

Enduro Composites FRP industrial roofing material delivers superior energy efficiency, sustainability, and corrosion resistance in the toughest environments, earning the highest ROI rating by the U.S. Army Corps of Engineers.

Architects, engineers and building owners of manufacturing or storage facilities know that the investment they make in a building must consider the lifecycle costs of not only the building itself but also high-quality industrial roofing materials that will withstand exterior and interior elements.

Permanent buildings have a life expectancy of about 40 years and typically outlive traditional roofing materials which are likely to need replacing during that time. Reconstructing a roof requires additional time and material costs and can result in costly downtime. By researching and installing the best quality roofing material on the market, builders and owners can increase the lifespan of a roof, decreasing eventual lifecycle costs down the line.

Evaluation by Department of Defense Study

According to a study done by the US Army Corp of Engineers® for the Department of Defense entitled, “**Demonstration of Three Corrosion-Resistant Sustainable Roofing Systems**,” new roofing system technologies today can close the lifecycle gap between buildings and roofing systems. The right technology can deliver better Return on Investment (ROI) and save money in the long run over traditional roofing systems.

This study reviewed three new roofing materials that might increase the lifespan of a facility and decrease lifecycle costs. They found that the fiberglass reinforced plastic (FRP) system provided the highest ROI. They determined that the FRP roofing system with translucent panels saved on energy costs by providing a well-lit work area, eliminating the need for additional lighting. The FRP roofing system also provided a cooler environment in the summer and warmer environment in the winter. The additional UV coating protected color fading and degradation of materials from sun exposure.

The FRP system offered superior results compared to the two other roof technologies considered in this study. “The FRP panel roof replacement was determined to provide an ROI of 2.63. The demonstration showed that an “FRP panel roof can provide significant benefits, including better indoor lighting, improved thermal comfort, and lower energy bills, when used on buildings such as craft shops, warehouses, and industrial facilities.”

Owners and builders/designers’ considerations for roofing materials must include environmental corrosion factors like the salt air and high winds common in coastal locations. Roofing can be subject to harsh elements inside the structure as well if corrosive items are being stored, processed or manufactured inside. Roofing materials

can also improve the conditions inside the building like enabling the use of natural light. All of these factors influence roof performance.

According to the study, “Issues affecting roof replacement include high replacement costs, high disposal costs (including environmental compliance), and disruption of mission-related activities. Postponing or avoiding roof replacement through the use of long-life roofing systems could help to reduce roof life-cycle costs.”

Because roof-related maintenance and repair are an ongoing concern, “Improvement of energy efficiency, drainage, and other attributes such as aesthetics and comfort can be cost-effectively addressed as part of these replacement projects.”

Upon completion, the study rated the FRP panel system, Tuff Span™ as manufactured by Enduro Composites Inc., the best roofing material tested when energy savings, sustainability and corrosion resistance are required.

Highlights of the FRP Industrial Roof System

During testing, the U.S. Army Corps of Engineers team of experts determined that when testing in accelerated corrosive environments, none of the exposed FRP panel coupons exhibited evidence of blistering, delamination, peeling, chalking, or any other environmental-related degradation.

“This analysis assumes that the FRP system will save costs related to reduced interior lighting requirements resulting from daylighting through the translucent roofing material. Each building has nine fluorescent light fixtures with two 40-watt tubes each. Without the FRP panel roof, it is assumed that the lights are turned on during 75% of working hours throughout the year. Accounting for typical amounts of overcast, cloudy, and rainy weather, it is estimated that with the FRP panel roofs the lights will be turned on about 25% of the time. Assuming an electricity cost of \$0.082 per kWh, the annual energy savings would be \$59 per building.”

“Fort Bragg personnel have remarked that the buildings’ interior temperatures are more comfortable than previously, when the metal roofs were in place, and that the new interior daylighting effect has improved working conditions. To estimate the potential benefit of increased productivity, a quarter man-hour per day is assumed for each building with an FRP panel roofing system. For a fully burdened labor rate of \$35/hour and a 200-day year, the annual savings is \$1,750.”

The baseline scenario assumes that 30 Army installations located in warmer regions of the United States have equipment storage buildings of similar design and construction without climate control. During each of the next 15 years, the roofs on these buildings at two of the installations will reach the end of their service lives. Unit costs to remove the failed roofs and replace them with standard 24-gauge galvanized steel, corrugated roofs are \$1.80/SF and \$2.57/SF, respectively. The cost for new gutters and downspouts is

\$607 per building. Maintenance and repair of metal roofs costs \$0.06/SF annually, and the expected service life is 15 years.”

3 Key Issues to Consider When Selecting an Industrial Roofing Material and System

1. **Performance** is a key factor and major contributor to the lifespan of the Two important criteria of performance are structural integrity and corrosion resistance. Roofing materials need to withstand external weather including wind – particularly in coastal environments – snow loads, and high moisture. In some cases, it is important that roofing products have capacity to support foot traffic. Corrosion resistance is particularly important where the process or materials inside of the building are chemically aggressive or exterior, adjacent environments provide corrosivity. High moisture and salt are common environmental factors for industrial facilities in coastal locations. An additional important consideration is safety performance in terms of flame propagation.
2. **Energy efficiency** can reduce lifecycle costs by reducing cooling and utility expenses. FRP translucent roofing materials that achieve this energy efficiency have also been reported to create better working environments for employees resulting in higher productivity rates.
3. **Overall return on investment (ROI)** is a critical performance metric. Measurement of ROI includes the above factors, plus the cost effectiveness of materials that are fit for purpose and environment. The FRP industrial roofing system and its robust features deliver excellent results in all three areas.

The total project costs for the demonstration of this technology were \$379K, resulting in a 30 year ROI of 2.63 compared to -.07 for the other two new roofing technologies in this report: slope conversion using SSMR system with high-performance coating and .28 for Stone-coated metal shingle system with ASV.

“The analysis supports the use of FRP panel systems to replace corroded metal roofing on non-climate-controlled buildings similar to those used in the demonstration. Candidate buildings are those that would benefit from no-cost daylighting provided by the translucent FRP panels. In highly corrosive environments, the FRP system may be even more competitive with low-cost metal roofing. Application to additional buildings at Army installations and other services installations would increase the ROI.” Table 7 from the report is included below that shows the details of the ROI analysis.

Table 7. ROI analysis for FRP panel system.

Investment Required		379,000
Return on Investment Ratio	2.63	Percent 263%
Net Present Value of Costs and Benefits/Savings	998,504	1,995,287 996,782

A Future Year	B Baseline Costs	C Baseline Benefits/Savings	D New System Costs	E New System Benefits/Savings	F Present Value of Costs	G Present Value of Savings	H Total Present Value
1	33,037			5,825		35,202	35,202
2	66,074		122,179	17,415	106,703	72,920	-33,783
3	66,074		122,179	29,025	99,727	77,630	-22,097
4	66,074		122,179	40,635	93,203	81,409	-11,795
5	66,074		122,179	52,245	87,107	84,362	-3,745
6	66,074		122,179	63,855	81,402	86,572	5,170
7	66,074		122,179	75,465	76,075	88,137	12,062
8	66,074		122,179	87,075	71,103	89,133	18,030
9	66,074		122,179	98,685	66,448	89,613	23,165
10	66,074		122,179	110,295	62,099	89,649	27,550
11	66,074		122,179	121,905	58,043	89,309	31,266
12	66,074		122,179	133,515	54,263	88,618	34,374
13	66,074		122,179	145,125	50,700	87,648	36,947
14	66,074		122,179	156,735	47,377	86,465	39,028
15	66,074		122,179	168,345	44,274	84,954	40,679
16	33,037		-	168,345		68,208	68,208
17	66,074		-	168,345		74,217	74,217
18	66,074		-	168,345		69,365	69,365
19	66,074		-	168,345		64,817	64,817
20	66,074		-	168,345		60,574	60,574
21	66,074		-	168,345		56,612	56,612
22	66,074		-	168,345		52,908	52,908
23	66,074		-	168,345		49,439	49,439
24	66,074		-	168,345		46,204	46,204
25	66,074		-	168,345		43,180	43,180
26	66,074		-	168,345		40,367	40,367
27	66,074		-	168,345		37,718	37,718
28	66,074		-	168,345		35,297	35,297
29	66,074		-	168,345		32,959	32,959
30	66,074		-	168,345		30,801	30,801

For additional details on the demonstration findings and the full report, email our team at sales@endurocomposites.com.

Investment in the right industrial roofing materials and system today can deliver significant long-term savings.

Key performance indicators for the best roofing systems:

1. Longevity and performance over time.
2. Corrosion resistance around chemically aggressive materials and in coastal regions.
3. Light transmission, which not only saves utility costs but also creates a better working environment for workers.
4. Reduction of lifecycle costs for permanent structures.
5. Cost-effective strategy for improving energy efficiency, drainage, aesthetics, worker productivity and comfort.

About the FRP Industrial Roofing System Reviewed in this Report:

Tuff Span™ panels, by Enduro Composites, referred to as “the FRP system” in this study, utilizes premium, isophthalic polyester resin for superior corrosion resistance.

Designed for environments with continuous exposure to acids, greatly reducing corrosion concern and future maintenance cost, Tuff Span™ panels are offered in a wide range of opaque and translucent colors with premium UV inhibitors and shop-applied acrylic polymer UV resistant coating. Translucent white panels were chosen to provide an aesthetically pleasing appearance while increasing natural light in the building. These noted benefits of Tuff Span™ will provide a long-term, structurally performing roof system. To learn more about Enduro Composites and the Tuff Span™ product line, email sales@endurocomposites.com.

To receive a copy of the U.S. Army Corps of Engineers report mentioned in this article, submit your email below.

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Tuff Span™ for your Project

Contact us if you would like to consider Tuff Span™ for your project. We will work with you to ensure that the design for your roofing system is optimized to perform best under the specific conditions for your building's design criteria. For example, if wind loads are properly identified with an existing owner's architect or engineer, Tuff Span™ can be designed to withstand high intensity windstorms and hurricane events due to Enduro's in-house full scale wind load laboratory. For more information, email us at sales@endurocomposites.com.