# Characterizing a Cementitious Material as a Tack Coat

S. Pakeetharan and C. Vipulanandan, Ph.D., P.E.
Center for Innovative Grouting Materials and Technology (CIGMAT)
Department of Civil and Environmental Engineering
University of Houston, Houston, Texas 77204-4003
Email: spakeetharan@uh.edu, cvipulanandan@uh.edu Phone: (713) 743-4278

**Abstract:** A tack coat is a diluted substance which is applied to an existing pavement surface or between layers of hot mix asphalt to ensure a good bonding. Tack coat materials are increasingly used in enhancing the bonding between old concrete pavement and asphaltic repair materials. Also tack coats are being used to enhance the bonding between layers of asphaltic materials. The tack coats that have been used and also reported in the literature are mainly asphaltic based materials. Hence there is potential for developing other materials, especially cement based materials as tack coats. In this study, the potential of using a cementitious material as a tack coat was investigated.

## 1. Introduction

Proper testing method is of importance to quantify the bonding ability of a material to a substrate. As reviewed in the report ICT-R55 by Al-Qadi et al. (2008), many studies have been performed in the past investigating the bonding properties of tack coats. Direct shear test, wedge splitting tension test, torque bond test and pull-off test have been performed in characterizing the bonding strength. Liu and Vipulanandan (2005) investigated the tensile bonding characteristics of epoxy coating to wet and dry concrete. One of the test methods used in this study was CIGMAT CT-3 standard where coating was sandwiched between a pair of rectangular concrete bricks and then tested to determine the tensile bonding strength. Five failure types have been identified as follows, substrate failure (Type I), coating failure (Type II), bonding failure (Type III), bonding+substrate failure (Type IV) and bonding+coating failure (Type V).

## 2. Objectives

The overall objective was to investigate the potential of using a cementitious material as an alternative tack coat to currently used asphaltic tack coats in rehabilitating highway pavements and other structures by determining the bonding characteristics of that material to various substrates.

## 3. Materials and Testing

In this study, a commercially available cementitious material (denoted as PP) which is a fast setting hydraulic cement material ideal for horizontal repairs of concrete in traffic areas was used. Since PP has advantages like high early strength, fast setting and freeze/thaw resistance, there is a potential to use it as a tack coat material after proper characterization. A commercially available PG 64-22 type asphalt binder (AB) which is also used as a tack coat material to concrete and asphalt layers was used. For testing purpose, concrete bricks were prepared using ordinary Portland cement type I/II (with average unit weight of 144 pcf) along with PP bricks in the CIGMAT laboratory at the University of Houston. Over 50 specimens were prepared in the four combinations listed in Table 1.

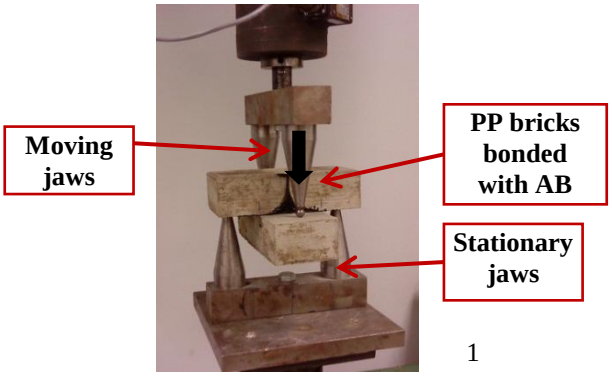


**Figure 1: Crossed brick specimen under tensile loading**

As shown in Figure 1, tensile bonding tests were performed, using the modified ASTM C 321 test (CIGMAT CT-3) to quantify the bonding characteristics of PP to concrete and asphaltic tack coat. Average bonding strength and predominant type of failure are summarized in Table 1. Figure 2 compares the bonding strength of the different types of specimens.

## 4. Results and Analysis

**Table 1: Summary of testing program and results**

| Test | Brick1 | Brick2 | Bonding material | Strength (psi) | Predominant type of failure (After Liu and Vipulanandan, 2005) |
|---|---|---|---|---|---|
| **1** | Concrete | Concrete | PP | 91.9 | Bonding failure (Type-III) |
| **2** | Concrete | Concrete | AB | 17.9 | Bonding failure (Type-III) |
| **3** | PP | PP | AB | 24.4 | Asphalt failure (Type-II) |
| **4** | Concrete | Concrete | PP+AB+PP | 32.8 | Asphalt failure (Type-II) |

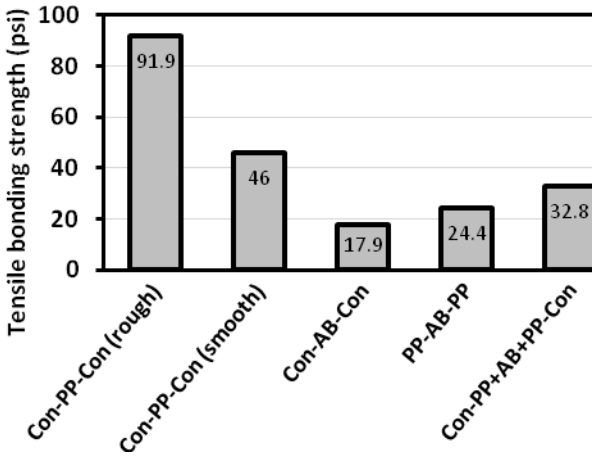


**Figure 2: Comparison of average 1day tensile bonding strength**

The PP bonding strength was affected by the smooth and rough conditions of the concrete surface. Tensile bonding strength of PP material to roughened concrete (91.9 psi) surface was more than four times that of asphaltic tack coat (17.9 psi). By comparing test no. 2 and 3, PP had better bonding to asphaltic binder than concrete. Considering test no. 2 and 4, PP material enhanced the bonding between the asphaltic tack coat and concrete.

## 5. Conclusions

Based on the test results, cementitious material (PP) enhanced the bonding between asphalt and concrete and has the potential for use as tack coat with concrete and asphaltic materials.

## 6. Acknowledgement

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## 7. Reference

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