EQUIPMENT ARMOR INC.

AN EXAMPLE OF MISDIRECTION AND COMPLACENCY IN THE MINING INDUSTRY

Tim Nickodemus
President
Monolithic Sheet – a sheet of standard polycarbonate.

Laminated Sheet – Polycarbonate sheet consisting of multiple layers.

Lexan, Makrolon and Palguard are trade names for polycarbonate.

Lexguard is a trade name of laminated polycarbonate.

Bracket – bolts to a machine.

Sub-frame (black) mounts to brackets and is black.

Shield Frame (yellow) mounts to the sub-frame and holds the Equipment Armor Shield.

Equipment Armor Shield – Composite polycarbonate assembly.

Cover sheet or sacrificial layer– 1/8 sheet of high optic coated polycarbonate.

MR – Mar-resistant Coating.

UL 752 – Ballistic Rating - Level 1 – 9mm – Level 2 – 357 .

Fissures – Microscopic breaks in molecular chains.

Embrittlement – Structural weakening at the molecular level of a sheet of polycarbonate.
AUGUST 2015 - PROJECTILE PENETRATED ¼ SHEET OF LEXAN MOUNTED ON HAMMER
PASSED THROUGH THE INSIDE OF THE WINDSHIELD IN FRONT OF OPERATOR
AND PASSED OUT THE BACK GLASS
THE PROJECTILE
AREA - 2”X1.5”X1.0”, WEIGHT - .5 POUND
THE PROJECTILE PASSED THROUGH THE ¼ SHEET OF LEXAN GENERATING A CIRCULAR PATTERN COMMON WITH FISSURE DEVELOPMENT
**Knowns**

- Mass of Projectile.
- Distance from hammer to impact point.
- Materials penetrated.
- Final resting place of projectile.

**Unknown**

- Co-efficient of drag of projectile through Lexan.
- Co-efficient of drag of projectile through glass.
A projectile (approximately ½ pound) separated from the hammer point and traveled through a ¼ sheet of Lexan (polycarbonate).

The projectile continued traveling through the front windshield of the cab and out the back glass missing the operator by inches.

The projectile was found approximately 60 yards (180 feet) from the back of the cab.

The projectile was traveling at a speed of 240 to 400 miles per hour.

If the operator of the machine had been struck it would have resulted in a fatality.

IN SUMMARY
WHAT ARE THE FACTS
Our focus has been to protect the windshield of the machine from damage.

Our focus should be on protecting the operator of the machine from serious injury or death.

Both the hammer manufacturer (NPK) and the point manufacturer gave warnings on their tools regarding shielding.
NPK HAMMER WARNING - • DO NOT OPERATE HAMMER WITHOUT AN IMPACT RESISTANT GUARD BETWEEN HAMMER AND OPERATOR. NPK RECOMMENDS LEXAN® OR EQUIVALENT MATERIAL, OR STEEL MESH.
ALLIED HAMMER POINT
THE OPERATOR MUST BE FULLY PROTECTED BY A PROTECTIVE SHIELD BETWEEN THE OPERATOR AND THE HAMMER.
NPK Service Department – Stated that there are no standards, but a \( \frac{1}{4} \)” to \( \frac{1}{2} \)” sheet of Lexan is known to work in protecting the windshield from flying rock.

Allied Construction Products Service Department stated that there are no industry standards but they recommend a bullet-resistant Lexan.
WE HAVE BECOME COMPLACENT

¼” POLYCARBONATE

½” POLYCARBONATE
After contacting SABIC (formerly GE Polymer) their market manager – Mr. Joe Brown, agreed to visit one of our local mines to review the application. During his visit he discussed the following standards:

- Bullet Resistant - UL Rating 752.
- Forced Entry – UL Rating 972.
- Blast Resistant – UL Rating is under development, it deals with maintaining building structure after an explosion.
The SABIC Engineering Group made the following recommendations:

- The use of Lexguard (laminate) MPC375 (.375 thickness – 3/8 inch) (UL752 - Level 1 rating - 9MM) for hammers up to and including 8000 lbs..

- The use of Lexguard (laminate) MPC500 (.500 thickness – ½ inch ) (UL752 - Level 2 rating - .357) for hammers over 8000 lbs..

- The use of coated sheet would double the life of the sheet as compared to a non-coated sheet.

- Although this is a step far above the current level of protection (a ¼” or ½” sheet of polycarbonate), it is by no means a guarantee that this will offer protection against any type of incident that may occur in the mining industry. Currently, in the forestry industry for example, some protective shields are as much as 1 ¼" thick to protect against teeth coming off of large clearing saws.
BALLISTIC FIELD TESTING
MORE QUESTIONS THAN ANSWERS.
BUT IN THE END – DIRECTION

- Actual Field Testing of Sabic’s recommendations.
  - Test #1 – Monolithic and laminated Sheet.
  - Test #2 – Level 1 Testing.
  - Test #3 – Level 2 Testing.
  - Test #4 – Test Protocol Testing.
<table>
<thead>
<tr>
<th>Test #</th>
<th>Date</th>
<th>Product</th>
<th>Base Thickness</th>
<th>Cover Product</th>
<th>Cover Thickness</th>
<th>Caliber</th>
<th>Grain Type</th>
<th>Distance</th>
<th>Temp</th>
<th>Humidity</th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>11/6/2015</td>
<td>Monolithic</td>
<td>1/2&quot;</td>
<td>N/A</td>
<td>N/A</td>
<td>0.357</td>
<td>JHP</td>
<td>15 FT.</td>
<td>73</td>
<td>76%</td>
<td>FAIL</td>
</tr>
<tr>
<td>2</td>
<td>11/6/2015</td>
<td>Monolithic</td>
<td>1/2&quot;</td>
<td>N/A</td>
<td>N/A</td>
<td>0.357</td>
<td>JHP</td>
<td>15 FT.</td>
<td>73</td>
<td>76%</td>
<td>FAIL</td>
</tr>
<tr>
<td>3</td>
<td>11/6/2015</td>
<td>Laminate</td>
<td>1/2&quot;</td>
<td>N/A</td>
<td>N/A</td>
<td>0.357</td>
<td>JHP</td>
<td>15 FT.</td>
<td>73</td>
<td>76%</td>
<td>FAIL</td>
</tr>
<tr>
<td>4</td>
<td>11/6/2015</td>
<td>Laminate</td>
<td>1/2&quot;</td>
<td>N/A</td>
<td>N/A</td>
<td>0.357</td>
<td>JHP</td>
<td>15 FT.</td>
<td>73</td>
<td>76%</td>
<td>FAIL</td>
</tr>
<tr>
<td>5</td>
<td>11/6/2015</td>
<td>Monolithic</td>
<td>1/2&quot;</td>
<td>N/A</td>
<td>N/A</td>
<td>9mm</td>
<td>FMJ</td>
<td>15 FT.</td>
<td>73</td>
<td>76%</td>
<td>FAIL</td>
</tr>
<tr>
<td>6</td>
<td>11/6/2015</td>
<td>Monolithic</td>
<td>1/2&quot;</td>
<td>N/A</td>
<td>N/A</td>
<td>9mm</td>
<td>FMJ</td>
<td>15 FT.</td>
<td>73</td>
<td>76%</td>
<td>FAIL</td>
</tr>
<tr>
<td>7</td>
<td>11/6/2015</td>
<td>Laminate</td>
<td>1/2&quot;</td>
<td>N/A</td>
<td>N/A</td>
<td>9mm</td>
<td>FMJ</td>
<td>15 FT.</td>
<td>73</td>
<td>76%</td>
<td>FAIL</td>
</tr>
<tr>
<td>8</td>
<td>11/6/2015</td>
<td>Laminate</td>
<td>1/2&quot;</td>
<td>N/A</td>
<td>N/A</td>
<td>9mm</td>
<td>FMJ</td>
<td>15 FT.</td>
<td>73</td>
<td>76%</td>
<td>FAIL</td>
</tr>
</tbody>
</table>

**TEST #1 - MORE RESEARCH NEEDED**
LEXGARD® MPC500 LAMINATE

Offering innovative solutions for bullet, blast, impact and wind resistance.

Material shall have a flexural strength not less than 13,500 psi (ASTM D790); 83% light transmission (ASTM D1003). Material shall be a total thickness of .500" ± 5%. Material which includes an abrasion resistant surface to improve service life performance, and must conform with IBCO, BC, and SBCCI Model Building Codes as an Approved Light Transmitting Plastic with a C1 (CC81) flammability performance level.

LEXGARD® MPC500 laminate alone maintains no Underwriters Laboratories (UL 752) ballistic rating, but is used as a component in systems laminated safety glass and an appropriate air space to achieve varying ballistic ratings.

Available Colors:
- Clear (112)
- Grey (713)
- Bronze (5109)
- Green (31035)

Standard Sheet Sizes (in inches):
- 36 x 96
- 48 x 96
- 48 x 48
- 48 x 60
- 48 x 72

TYPICAL PROPERTY VALUE
- Gauge/Tolerance: .500" ± 5%
- Weight: 3.1 lbs. per sq. ft.
- Shading Coefficient: 1.01 Clear
- U-Factor: .82
- Percent Light Transmission (Average Gardner Value): 83%

DESCRIPTION
- LEXGARD® MPC500 laminate is a three-ply polycarbonate laminate primarily developed for security protection.
- LEXGARD® MPC500 laminate provides dependable protection and exceptional abrasion resistance.
- UL Ballistic protection, LEXGARD® MPC500 laminate must be used behind glass as a component in a replaceable glass system.

SPECIFICATIONS
- Three-ply, clear, extruded polycarbonate of the following construction:
  - 1/8" Polycarbonate sheet with an abrasion resistant surface
  - Polyurethane interlayer
  - 1/4" Polycarbonate sheet
  - 1/8" Polycarbonate sheet with an abrasion resistant surface

LEXGARD® MPC500 laminate, when used as a stand-alone glazing product, meets the requirements of HPW-TP-0500.00 for:
- Level A — Ballistic material (.38 Special handgun)
- Level D (Step 14) — Forced entry material

LEXGARD® MPC500 laminate, when used as a stand-alone glazing product, complies with the requirements of ASTM F1233-98 for:
- Class III (Step 15) — Forced Entry Protection

GLAZING INFORMATION
- Structural security metal framing rated to the appropriate bullet resistant level is suggested.
- A minimum edge engagement of one (1) inch is recommended with allowances for material expansion. (Larger lites may require deeper engagements.)
- The use of compatible sealant or gasket material is recommended, with flexible material on both sides of the laminate.
- Do not use PVC gasket material.
- Do not use setting blocks made from PVC, EPDM, or rubber materials. Santoprene® rubber should be suggested. If these other rubber products are required, a protective barrier material should be used between the rubber setting lock and the LEXGARD® sheet edge.

Santoprene® is either a registered trademark or trademark of Exxon Mobil. Lexgard® is either a registered trademark or trademark of Global Security Glazing.
<table>
<thead>
<tr>
<th>Test</th>
<th>Date</th>
<th>Plate</th>
<th>Base Product</th>
<th>Base Thickness</th>
<th>Cover Product</th>
<th>Cover Thickness</th>
<th>Caliber</th>
<th>Grain</th>
<th>Type</th>
<th>Distance</th>
<th>Temp</th>
<th>Humidity</th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>11/8/2015</td>
<td>1/2&quot;</td>
<td>Monolithic</td>
<td>Monolithic</td>
<td>1/4&quot;</td>
<td>9mm</td>
<td>124</td>
<td>FMJ</td>
<td>15 FT.</td>
<td>54</td>
<td>47</td>
<td>Fail</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>11/8/2015</td>
<td>1/2&quot;</td>
<td>Monolithic</td>
<td>Monolithic</td>
<td>1/4&quot;</td>
<td>9mm</td>
<td>124</td>
<td>FMJ</td>
<td>15 FT.</td>
<td>54</td>
<td>47</td>
<td>Fail</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>11/8/2015</td>
<td>1/2&quot;</td>
<td>Laminate</td>
<td>Monolithic</td>
<td>1/4&quot;</td>
<td>9mm</td>
<td>124</td>
<td>FMJ</td>
<td>15 FT.</td>
<td>54</td>
<td>47</td>
<td>Fail</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>11/8/2015</td>
<td>1/2&quot;</td>
<td>Laminate</td>
<td>Monolithic</td>
<td>1/4&quot;</td>
<td>9mm</td>
<td>124</td>
<td>FMJ</td>
<td>15 FT.</td>
<td>54</td>
<td>47</td>
<td>Fail</td>
<td></td>
</tr>
</tbody>
</table>

The first shot held but subsequent shots failed.

This test revealed that fissures were developing after the first shot.
<table>
<thead>
<tr>
<th>Test</th>
<th>Date</th>
<th>Plate</th>
<th>Product</th>
<th>Thickness</th>
<th>Product</th>
<th>Thickness</th>
<th>Caliber</th>
<th>Grain</th>
<th>Type</th>
<th>Feet</th>
<th>Temp</th>
<th>Humidity</th>
<th>PASS/FAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>11/8/2015</td>
<td>Monolithic</td>
<td>1/2&quot;</td>
<td>Monolithic</td>
<td>1/4&quot;</td>
<td>0.357</td>
<td>158</td>
<td>JHP</td>
<td>15</td>
<td>54</td>
<td>47</td>
<td>Pass</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>11/8/2015</td>
<td>Monolithic</td>
<td>1/2&quot;</td>
<td>Monolithic</td>
<td>1/4&quot;</td>
<td>0.357</td>
<td>158</td>
<td>JHP</td>
<td>15</td>
<td>54</td>
<td>47</td>
<td>Pass</td>
<td></td>
</tr>
</tbody>
</table>

The test revealed that ½” monolithic sheet was strong enough to use as a base for shields.

**TEST #3**
The test confirmed UL752 testing protocol.
From the Ballistic Testing we learned:

- Test #1 – A composite shield is needed to dissipate energy.
- Test #2 – Fissures developed after the first catastrophic incident.
- Test #3 – The actual projectile was critical to real world testing.
Testing protocol:

- Use actual pieces of a hammer point that have been cut from an existing point to approximately the size of the projectile that was found.
- Shoot the sample projectiles at blast plates constructed of composite monolithic sheets.
- Attempt to obtain velocities between 240 mph and 400 mph.
We considered two test labs:

- Sabic – Boston, MA.
- Intertek – Springdale and York, PA.

  - Sabic could only mount projectiles on a standard sabot for shooting so they declined.
  - Intertek worked with us to develop the canon barrel we needed to shoot our projectile.
Testing Lab;

- Intertek – Architectural Testing – Springdale, PA
  - Cannon designed to shoot the “Dade County and Miami 2x4” for hurricane testing resulted in only 125 mph with our projectile.

- Intertek – Ballistic Testing – York, PA
  - They built a cannon to shoot our projectile but we only achieved a level of 300 mph in testing, before blowing the sabot that holds the projectile apart.
AIR CANNON

200 psi air tank with butterfly valve and 8 foot long 6” Cast Iron Barrel.
LASER SPEED METERS

Measures speed by passing through the first meter and triggering the computer to measure time until the second meter is tripped. This in turn provided a foot per second reading that was then used to calculate MPH.
A specially designed sabot was built to accommodate the projectile. It looks very much like a shot gun shell’s wadding.
INSIDE OF SABOT

Projectile was wrapped in paper which held it in place in the Sabot. The Sabot was then placed in barrel and rammed approximately 6 feet into the barrel.
THE TEST SUBJECTS

- Plate 1 – Base Plate
  - Standard sheet of ½ inch polycarbonate

- Blast Plates 34x60 (composite)
  - Plate 2 – Polycarbonate Composite Shield.
  - Plate 3 – Laminated Base Composite Shield.
Plate 1 was shot three times, 235, 224, and 243 mph. The first two shots showed impact points but no noticeable cracking. However, at the molecular level there were fissures developing throughout the plate.
PLATE 1 – THIRD SHOT

On the third shot, 243 mph, the plate exploded. There was flying shards all over the lab. It was a very dangerous situation and a totally unexpected result.
The explosion of Plate #1 as a result of shot 3, documented the circular pattern prominent in fissure development throughout the testing.
PREPARING TO TEST THE SHIELD/BLAST PLATES, SECURING THE FRAME

An actual frame was used for the testing. It was attached to a wooden/metal buck system for support.
THE FRAME READY FOR TESTING.

This is a stainless steel frame made specifically for testing the shield at the lab.
PLATES #2 AND #3 AFTER TESTING
Test Results

- Shot 1 – 406 fps, 276mph
  - Results – Pass – Cover plate penetration.
- Shot 2 – 256 fps, 175mph
  - Results – Pass.
- Shot 3 – 379 fps, 258mph
  - Results – Pass.
- Shot 4 – 369 fps, 252mph
  - Results – Pass – Cover plate penetration.

Monolithic Composite Plate
Test Results

- Shot 1 - 376 fps, 256 mph
  - Results – Pass.
- Shot 2 – 250 fps, 175 mph
  - Results – Pass.
- Shot 3 – 325 fps, 222 mph
  - Results – Cover plate penetration – physical representation of fissures.
- Shot 4 – 356 fps, 243 mph
  - Results – Pass – Visual representation of fissures.
- Shot 5 – 438 fps, 299 mph
  - Results – Pass – Visual representation of fissures.

PLATE #3

Laminated Composite Plate
Maintains a UL752 Level 2 Ballistics Rating for .357.
- Plate 2 showed the greatest amount of base deflection with Shot #4 at 252 mph.
- Plate 2 did not show the amount of fissuring that was shown by Plate 3.
- Plate 3 did not show significant base plate deterioration.
- Plate 3 showed fissuring in the cover plate at each impact plus an actual break out on Shot #3 at 222 mph.

**PLATE 2 MONOLITHIC VS. PLATE 3 LAMINATE**
Both the \( \frac{1}{4} \) and \( \frac{1}{2} \) standard polycarbonate sheet alone is inadequate to provide catastrophic incident elimination in themselves.

Given the difference in projectile penetration from 175 mph and 275 mph, the composite shield assembly should be capable of withstanding impact up to 400 mph.

The life cycle of a composite polycarbonate shield should be limited to 1 year due to constant exposure to the elements generating embrittlement, and due to the development of fissures during normal operating conditions in the mining environment.

A composite shield should be inspected regularly to identify both embrittlement and fissuring.

**FINAL SHIELD RECOMMENDATIONS**
CURRENT TESTING PROTOCOL INCLUDES BALLISTIC TESTING – UL752 LEVEL 1 (9MM) AND UL752 LEVEL 2 (.357).
FRAME DEVELOPMENT
EXCAVATOR CONSIDERATIONS

- Size of shield needed and contour of cab.
- Rops vs. Fops.
- Number of bosses and the weight they can support.
VERSION #1 - THE “ORIGINAL” EQUIPMENT ARMOR SHIELD, WELD-ON FRAME AND MOUNTS.
THE INHERENT PROBLEMS WITH VERSION #1 WERE IN THE APPLICABILITY OF THE FRAME

- 1. Weld on only design.
- 2. Violation of ROPS certification.
- 3. Applicable to older cabs only (FOPS).
Custom mounts bolted directly to Cab Bosses.

Maintains integrity of ROPS Certification.

Sub Frame with adjustable mounted Hinges, T-Locks, and Locking Pin bolts directly to the mounting brackets.

Shield frame mounts directly on three barrel hinges for ease of service.
SERVICE AND ACCESSIBILITY

THE EQUIPMENT ARMOR SHIELD FRAME OPENS AND CLOSES LIKE A DOOR ALLOWING FOR EASY ACCESS TO THE WINDSHIELD FOR CLEANING.
SHIELD OPTIONS

Option #1 – Shield Frame Wrap.

Option #2 – 1/8” sacrificial layer.
EQUIPMENT ARMOR PROTECTION PACKAGE

Komatsu PC 360
EQUIPMENT ARMOR STAINLESS STEEL FRAME MOUNTED ON CAT 374D.
CAT – 336F
HITACHI 350
IN SUMMARY
THE BENEFITS OF THE EQUIPMENT ARMOR PROTECTION PACKAGE

1. Unmatched Visibility through high optics polycarbonate.
2. Superior Stopping power - UL 752 - Level 1 (9mm) and Level 2 (.357).
3. Fast field service/No down time on machine - takes less than 15 minutes to replace a shield.
4. Hinged shield frame door - allows for easy access to windshield for cleaning.
5. Maintains ROPS certification on all machines - bolts directly to existing cab bosses.
6. Easily moved from machine to machine regardless of manufacturer, simply change out mounting brackets.
7. Easy cleaning with mar-resistant coating simply spray with water.
Shield Service Requirements – The Equipment Armor Protective Shield:

- can easily be cleaned by pouring clean, warm water over it. Should additional cleaning be required, see the Cleaning Instructions affixed to the Shield.

- should be inspected regularly, as part of a pre-shift program, to inspect for a broken seal, embrittlement, or visual fissures.

- should be replaced yearly due to environmental considerations, or sooner in the event of an impact breaking the seal of the unit.
Frame Service Requirements - The Equipment Armor Shield Frame and Sub Frame should be inspected at each pre-shift inspection to ensure:

- All mounting hardware is securely fastened to the cab.
- That the Sub-Frame is securely fastened to the mounts.
- All bosses and their respective welds are intact.
- All rubber T handle locks are in place and securely fastened.
- That the lock down pin is in place and secure.
EQUIPMENT ARMOR INC. - LIMITED WARRANTY

- Equipment Armor Inc., provides a One Year Limited Warranty on both the Equipment Armor Protective Shield and the Equipment Armor Brackets, Sub-Frame, and Shield Frame. The Equipment Armor Protective Shield will be guaranteed for a period of one (1) year against seal failure and against breakage from a projectile weighting up to one half a pound (8 ounces), and traveling at a speed equal to or less than 300 miles per hour. The Equipment Armor Protective Shield Frame, Sub Frame, and Brackets will be guaranteed against manufacturer’s defects for a period of one (1) year.

1) The limited written warranty applies solely to a standard installation for which the product was intended to be used for: Operator protection against flying projectiles, mounted on the front of an excavator. The Equipment Armor Protection Package is not designed to provide neither Roll Over Protection (ROPS), or Falling Object Protection (FOPS).

2) Equipment Armor Inc. warrants its products that are used correctly as an excavator guarding system when installed and maintained according to Equipment Armor, Inc.’s recommendations contained in the Installation Manual and on the Product Instruction Stickers provided with the Equipment Armor Protection Package.

3) This limited written warranty does not apply to Equipment Armor Protection Packages that have been modified in anyway or have been used in installations or applications that it has been not designed for: such as blasting protection.

4) This limited written warranty is given only to the original purchaser of the Equipment Armor Protection Package and does not extend to any subsequent purchaser or transferee. Any warranty claim hereunder must be made immediately within the warranty period by specifying the claim in writing and submitting to Equipment Armor, Inc., the original sales receipt which must contain the name and address of the purchaser, the date of purchase, the complete product name, the Shield Frame Number (found on the upper left corner of the Shield Frame (yellow frame)), and the shield number (found in the upper left corner of the shield. On request of Equipment Armor, Inc. claimant must allow the material to be inspected on site and/or return the product to Equipment Armor, Inc. for their review and testing.

5) This limited written warranty shall be Equipment Armor, Inc’s sole liability and customer’s exclusive remedy for the products and all other claims for damages are excluded. This limited written warranty is in lieu of all other warranties (except of title), written or oral, statutory, express or implied, including any limited written warranty of merchantability or fitness of purpose. This limited written warranty shall be governed by the laws of the United States of America.
EXCEPT FOR ANY EXPRESS WARRANTIES MADE BY EQUIPMENT ARMOR, INC. AND/OR ITS AFFILIATES (COLLECTIVELY “EQUIPMENT ARMOR”) PURSUANT TO ANY WRITTEN OR ORAL RECOMMENDATIONS, EQUIPMENT ARMOR HEREBY DISCLAIMS ALL OTHER EXPRESS WARRANTIES AND IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE. EQUIPMENT ARMOR MAKES NO WARRANTY OR GUARANTEE, EXPRESS OR IMPLIED, (i) THAT THE RESULTS DESCRIBED IN ANY WRITTEN OR ORAL RECOMMENDATIONS WILL BE OBTAINED UNDER END-USE CONDITIONS, OR (ii) AS TO THE EFFECTIVENESS OR SAFETY OF ANY DESIGN INCORPORATING ITS PRODUCTS, MATERIALS, SERVICES, RECOMMENDATIONS OR ADVICE.

EQUIPMENT ARMOR SHALL IN NO EVENT BE RESPONSIBLE OR LIABLE FOR ANY LOSS OR DAMAGES RESULTING FROM THE USE OF ANY OF ITS MATERIALS, PRODUCTS OR SERVICES IN EXCESS OF THE ACTUAL INVOICE COST OF ITS MATERIALS, PRODUCTS OR SERVICES.

Each user bears full responsibility for making its own determination as to the suitability of products, materials, services, recommendations, or advice provided by EQUIPMENT ARMOR for its own particular use. Each user must identify and perform all tests and analyses necessary to assure that its finished parts incorporating products, materials, or services provided by EQUIPMENT ARMOR will be safe and suitable for use under end-use conditions. Nothing in this or any other document, nor any oral recommendation or advice, shall be deemed to alter, vary, supersede, or waive any provision of this disclaimer, unless any such modification is specifically agreed to in a writing signed by EQUIPMENT ARMOR. No statement contained herein or in any other written or oral statement concerning a possible or suggested use of any material, product, service or design is intended, or should be construed, to grant any license under any patent or other intellectual property right of EQUIPMENT ARMOR, or as a recommendation for the use of such material, product, service or design in the infringement of any patent or other intellectual property right.