



Working with ArmorONE® Panels

A Use Guide



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Introduction

Working with ArmorONE® Panels is a guide designed to educate and aid manufacturers, service centers, installers, fabricators, designers, engineers, and researchers in the most effective and efficient use of ArmorONE Panel technology. It is an evergreen document that is updated regularly to incorporate technology advancements and product developments within the ArmorONE line.

ABOUT OUR TECHNOLOGY

Most composite panels use technology that combines steel with a high-density foam core, dating back to the 1990s. ArmorONE cores use Origami Composite™ technology developed through research and development with the National Science Foundation and NASA.

Origami Composites are engineered materials that use patented geometric structures to unlock advanced functionality: lighter can be stronger, and stronger can be thinner. The result is an extraordinarily efficient panel with higher stiffness- and strength-to-weight ratios.

ABOUT OUR PANELS

Tough-skinned, rugged, and built to last, ArmorONE Panels deliver improved efficiency and a lightweight competitive advantage. That means immediate payback and increased ROI for your business.

Panels are available in ultralight Advanced Composite™ and high-strength steel. The polymer core adds flex to the steel's strength, giving the panel resilience to absorb impact, yet retain its shape over time.

Proudly made from recycled/recyclable materials in the U.S.A. by Armory Technologies, Inc., ArmorONE panels are an easy, economical way to improve performance.

This guide was developed to help you work with us and we welcome your comments and questions.

ArmorONE@armorytechnologies.com

armorytechnologies.com/ArmorONE

Warnings, Cautions, and Safety

This manual contains the following WARNINGS and CAUTIONS related to working with ArmorONE Panels:



The “**WARNING**” symbol refers to a situation that can cause serious injury or death.



The “**CAUTION**” symbol refers to a situation that can cause equipment damage.

SAFETY FIRST

Always prioritize safety over convenience or speed. If an activity cannot be done safely, it should not be done. Follow OSHA guidelines and these safety instructions for working with ArmorONE. Follow manufacturer safety guidelines for operating equipment. Proper and routine equipment maintenance enhances safety. Always wear appropriate and approved personal protective equipment (PPE) and maintain a clean, safe work environment.

Personal Protective Equipment

- **Eye Protection:** Safety goggles or glasses with side shields.
- **Ear Protection:** Ear muffs or plugs to protect hearing when operating noisy machinery.
- **Face Protection:** Face shields during cutting operations.
- **Respiratory Protection:** Dust masks or respirators with filtration against airborne particles, particularly during sanding, drilling, routing, or cutting.
- **Head Protection:** Hard hats suitable for the work environment.
- **Hand and Arm Protection:** Cut-resistant gloves and guards suitable for the task.
- **Foot Protection:** Steel-toed shoes or boots.
- **Knee Protection:** Pads when working in areas with potential for foreign body hazards like drill shavings, metal slivers, or rivet bodies.

Workplace Safety:

- **Housekeeping:** Maintain a clean and orderly workspace. Remove tripping hazards such as air lines, waste materials, tools, and parts, from walking and working areas.
- **Tool Integrity:** Never use damaged or defective tools. Ensure cutting tools such as saws, shears, blades, bits, drills, and punches are sharp and properly maintained.

- **Safe Tool Use:** When using sharp tools, cut away from your body to prevent injury.
- **Awareness of Surroundings:** Before cutting, drilling, punching or machining panels, verify clearance and the location of others to avoid accidental contact.
- **Handling Panel Edges:** Panel edges can be extremely sharp. Exercise caution and always wear protective gear including gloves and arm guards.
- **Cleaning Procedures:** To prevent eye injuries, avoid using compressed air for cleaning.
- **Ladder Safety:** Do not stand on or near the top of a ladder, and do not rock or 'walk' a ladder—always descend to safely reposition it.
- **Heavy Lifting:** Use appropriate tools, equipment, force, and lifting techniques when moving panels and their components.



WARNING: Do not weld. Welding will damage ArmorONE Panels.



CAUTION: The steel in ArmorONE Panels is thin and sharp. Use appropriate PPE and exercise caution when handling and maneuvering to avoid damage and injury.

ArmorONE® Panels

THE NEW STANDARD IN PANEL PERFORMANCE

ArmorONE combines patented Origami Composite technology with advanced material science to create a new standard for durability, strength, and lightweight panel construction.

ArmorONE® Panel



VERSATILE SOLUTIONS

ArmorONE Panels are as versatile as they are robust, and tailored to meet the unique challenges of each application. In addition to strength and lightweighting, additive features include elasticity, impact and energy absorption, thermal management, high R-value insulation, acoustic and vibration control, and auxetic properties that enable common materials to conform, convey, and withstand uncommon forces and weight.

Ask us what we can do for you: ArmorONE@armorytechnologies.com

SUSTAINABILITY

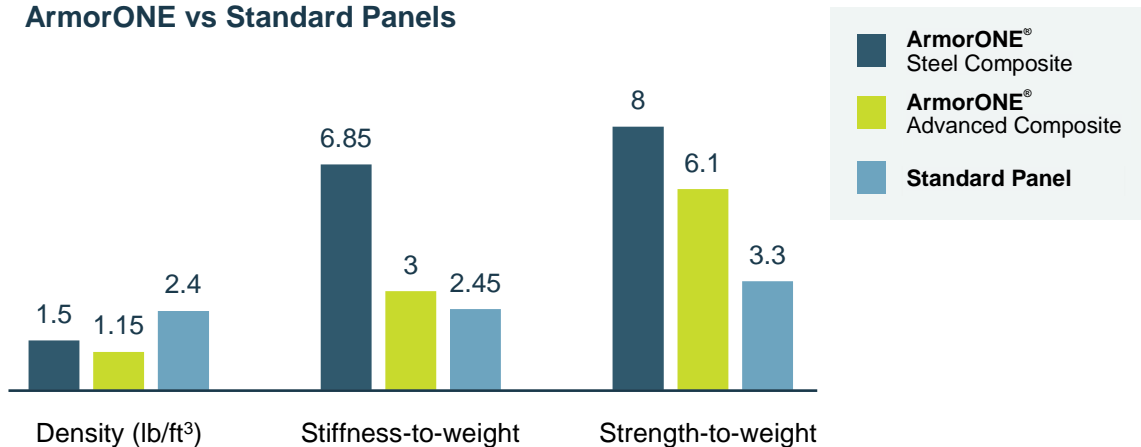
We are committed to doing better within our organization and helping others fulfill their own social and environmental responsibilities.

Our sustainable practices and products include:

- **Recycled Materials:** Our core technology uses up to 50% recycled materials. 100% of the polymer offcuts produced during thermoforming are reground and reused.
- **Domestic Products:** We reduce our environmental impact by domestically sourcing all raw materials and manufacturing within the U.S.A.

- **Reduced Climate Impact:** Thermoforming cores eliminates harmful foam-blowing agents that are used in the production of standard panels. ArmorONE Panels also contain lower embodied CO₂ compared to standard HDPE foam panels.
- **Greater Efficiency:** ArmorONE Panels are up to 64% lighter than the conventional composite panels on the road today. In transportation that means less fuel and fewer emissions—or more MPG and freight. Lighter panels promote fuel savings by offsetting the added weight of aerodynamics components, which improves MPG for long-haul trailers. Lighter panels also promote electrification by offsetting extra battery weight, which increases range and capacity for electric trucks. For long-distance drivers who stay overnight, ArmorONE panels compensate for the added weight of a sleeper cabin. For building materials and body shops, lighter means less labor, faster builds and repairs, and a higher ROI.

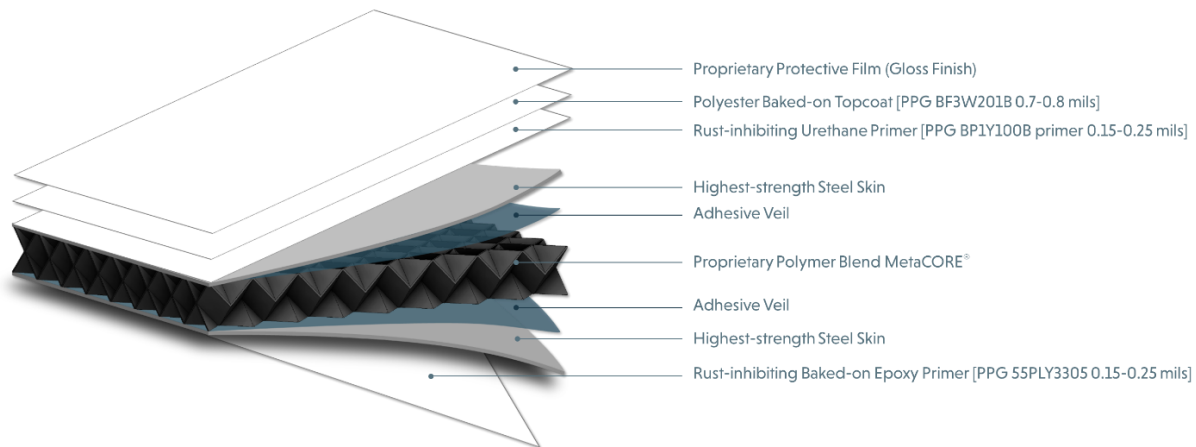
ArmorONE vs Standard Panels



Panel Design

SMARTER CORES. BETTER PANELS.

ArmorONE Panels are uniquely fabricated using MetaCORE® and bonded to proprietary high-strength skins to deliver the next generation of performance panels.



PANEL CONSTRUCTION

MetaCORE®

A smarter core, created with Origami Composite technology developed through R&D with NASA and the National Science Foundation. Origami Composites harness the power of geometry to enhance materials with advanced functionality.

High-Strength Steel Skins

For maximum-strength lightweighting, ArmorONE utilizes proprietary steel skins of the highest strength to withstand the most demanding conditions.

Advanced Composite™ Skins

For ultralight strength, ArmorONE Advanced Composite skins are engineered with favorable mechanical properties to suit high-performance applications.

Our Advanced Composite skin is a proprietary engineered material composed of a thermoplastic matrix interwoven with continuous glass filaments. Advanced Composite is not FRP or fiberglass. Fiberglass and FRP are composed of a thermoset with fibers or crushed glass particles, forming a permanently hardened chemical bond when cured. As such, they are non-recyclable, impossible to re-mold, and require sanding to repair.

In contrast, Advanced Composite is easily patched and repaired with heat and remolding, a method that avoids dangerous airborne particles.

PANEL COATINGS

ArmorONE offers durable, glossy finishes in a range of formats and colors for Steel or Advanced Composite Panels. Surfaces are easily cleaned and maintained with conventional non-abrasive detergents.

Paint Finish for Steel Composite Panels

ArmorONE Steel Composite Panels have a glossy paint finish that provides lasting durability and performance inside and out, with a 15-year limited warranty. Initial surface treatment promotes coating adhesion, followed by surface priming, then roll coating for uniform surface coverage using a polyester, baked-on topcoat. The result is a strong surface that resists scratching, marking, marring, staining, moisture, salts, corrosion, chalking, and fading.

Our ArmorONE standard coil-coated, PPG white, polyester topcoat has a thickness of 0.001–0.0013" (0.4–0.52 mm). Matching paint is available for field repair.

Basic Finish for Advanced Composite Panels

ArmorONE Advanced Composite Panels have a durable and damage-resistant finish that is inherent in panel construction. It's the most economical and sustainable finish option, ideal for interior walls or applying vinyl or paint wraps. Basic finish is resistant to scratches, marks, stains, moisture, salts, corrosion, chalking, and fading.

Gloss Finish

ArmorONE Advanced Composite Panels are also available with a durable glossy finish, in a range of colors. Gloss finish features anti-UV and anti-cracking technology that resists scratches, marks, stains, moisture, salts, corrosion, chalking, and fading.

Paint Wraps

Paint wraps are a novel technology that features a multi-layer urethane film with damage-resisting and self-healing properties. Removable like vinyl, but thicker and more resilient, paint wraps provide a sleeker, automotive-grade finish with UV protection. Contact us for information or samples at: ArmorONE@armorytechnologies.com.

Vinyl Wraps

High-quality vinyl wraps provide durable, removable protection. They are easy to apply, more affordable than paint finishing, and provide cost-effective flexibility for changing designs to accommodate promotional needs.

FINISH OPTIONS

			
BASIC Advanced Composite	GLOSS Advanced Composite	GLOSS Steel Composite	WRAPS Steel or Advanced Composite
The most economical and sustainable option, ideal for interiors or wraps.	Durable, glossy thermoplastic finish with anti-UV and anti-cracking technology, available in a range of colors.	PPG polyester baked-on topcoat providing a durable, glossy finish in a range of colors.	<p>Paint Wraps The latest in automotive-grade finishing technology, with advanced self-healing and damage-resisting properties.</p> <p>Vinyl Wraps Durable and cost-effective for protection and promotional display.</p>

SPECIFICATIONS

Following are specifications typical of ArmorONE Panels using an acrylonitrile butadiene styrene MetaCORE core with steel or Advanced Composite skins.

Steel Composite with MetaCORE	Advanced Composite with MetaCORE
Galvanized Steel (hot dip G60 to G90)	Continuous glass fiber multiaxial laminate
Minimum 80,000 psi steel yield strength	54,000 psi laminate yield strength
Thermoplastic ABS MetaCORE	Thermoplastic ABS MetaCORE

PROPERTIES

Nominal panel thickness ranges from 0.26–0.98” (6.5–25 mm). The following are **typical** engineering properties of ArmorONE Panels using an acrylonitrile butadiene styrene MetaCORE with Steel or Advanced Composite skins:

TYPICAL	Steel Composite Panel		Advanced Composite Panel	
	U.S.	Metric	U.S.	Metric
Nominal panel thickness	0.35 in	9mm	0.40 in	10mm
Standard width	49 in	1.25m	49 in	1.25m
Standard length	107 in	2.72m	107 in	2.72m
Areal weight	1.4 lb/ft ²	6.8kg/m ²	1.15 lb/ft ²	5.6 kg/m ²
Flexural rigidity ¹	21,242 lb-in	2400 Nm	12,692 lb-in	1434 Nm
Skin tensile strength	120 ksi	827 MPa	54 ksi	372 MPa
Puncture resistance ²	355 lb-in	40 J	309 lb-in	35 J

¹ Flexural rigidity measures the bending stiffness of a composite panel (ASTM D7249).

² Total energy absorbed during puncture.

TOLERANCES

Typical tolerances are given below. Refer to your specific product prints for the actual tolerances of your panels.

Thickness	+/- 0.080” Regardless of core depth
Length	+/- 0.125”
Width	+/- 0.125”
Squareness	+/- 0.1875” Diagonal measurements tolerance (face of panel)
Skin Alignment	-0.0625”, +0.03125”
Flatness	Camber or lateral bow: 0.016” per 8’ Transverse bow: 0” +/- 0.125” in 49”

PACKAGING AND SHIPPING

AarmorONE products pass a quality inspection prior to leaving the manufacturing facility. Panels are professionally packaged and carefully transported via flatbed or dry van trailer by a preferred freight carrier.



WARNING: Products subject to damage if not handled properly.

Take extra care to protect panels from damage during transport and storage. The steel edges of shiplap steel composite panels are susceptible to bending and deforming.

The approximate maximum weight of a load is 3,000 lb. When using a forklift to move pallets of panels, we recommend approaching from the long axis for load balancing and stability.

If it is necessary to load or unload from the narrow edge of a pallet, forklift extensions are required to properly support and balance the long load.

Unbalanced and excess contact between forklift and pallet can result in damage to the panels.

Panel Cutting

Cutting results vary depending on equipment, condition, and settings. Follow manufacturer instructions and safety guidelines. Always wear appropriate personal protective equipment including safety glasses, gloves, and a dust mask to protect against airborne particles.

Prior to cutting actual panels, we recommend using ArmorONE Panel samples to test and calibrate your equipment and settings.

We recommend using tape along the cut line to limit chipping on Advanced Composite Panels.

Because of the unique core structure, we do not recommend shearing ArmorONE Panels. Following are best practices for cutting ArmorONE panels.

SAWING

ArmorONE Panels are readily cut with a hand or table saw.

Steel Composite Panels require a metal-cutting circular saw with a carbide blade or blade for metal cutting. A reciprocating saw will yield a rougher cut and requires the panel remain flat and stable during cutting. Using lower pressure pneumatic hold-downs, as well as a wood shim between the hold down and the panel, can help prevent movement and damage to the panel.



For Advanced Composite panels, we recommend using a thin kerf construction wood saw blade, with the blade reversed, using light and evenly applied pressure. We recommend using masking tape on the cutline to ensure a clean cut, and to minimize splintering and chipping of the finish. Rough edges can be sanded with 120/180 grit paper.

	Steel Panels	Advanced Composite Panels
Smooth Cut	metal-cutting circular saw	circular saw
Rough Cut	reciprocating saw	
Blade	metal-cutting blade	thin kerf, 6½-inch 60-teeth Ultra Finish carbide blade [D0660]

CNC CUTTING

Steel and Advanced Composite panels can be machine cut or routed using recommended settings. Observe machine tolerances. Cutting Steel panels slower than recommended can

leave a ragged edge, while cutting faster can cause burn, poor cut quality, and screeching from the tool contacting the material.

ROUTING

	Steel Composite Panel	Advanced Composite Panel
Router	Kimla (BPF)	Kimla (BPF)
Bit Size	Bit - X-Edge (XS2052) ¼"	Bit - X-Edge (XO2010) ½"
Feed Rate	200 IPM (Climb)	100 IPM (Conventional)
Plunge Rate	100 IPM	100 IPM
Spindle Speed	17,000 RPM	12,000 RPM
Number of Passes	1	1
Misting	Yes (Liquid-X)	No

DRILLING

	Steel Panels	Advanced Composite Panels
Bit Type	high-speed steel or carbide-tipped	carbide-tipped
Bit Size	0.2" (5 mm) radius	e.g. 0.2" (5 mm) radius
Point Angle	118 degrees	e.g. 118 degrees
Speed	Moderate up to 2500 RPM	Low to moderate up to 2500 RPM

PUNCHING

ArmorONE Panels are designed with an optional frame for punching. We recommend only perimeter punching a panel with this frame.

MetaCORE offers little resistance to punching. Ensure dies are sharp.

Because panel material composition is unique, some traditional punching guidelines, such as hole diameter to panel thickness ratio or percentage part thickness equal to punch clearance, do not apply.

Prevent movement by using lower pressure pneumatic hold-downs set to the appropriate pressure, with wood shims between the hold down and the panel to help prevent damage to the panel.

In the event of spring back, whereby hole diameter shrinks after punching, a larger hole may be punched or drilled out to reduce the force required to insert rivets or bolts.



WARNING: Excessive pressure on panel will mar the finish and/or dent the panel.

Panel Assembly & Replacement

PANEL JOINTS

Panels with parallel joints have skins cut flush with the core. The edges can be joined by a logistics post and mechanical fasteners.

Panels with shiplap joints have overlap edges with skins extending at least 1" beyond the core. These edges can be joined by alternating the inside/outside face of the panel and overlapping the edges. A shiplap edge may be sheared off to create a flush edge (e.g. at the beginning or end of a wall assembly).



parallel joint

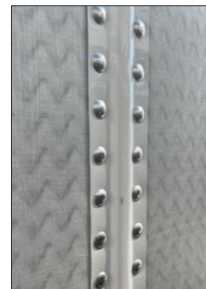


shiplap joint

MECHANICAL FASTENERS

Rivets

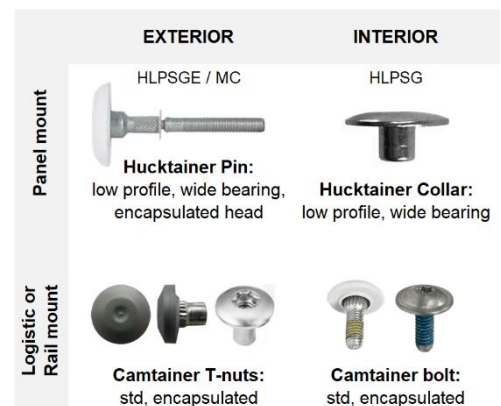
Riveting is a common and reliable method of panel attachment. Consider the surface material when selecting rivets. Common types include solid and tubular, aluminum buck rivets and pull rivets, as well as blind rivets for interior surfaces. Rivets and logistic strips that are recessed, set flush, or tapered will provide a smooth, snag-free surface. Rivet hole patterns can be punched or drilled to suit the application configuration.



Standard best practices for mechanical fasteners can be used without modification for replacing ArmorONE panels, both Steel and Advanced Composite. Refer to OEM-specific instructions.

Bolts

We also recommend Hucktainers (Huck bolts or lock bolts) and Camtainers (T-nuts and bolts) as strong, reliable attachment methods. These low-profile fasteners deliver superior vibration resistance. Huck and Cam fasteners provide consistent clamp pressure that distributes force and load evenly without crushing or crazing the panel. Although smaller heads are effective, medium and wider heads cover more surface area to prevent damage. T-nuts and bolts can also be



torqued to achieve an ideal fit without panel distortion. To accomplish this consistently, we recommend using a drill with a clutch setting adjusted to the appropriate amount of torque.

ADHESIVES

Adhesive Options

Attachment with adhesives is common practice, particularly for shiplap panel applications. Adhesive fastening reduces or eliminates hole-punching and provides a weatherproof seal along shiplap seams. In some applications, adhesive fastening can be a faster, easier alternative to mechanical fasteners.

We recommend the following adhesives for use with ArmorONE panels. We strongly recommend consulting your adhesive provider to identify the right adhesive for your application.

Manufacturer	Adhesive	Type	Part Number
3M™	VHB™	Tape	CV62F
3M™	Scotch-Weld™ Structural Plastic	Liquid	DP8010

Tape Assembly

Armory Technologies is experienced in adhesive assembly. For on-site assistance or training, contact us at: ArmorONE@armorytechnologies.com

3M™ VHB™ Tape is not recommended for class 8 trailer assembly.

Visit the 3M website to review tutorial videos for your application at:

www.3m.com/3M/en_US/vhb-tapes-us/applications/transportation

or www.3M.com/vhbboxtruck

Follow the manufacturer's instructions exactly for applying tape:

www.3m.com/3M/en_US/vhb-tapes-us/resources/applying-3m-vhb-tapes

Best practices developed with 3M for using Adhesive Tape:

1. Ensure materials are used at a temperature of 60°F or above.
2. Wear appropriate PPE.
3. Make alignment marks on panel(s) for accurate placement.
4. Scuff joint surfaces with 120/180 grit pads or paper.
5. Wipe joint surfaces clean with alcohol on a cloth.
6. Apply 3M™ Tape Primer 94.
7. Apply 3M™ VHB™ Tape along shiplap edge, pressing firmly and ensuring alignment.
8. Use a V-300 Laminate Roller to press along bond lines after panel is attached.



Liquid Adhesive Assembly

Armory Technologies is experienced in adhesive assembly. For on-site assistance or training, contact us at: ArmorONE@armorytechnologies.com

Visit the 3M website to review tutorial video for your application at:
www.3m.com/3M/en_US/p/d/b40066429

Follow the manufacturer's instructions exactly for applying liquid adhesive:
www.3m.com/3M/en_US/p/d/b40066429

Best practices developed with 3M for using liquid adhesive:

1. Ensure materials are used at an application temperature of 60°F or above.
2. Wear appropriate PPE.
3. Make alignment marks on panels for accurate placement.
4. Lightly scuff joint surfaces with 120/180 grit pads or paper.
5. Wipe joint surfaces clean with alcohol on a cloth.
6. Apply adhesive along shiplap edge in a zig-zag bead line.
7. **Working time is 8 minutes** requiring a fast application.
Armory standard time for liquid adhesive application and panel mounting is 4 min per panel.
8. Clamp the bonded joint until adhesive sets.



3M™ Scotch-Weld™ Structural Plastic Adhesive DP8010

490 ml Cartridge UPC: 0-00-51115-81453-2
Unit Stock #7100036723 (1 cartridge)
Case Stock #7100036719 (36 cartridges)

Applicator Gun:

3M™ Scotch-Weld™ Dual Drive Pneumatic 10:1 Applicator (option to use manual gun)

490 ml Applicator UPC: 00-638060-40919-0
Unit Stock #7100244681 (1 applicator gun)



Static Mixing Nozzle:

3M™ Scotch-Weld™ EPX Helical Orange 9.5" or 3M™ Epoxy Mixing Nozzle S-22872 *

490 ml Nozzles UPC: 0-00-51115-69042-6
Unit Stock #:7100015959 (1 nozzle)
Case Stock #7100304367 (36 nozzles)

** works with pneumatic or manual applicators*



Sealing

While adhesive fastening eliminates hole-punching and provides a seal along shiplap seams, caulking and sealing is typically done behind riveted or bolted seams and along a frame or base rail, to provide a weatherproofing barrier.

Notice of Disclaimer

These instructions will be effective if the materials are maintained, operated, and used in accordance with Armory's or other suppliers' recommendations, specifications, and standard industry practice; and not involved in any type of accident; not subject to abuse, alteration, misuse, or damage of any kind; and were not subject to improper service, repair, assembly, or disassembly.

You may have occasion to speak with an Armory representative. But their oral statements do not change the written descriptions of the products or the instructions contained in this document. You will bear the risk of injury or property damage if you deviate from the instructions contained in this document.

Armory also adopts and refers you to all of the specifications and disclaimers in its Limited Warranty that applies to all purchases of its products.

CONTACT & SAMPLES

For information or samples, please contact Armory Technologies:

ArmorONE@armorytechnologies.com

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Courtesy of SRS National

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