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tesa® ACX^{plus} in combination with Alpolic® composite panels

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Objective: Adhesion testing of tesa® 70xxx ACX^{plus} structural bonding tape to Alpolic® ACM panels

Tesa test report: MC 13013

Date: May 10, 2013

A. Application Description:

Mitsubishi Plastics Composites America, Inc. is the manufacturer of Alpolic® aluminum and metal composite material panels for architectural applications. tesa® ACX^{plus} structural bonding tapes are used in the bonding of composite panel materials. This includes stiffener bonding, perimeter frame bonding, and trim bonding applications.

B. Test Scope(s):

The purpose of this test study was to evaluate the adhesion of tesa® 70xxx ACX^{plus} structural bonding tape to several Alpolic® panels with common finishes and metal surfaces. A series 90° peel adhesion tests were performed with tesa® 70xxx ACX^{plus} structural bonding tape applied to Alpolic® substrates. The 90° peel adhesion test is the most sensitive test for determining how well adhesive tape will bond to a substrate finish. The tesa® 70xxx ACX^{plus} structural bonding tape evaluated in this study is 0.040" (1.0 mm) thick. → The specific product number of the product used in the test program is tesa 70100. The following is an overview of product thicknesses available:

Product	Thickness [µm]	Thickness [mil]	Construction
70100	1000	40	Foamed pure acrylic
70150	1500	60	Foamed pure acrylic
70200	2000	80	Foamed pure acrylic

C. Test Procedures:

Adhesion was measured using a 90° peel adhesion test based on test method ASTM D3330. 1.0" (25mm) wide strips of tape were used for this test. The strips of tape were applied to the customer supplied substrates after the application surfaces were prepared utilizing the surface preparation methods listed in Section D. Three strips of tape were used for each different surface preparation method. The tape was then backed with a 1 mil (23 µm) thick PET strip and allowed to dwell for 3 days at 70°F/50% RH (21°C/50% RH) conditions to allow the bond strength to develop. The 90° peel adhesion tests were completed at the same environmental conditions. Standard production samples of tesa® 70100 ACX^{plus} structural bonding were used for this study and average peel test data is reported in pounds per inch width (lbs/in) and Newtons per centimeter width (N/cm) of adhesive tape.

D. Surface Preparation:

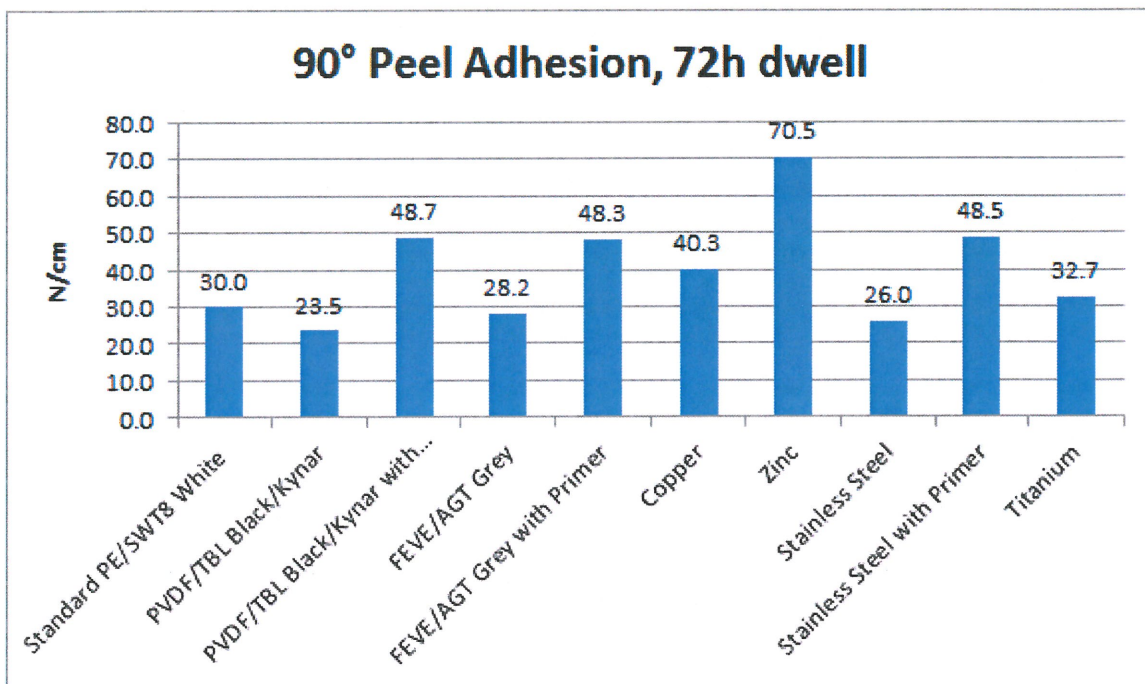
The following surface preparation method was used in this study. Proper surface preparation is critical for achieving high bond strength. Lint free towels were utilized for all surface preparation techniques involving a wiping/cleaning procedure.

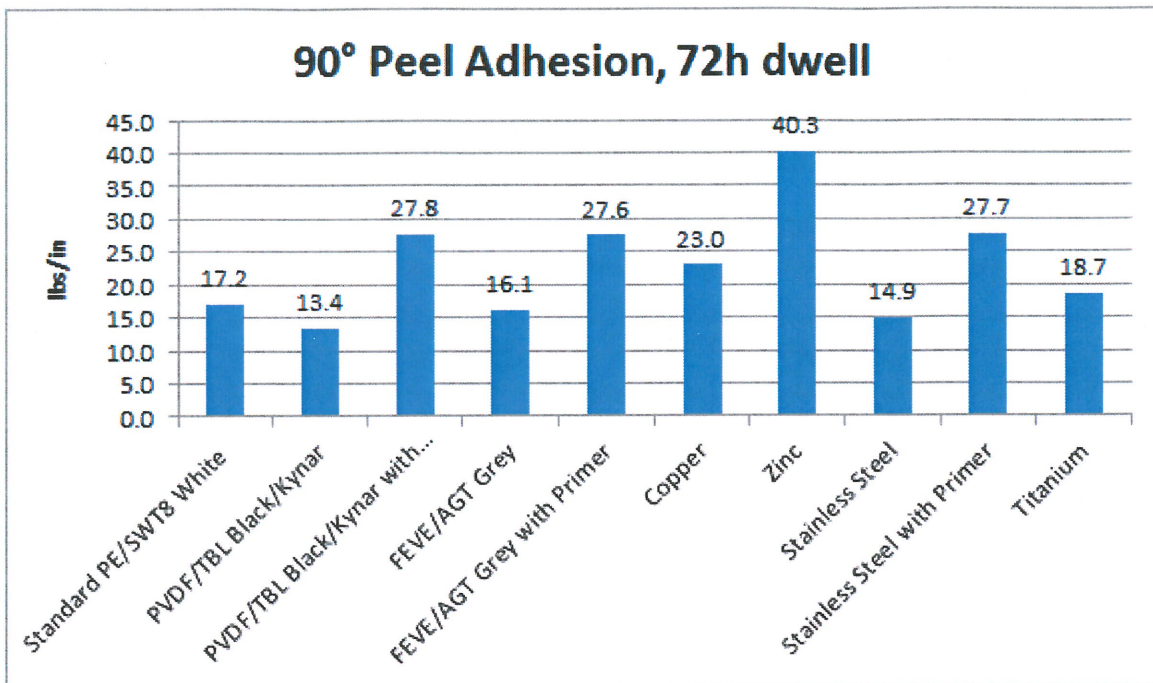
a. IPA/Water - Clean bonding surface area with a 50:50 mixture of isopropyl alcohol (IPA) and water.

b. tesa 60150 Adhesion Promoter - Clean bonding area with 50:50 IPA/water solution first and then treat surface with tesa 60150 Adhesion Promoter. The Adhesion Promoter was applied by using Montana Markers application sticks. Tape was applied at least one minute after cleaning/priming.

E. Summary of Results:

A minimum 90-degree average peel force result of >11 lbs/in (>20N/cm) is generally desired for most constructive bonding applications. For all outdoor applications and in order to achieve a cohesive failure mode (foam split, partial foam split, or mostly foam split) the usage of tesa 60150 Adhesion Promoter is highly recommended. Cohesive failure demonstrates the adhesive bond line strength is greater than the internal strength of the acrylic foam core. This is the most desirable failure mode demonstrating maximum achievable adhesive bond strength.





I. Conclusion:

tesa® 70xxx ACX^{plus} structural bonding tape formed high bond strength to all the Alpolic® composite panel substrates evaluated in this adhesion study. Cleaning with IPA/Water solution is mandatory and the use of tesa 60150 Adhesion Promoter is highly recommended on the different Alpolic® composite panel types and finishes. Further surface preparations like abrasion, sanding or plasma treatments might be recommended on specific project after substrates are tested by tesa. To validate acceptable adhesion performance, an independent adhesion test should be conducted on all panel finishes for each project.

Please note: The adhesion results in this test report are only relevant for the specific Alpolic® composite panel finishes/types tested in this study. Alternative Alpolic® composite panel finishes/types should be tested for adhesion by tesa prior to the commencement of a bonding project.

Panels having corrosive substrates such as the Alpolic® CCM (Natural Copper Skin) and CCM FR composite panels should only be considered for interior panel bonding applications. For exterior panel applications a dedicated test program is highly recommend. Please consult tesa under buildingenvelope@tesatape.com

F. Additional Considerations – Design & Fabrication:

1. Work Area & Substrate Temperatures: While surface preparation is critical to achieving good bonding performance of tesa® 70xxx ACX^{plus} structural bonding tape, it is equally important to apply the adhesive tape in a work area with a temperature > 60°F (15°C). In addition, the bonding substrates must be at the same temperatures (thermal equilibrium). The use of an adhesion promoter will likely lower the minimum application temperature to approximately 50°F (10°C) if this is a requirement for an application. The performance should be verified by the customer prior to fabricating parts at temperatures <60°F (15°C). Once fabricated and full bond strength is achieved, the bonded parts are capable of withstanding cold exterior temperatures.

2. Application Pressures: It is also important to provide adequate pressure to the tape after it has been applied to the first prepared substrate surface and then after the two parts are joined together. The application of pressure facilitates good contact and adhesion of the adhesive tape to both substrate surfaces. Hand pressure alone should not be considered adequate pressure for the final application of pressure to the assembled parts.

The use of pressure application equipment (roller, clamps, etc...) is strongly encouraged for the final pressure application step.

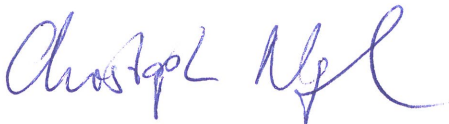
3. Static Loads: tesa® 70xxx ACX^{plus} structural bonding tape offer a static load design guideline strength of 0.25 psi (1.7 kPa). This means that there should be 4 in² of tesa® 70xxx ACX^{plus} structural bonding tape for every 1 lb of weight (60 cm² of tape per 1 kg) it will support on a constant basis. If a panel bonding application will involve a constant static load acting on tesa® 70xxx ACX^{plus} structural bonding tape, the customer should verify that an appropriate amount of adhesive tape is utilized to satisfy this design guideline.

4. Dynamic Loads: tesa® 70xxx ACX^{plus} structural bonding tape has a dynamic load design guideline strength of 13 psi (90 kPa). Dynamic loads are short term forces such as high wind gusts. The customer should verify that their design will satisfy tesa's design guideline when architectural panel substrates attached with tesa® 70xxx ACX^{plus} structural bonding tape are intended to be subjected to dynamic loads such as wind loads in exterior applications. tesa® 70xxx ACX^{plus} structural bonding tape is utilized for panel attachment.

5. Equipment: The application of adhesion promoters, tesa® 70xxx ACX^{plus} structural bonding tape, and pressure can be enhanced through the use of equipment. This can result in faster and more robust manufacturing processes. Please consult with tesa under buildingenvelope@tesatape.com for more information on application equipment.

Testing should be conducted by the customer to determine if a tesa® 70xxx ACX^{plus} structural bonding tape will meet all the performance requirements for their application. The data reported in this document is to be used as a representation of how well the tested tesa® 70xxx ACX^{plus} structural tape will bond to the specific customer-supplied substrates with the same surface preparation methods and environmental conditions. A thorough evaluation should be done by the customer to verify if a tesa® 70xxx ACX^{plus} structural bonding tape is capable of meeting the total needs of the application, including those that were not anticipated with this testing.

Sincerely,



Christoph Nagel

Director R&D tesa tape North America

http://www.tesa.com/industry/building_supply

Where any legislation implies into this statement any term, condition or warranty; and the relevant legislation avoids or prohibits provisions in a contract excluding or modifying the application of, or the liability under, any such term, condition or warranty, such term, condition or warranty will be deemed to be included in this warranty statement provided that, to the extent that such legislation permits tesa to limit its liability for such breach will be limited as set out in this statement.