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Fiberglass Reinforced Plastic vs. Non-Reinforced Thermoplastic Panels

Overview

This report compares the performance characteristics of thermoset fiberglass reinforced plastic (frp) wall panels against non-reinforced thermoplastic panels such as PVC (polyvinyl chloride), PE (polyethylene), PP (polypropylene) or combinations of these plastics. The following data does not apply to reinforced thermoplastic panels.

The comparisons were designed to provide consumers and specifiers with a guide for choosing an interior wall finish that meets the application demands of durability, sanitation, long-term performance and a trouble-free installation.

Current Situation

FRP panels have been in wide commercial use since the 1960's. A frp wall panel provides a long term, durable, sanitary finish that meets the rugged performance needed in applications such as food processing, healthcare, cold storage, and many other areas. The primary advantage of a frp panel is the long term resolution of these performance needs.

Some companies have introduced lower cost, non-reinforced thermoplastic panels and are marketing these panels as a performance alternative to fiberglass reinforced plastic panels. These non-reinforced thermoplastic panels are marketed to building professionals as "non-reinforced plastic' panels, and along with low costs, are promoted as "environmentally friendly." Here are the facts…

The facts show that non-reinforced thermoplastic panels don't offer much beyond a low initial cost. However, with demonstrated performance differences, the replacement and maintenance costs for non-reinforced products are likely to far outweigh even this low cost advantage.

Installation

Non-reinforced thermoplastic panels, because of their "type" of plastic and lack of reinforcement, are particularly difficult to install properly. Both polypropylene and polyethylene based panels may be more difficult to use with water-based latex adhesives because of high surface tension properties versus frp. This means that during installation, latex adhesives can tend to "bead" and resist spreading, possibly causing delamination early after installation. This high surface tension, combined with thermal expansion up to three times higher than that of frp panels, can cause bubbles and bulges in wall panels within weeks of installation.

The facts indicate that only a small temperature change will result in extremely large expansion of these non-reinforced thermoplastic panels. Certainly, the enormous thermal ranges that occur in refrigerated and cooking areas make non-reinforced thermoplastic panels likely to fail, resulting in costly replacement.

Cleanability

Non-reinforced thermoplastic panels are extremely poor performers in cleanability and abrasion tests mainly due to the soft surface in comparison to thermoset frp panels.

Surface hardness tests plainly show that frp panels are over three times harder on the surface than non-reinforced thermoplastic wall panels which will get dirty and stay dirty! The facts show in real life tests that utilized stains and cleaning methods typical for commercial installations of frp panels, the non-reinforced thermoplastic panels were extremely difficult to clean.

- ***Graffiti:*** In comparison to frp panels, non-reinforced thermoplastic panels never came clean!
- ***Food Stains:*** In comparison to frp panels, non-reinforced thermoplastic panels retained stains that frp panels resisted throughout the testing.
- ***Yellowing/Color Change:*** In comparison to frp panels, non-reinforced thermoplastic panels displayed a much higher propensity to yellow and chalk.

Durabilty

In applications where wall panel stiffness is an important factor, non-reinforced thermoplastic panels display only 24% of the "stiffness' that frp panels provide.

Non-reinforced thermoplastic panels display less than 16% of the impact resistance protection of frp panels. This means that walls that are exposed to impacts from carts, forklifts, food preparation equipment, and vandals are more likely to be damaged and show damage than frp panels.

Conclusion

In all tests, both laboratory and "real life", that reflect the required performance of a durable, sanitary wall covering, Non-reinforced thermoplastic panels performed poorly compared to frp panels.

It is estimated that wall coverings that use non-reinforced thermoplastic panels will have 20% less useful life when compared to frp panels. Additionally, this doesn't take into account that the wall appearance will diminish 5x more than the wall utilizing an frp panel.

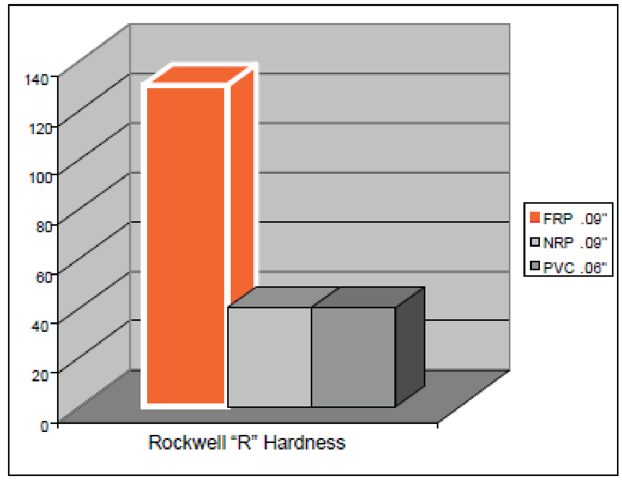
Performance Characteristic	FRP	Non-Reinforced
Easier to install	X	
Lower thermal expansion (less buckling)	X	
Better cleanability	X	
Better durability (lasts longer)	X	
Highest impact resistance	X	
Better long-term investment	X	

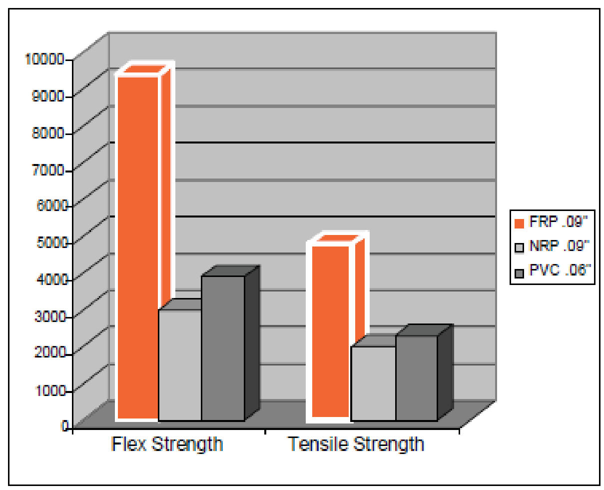
ADDENDUM A: PRODUCT DEFINITIONS

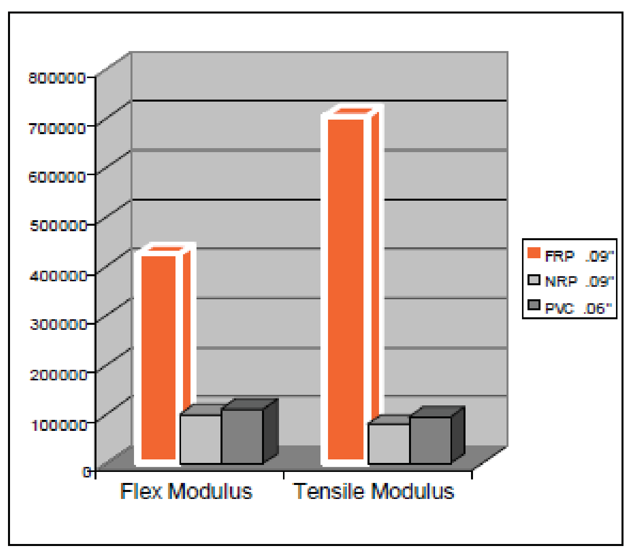
Term	Definition
FRP:	**F**iberglass **R**einforced **P**lastic, A thermoset material composed of modified polyester copolymer and inorganic fillers and pigment that is reinforced with random chopped fiberglass roving.
NRP:	Non-reinforced thermoplastic
PP:	Polyester
PE:	Polyethylene
PVC:	A thermoplastic material composed of copolymers of vinyl chloride
Thermoset:	A plastic material that will undergo or has undergone a chemical reaction caused by heat, catalyst, ultraviolet light, etc., leading to the formation of a solid. Once it becomes a solid, it cannot be reformed.
Thermoplastic:	A plastic material that can be readily softened and reformed by heating and be re-hardened by cooling.

Additional definitions are available on our Product Encyclopedia at http://www.cranecomposites.com/encyclopedia.asp

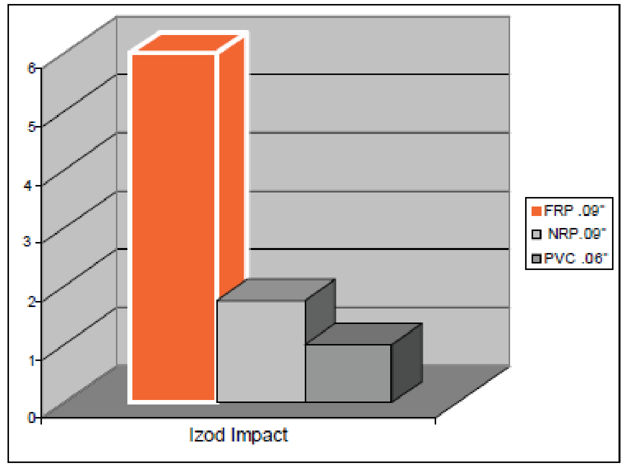
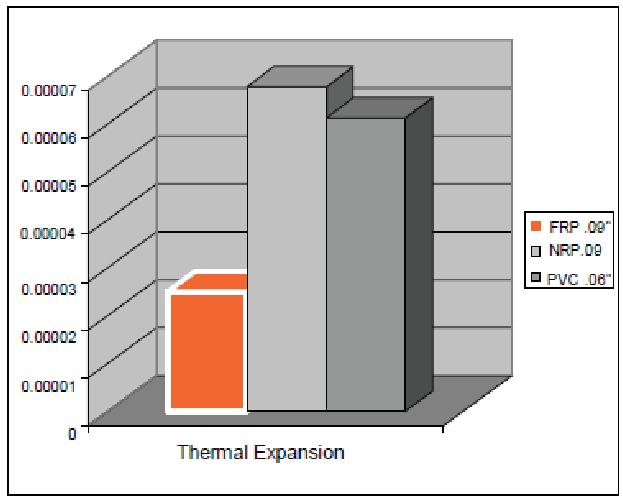
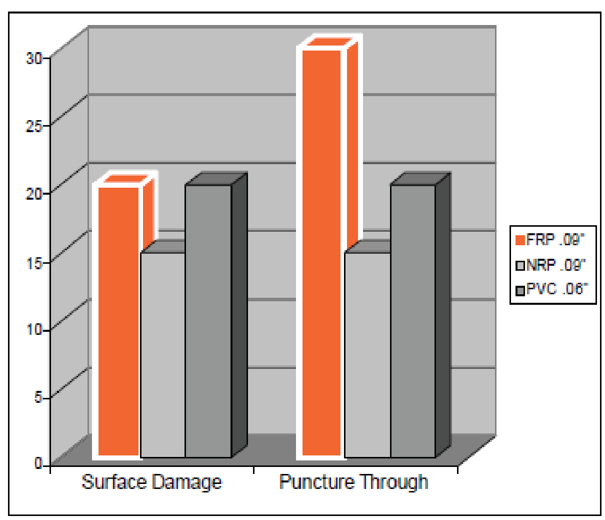
ADDENDUM B: PHYSICAL PROPERTIES & TEST RESULTS

<table>
<tr><th>Physical Property</th><th>Physical Property Description</th><th>Test Method</th><th>Chart</th></tr>
<tr><td>Rockwell “R” Hardness</td><td>Measures a material’s surface hardness. A steel point is forced into the material and its resistance to penetration is measured.</td><td>ASTM D785</td><td>


</td></tr>
<tr><td>Flexural Strength</td><td>This is also known as bending strength. It describes how much of a load can be applied before a panel yields or breaks. Higher numbers indicate stronger materials which can withstand a heavier load before breaking.</td><td>ASTM D790</td><td rowspan="2">


</td></tr>
<tr><td>Tensile Strength</td><td>This number describes how large of a load a panel can withstand before it breaks due to elongation. Higher numbers indicate materials that can withstand a stronger pull before breaking.</td><td>ASTM D638/D651</td></tr>
<tr><td>Flexural Modulus</td><td>A number associated with the flexibility or stiffness of a material. It indicates how far a material will bend when a certain load is applied to it. The lower the modulus, the more flexible the material.</td><td>ASTM D790</td><td rowspan="2">


</td></tr>
<tr><td>Tensile Modulus</td><td>Measures how much of a load a material can take before it fractures or breaks when it is in the process of being bent.</td><td>ASTM D638</td></tr>
</table>

Physical Property	Physical Property Description	Test Method	Chart
Izod Impact	The impact strength of a material is a measure by how much energy is absorbed by the test specimen when it is broken by a moving weight. Higher numbers mean the material will absorb more energy before breaking.	*ASTM D256*	
Thermal Expansion	This is a measurement of how much the length of a material will change when the material is heated or cooled. The graph shows how much the material will increase in length if the temperature of the material is raised one degree Fahrenheit. Smaller numbers indicated relative stability to changes in temperature.	*ASTM D256*	
Gardner Impact	Front side impact test conducted at 0º F (freezer). Higher numbers mean the material will absorb more energy before breaking.	*ASTM D638*	

www.FRP.com | 1.800.435.0080 | 1.815.467.8666 (fax) | salesbp@cranecomposites.com

Crane Composites is the manufacturer of Glasbord, Sequentia, Sanigrid II and a variety of other fiberglass reinforced plastic (FRP) composite wall panels. Inspired by the Kemlite tradition, Crane Composites has over 55 years of experience in Commercial Building Products and is a recognized industry leader in FRP applications.

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