

TECHNICAL REPORT

DETERMINATION OF ADHESION STRENGTHS OF VISUL SYSTEMS POLYURETHANE ADHESIVE

Report Reference: TR312

OBJECTIVE

A series of tests were conducted to determine the adhesion strengths of Polyurethane Adhesive, as supplied to Visul Systems, to asphalt, concrete, cast polyurethane tile and Terrazzo tile.

1) **INTRODUCTION**

The Polyurethane Adhesive was batched and mixed in accordance with the instructions on the Product Technical Data Sheet.

All test pieces were conditioned at 20+/-1°C for 28 days before evaluation of the adhesion strengths achieved.

2) **TEST PROCEDURE**

a) **TENSILE ADHESION TO ASPHALT**

Sections of asphalt that was a minimum of 28 days old were cut and bonded to flat steel plates incorporating suitable attachments for location in a Hounsfield Universal Testing Machine, using a fast-setting epoxy adhesive. These were allowed to cure for 7 days at 20+/-1°C before continuing with the test procedure.

The mixed Polyurethane Adhesive was then used to bond a second flat steel plate and locating attachment to the previously prepared asphalt test pieces, ensuring that the two halves of each unit were maintained perpendicular to each other while curing.

b) **TENSILE ADHESION TO CONCRETE**

Sections of concrete that was a minimum of 28 days old were cut and bonded to flat steel plates incorporating suitable attachments for location in a Hounsfield Universal Testing Machine, using a fast-setting epoxy adhesive. These were allowed to cure for 7 days at 20+/-1°C before continuing with the test procedure.

The bonding surface of the concrete test pieces were then wire brushed to remove any loose material, laitance, etc.

The mixed Polyurethane Adhesive was then used to bond a second flat steel plate and locating attachment to the previously prepared concrete test pieces, ensuring that the two halves of each unit were maintained perpendicular to each other while curing.

c) **TENSILE ADHESION TO CAST POLYURETHANE TILE**

Sections of cast polyurethane tile that was a minimum of 28 days old were cut and bonded to flat steel plates incorporating suitable attachments for location in a Hounsfield Universal Testing Machine, using a fast-setting epoxy adhesive. These were allowed to cure for 7 days at 20+/-1°C before continuing with the test procedure.

The bonding surface of the polyurethane tile test pieces were then abraded using a medium grade emery cloth to give a uniform dull surface, and then the surface was cleaned using a paper towel soaked with Nuwash to remove any loose material.

After allowing the solvent to completely evaporate the mixed Polyurethane Adhesive was then used to bond a second flat steel plate and locating attachment to the previously prepared polyurethane tile test pieces, ensuring that the two halves of each unit were maintained perpendicular to each other while curing.

d) TENSILE ADHESION TO TERRAZZO TILE

Sections of Terrazzo tile that was a minimum of 28 days old were cut and bonded to flat steel plates incorporating suitable attachments for location in a Hounsfield Universal Testing Machine, using a fast-setting epoxy adhesive. These were allowed to cure for 7 days at 20+/-1°C before continuing with the test procedure.

The bonding surface of the Terrazzo tile test pieces were then abraded using a medium grade emery cloth to give a uniform dull surface, and then the surface was cleaned using a paper towel soaked with Nuwash to remove any loose material.

After allowing the solvent to completely evaporate the mixed Polyurethane Adhesive was then used to bond a second flat steel plate and locating attachment to the previously prepared Terrazzo tile test pieces, ensuring that the two halves of each unit were maintained perpendicular to each other while curing.

3) TESTING

In all cases the test pieces prepared as above were tested to failure using a calibrated Hounsfield H50KS Universal Testing Machine, after aging for 28 days at 20+/-1°C following completion of the test piece assembly in each case. The maximum tensile strength and mode of failure were recorded for each test.

4) RESULTS

a) TENSILE ADHESION TO ASPHALT

Sample No.	Tensile Strength (PSI)	Failure Mode
1	176.9	100% cohesive failure of asphalt
2	156.6	100% cohesive failure of asphalt
3	165.3	100% cohesive failure of asphalt
Average	166.8	

b) TENSILE ADHESION TO CONCRETE

Sample No.	Tensile Strength (PSI)	Failure Mode
1	362.6	100% cohesive failure of concrete
2	417.7	100% cohesive failure of concrete
3	355.3	100% cohesive failure of concrete
Average	378.5	

c) TENSILE ADHESION TO CAST POLYURETHANE TILE

Sample No.	Tensile Strength (PSI)	Failure Mode
1	500.4	100% cohesive failure of epoxy adhesive bonding tile to steel plate
2	480.1	100% cohesive failure of epoxy adhesive bonding tile to steel plate
3	512.0	100% cohesive failure of epoxy adhesive bonding tile to steel plate
Average	497.5	

d) TENSILE ADHESION TO TERRAZZO TILE

Sample No.	Tensile Strength (PSI)	Failure Mode
1	474.3	100% cohesive failure of epoxy adhesive bonding tile to steel plate
2	607.7	100% cohesive failure of epoxy adhesive bonding tile to steel plate
3	564.2	100% cohesive failure of epoxy adhesive bonding tile to steel plate
Average	548.2	

5) CONCLUSIONS

In all combinations of substrates, separation of the bonds resulted in cohesive failure other than at the bond interface between the Polyurethane Adhesive and the substrate under test.

This indicates that the actual bond strength between the Polyurethane Adhesive and the substrates tested is greater than the tensile strengths listed above, and is a stronger component of the system than the various substrates used.

Signed: *F Stratton*
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Date: 11th January

F. STRATTON
SENIOR CHEMIST

Approved: *A.W. Laing*

A.W. LAING
DIVISIONAL DIRECTOR - MANUFACTURING