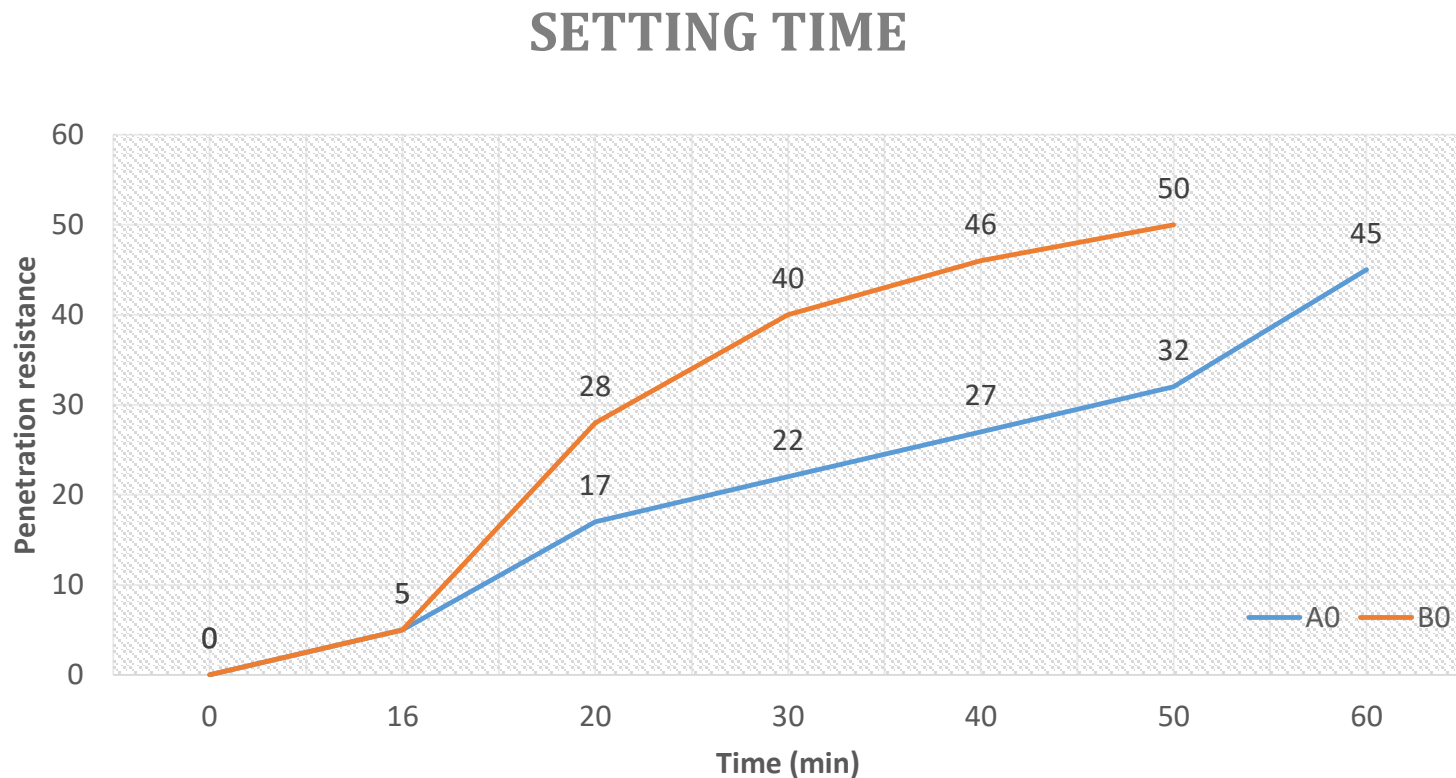
Mix proportions	Specimen					
	A0	A1	A2	B0	B1	B2
Binder (kg)	25	25	25	25	25	25
Water/binder	0.15	0.15	0.15	0.15	0.15	0.15
Fiber (gr)	-	50	50	-	50	50
Admixtures (litre)	-	-	0.25	-	-	0.25

Methods

- **Compressive strength test** of 50 x 50 x 50 mm cubes in accordance with ASTM C39 for concrete ages of 3 hours, 1 day and 7 days.
- **Flexural strength test** of 50 x 50 x 30 mm prisms or beams in accordance with ASTM C78 / C78M-18
- **The initial setting time** based on the ASTM C403 / C403-99

Results and Discussion

Setting Time

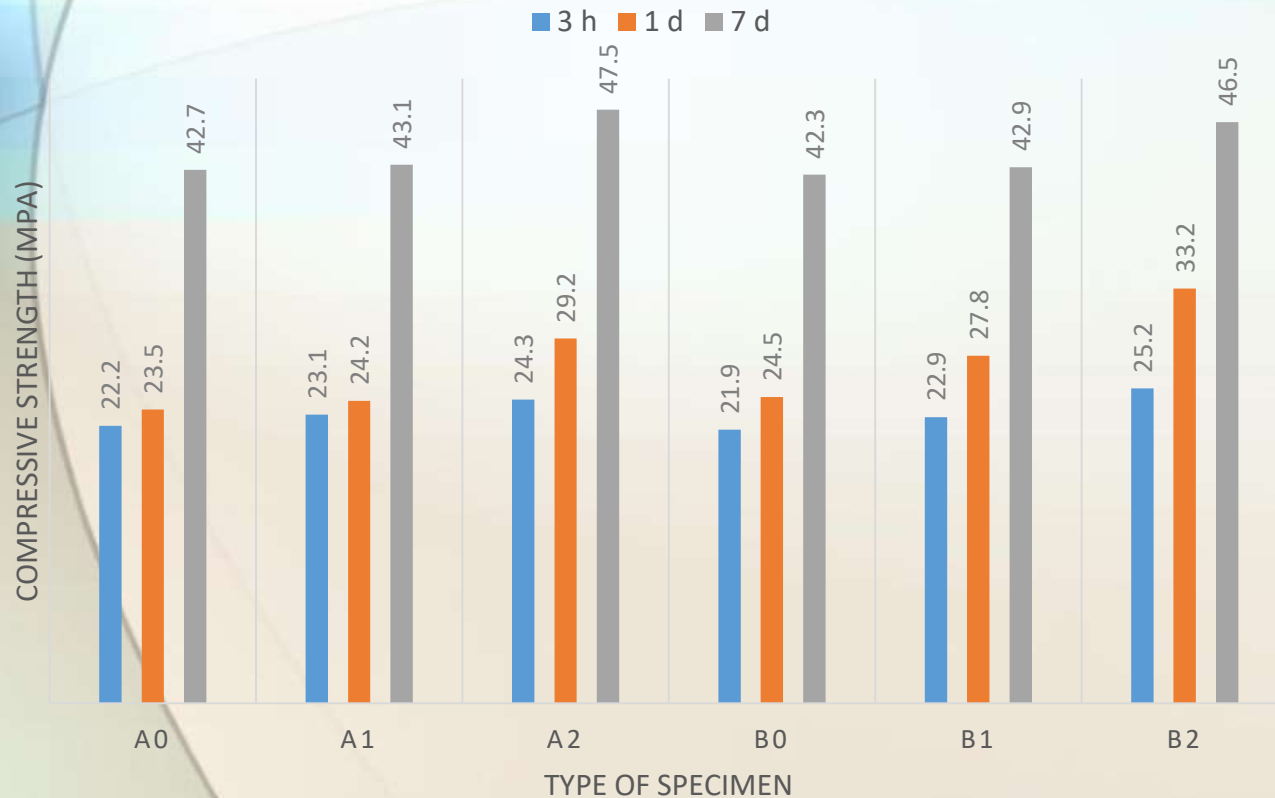


- Material B0 sets faster compared to A0.
- both materials are rapid setting (because they can harden in less than 60 minutes).
- Set time indicates when, and how easily, a particular type of material can be applied.
- The use of the PPF in concrete mixture does not have obvious negative effect on the setting times for either material A0 and B0.

Result and Discussion

Compressive strength

COMPRESSIVE STRENGTH

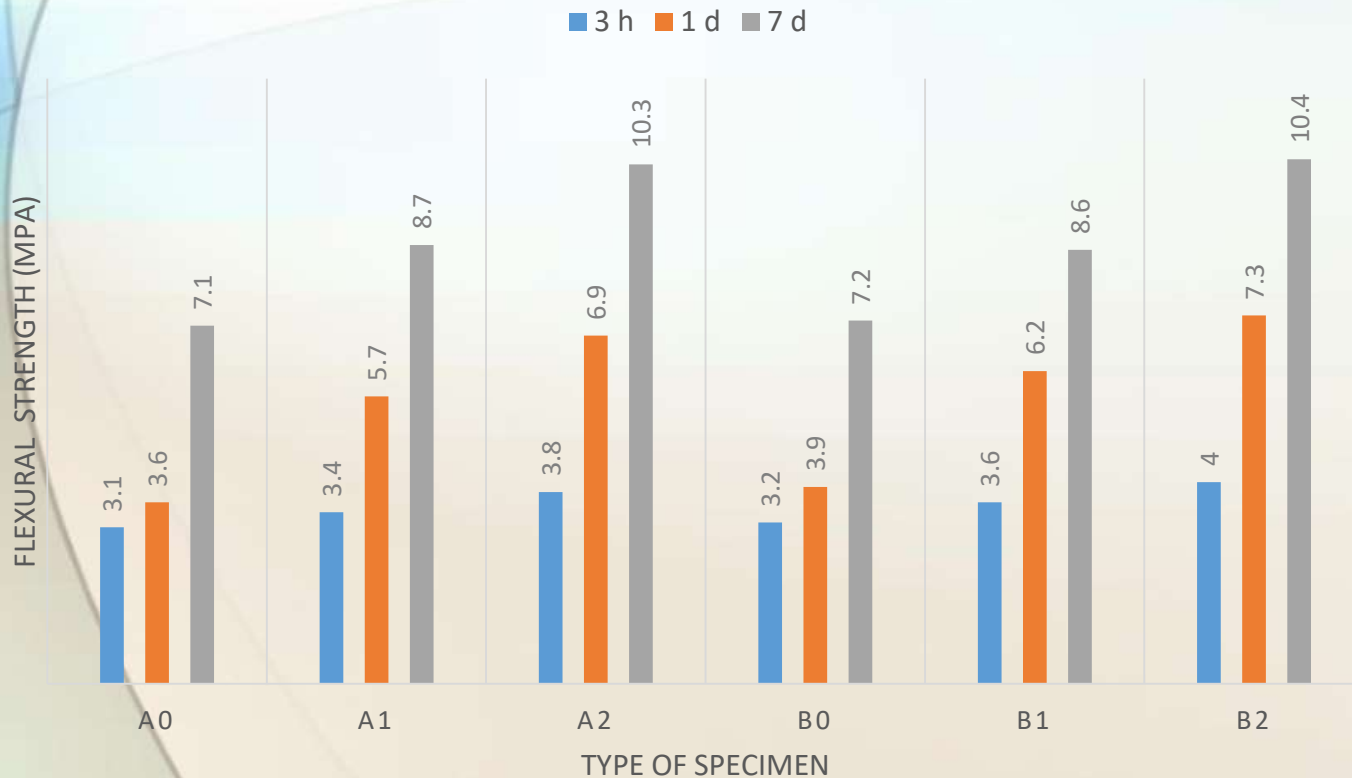


- Significant improvement occurred with the addition of PPF as well as the addition of PPF and Admixture.
- **At the age of 3 hours :**
 - For A0 and A1 there were increased by 4% and 9.5%.
 - For B0 and B1 there were increased by 4.5% and 15%.
- **At the age of 1 day :**
 - For A1 and A2 there were increased by 2.9% and 24.3%.
 - For B1 and B2 there were increased by 13.5% and 35.5%.
- **At the age of 7 days :**
 - For A1 and A2 there were increased by 0.9% and 11.2%.
 - For B2 and B2 there were increased by 1.4% and 9.9%.
- The addition of PPF and admixture can increase the compressive strength by 11.2% and 9.9%.

Result and Discussion

Flexural Strength

FLEXURAL STRENGTH



- **At the age of 3 hours :**
 - For A1 and A2 there were increased by 9.7% and 22.6%.
 - For B1 and B2 there were increased by 12.5% and 25%.
- **At the age of 1 day :**
 - For A1 and A2 there were increased by 58.3% and 91.7%.
 - For B1 and B2 there were increased by 59 % and 87.2%.
- **At the age of 7 days :**
 - For A1 and A2 there were increased by 19.2% and 27.4%.
 - For B1 and B2 there were increased by 19.4% and 44.4%.
- The addition of PPF and admixture can improve the flexural strength in materials A0 and B0.

Conclusion

- The use of either Polypropylene Fiber (PPF) or Polypropylene (PCE) is highly effective to improve the compressive strength and flexural strength of concrete mixtures used in repairing heavily trafficked road surfaces such as toll roads
- Adding PPF and PCE significantly improves the compressive strength by 11.2% and the flexural strength by 18.4% for material A0 (Estopatch RSP), and increases the compressive strength by 9.9% and flexural strength by 44.4% for material B0 (Patchroc RSP)

Thank You