

EQUIPMENT ARMOR



The only field developed, ballistic laboratory tested, and operator approved excavator protection package proven to stop a ½ pound piece of hammer steel at 300 mph.



THE EQUIPMENT ARMOR PROTECTION PACKAGE

By: Equipment Armor, Inc.

Corporate Headquarters:

Equipment Armor Inc.

3331 Heritage Trade Drive

Suite 108

Wake Forest, NC 27587

Phone: 919-554-6571

Web Site: www.equipmentarmor.com

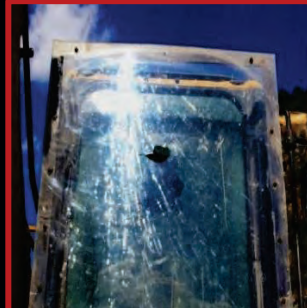
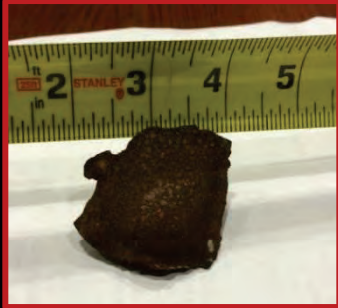
Contact: info@equipmentarmor.com

"On that fateful day, in the bottom of the pit, sitting in the cab, I knew immediately that our focus was misdirected. We should have focused on protecting the operator from injury or death, not protecting the windshield from breakage..."

An Example of Misdirection and Complacency in The Mining Industry

In August of 2015 a near miss occurred at an aggregate mine in eastern North Carolina. A ½ lb. piece of hammer steel sheared off the tool of a 16,000-lb. hydraulic hammer. Traveling between 240 and 400 MPH the projectile pierced a 1/4" polycarbonate sheet designed to protect the windshield from damage.

"We had become complacent. Even though we replaced ¼" LEXAN™ polycarbonate daily, we always thought LEXAN™ was unbreakable..."



The projectile continued through the windshield and out the back glass of the excavator, landing approximately 60 yards behind the machine. The projectile missed the operator by inches, covering him with broken polycarbonate and shattered glass. A fatality would have been recorded if he had been stuck. The misdirection in this incident was focusing on protecting the windshield instead of the operator. The complacency was thinking a ¼" sheet of polycarbonate, which was always thought to be unbreakable, was capable of stopping a ½ lb. piece of hammer steel traveling between 240 and 400 MPH.

SHIELD DEVELOPMENT - As a result of this near-miss, Equipment Armor, Inc. developed and patented the Equipment Armor Shield and Frame Package. The shield was a culmination of two years of product testing working with various types of polycarbonate, coatings, sealants, and assembly methods and materials. The Equipment Armor shield is a composite shield consisting of high optic polycarbonate utilizing a protective hard coating.



"The configuration of the Shield was showing promise, but there were too many unknowns. We had to replicate what happened in the quarry..."

INITIAL TESTING: In March of 2016 initial testing was done on the shield at York, PA based Intertek Laboratories, a specialist in ballistic testing for government and private industries on a global basis. Their engineers built an air cannon designed to shoot a ½" piece of hammer steel at the Equipment Armor Shield. The ballistic test for Equipment Armor consisted of shooting two separate shields. Shield #1 was shot four times from speeds of 175 mph to 276 mph. Shield #2 was shot 5 times at speeds of 175 mph to 300 mph. The Equipment Armor shields' design and construction was validated through this process offering protection to operators of hydraulic hammers from projectiles traveling up to 300 MPH.

The Equipment Armor Shield Package

The Equipment Armor Shield Package consists of Custom Mounting Brackets designed to maintain Roll Over Protection (ROPS) certification, the patented Equipment Armor Shield, the Sub-Frame and Shield Frame. The Equipment Armor Frame and Bracket Package are made with A36 structural steel, laser cut and formed to engineered manufacturing specifications and then powder coated. Designed to offer versatility, the frame is universally sized at approximately 36" (W) x 60" (L) allowing for transfer among different manufacturers machines simply by changing out the custom bracket system.

CUSTOM BRACKETS – To maintain ROPS certification Equipment Armor developed custom brackets designed to work with individual manufacturers cabs. The brackets bolt directly to the cab bosses and to predrilled holes in the sub-frame allowing for simple installation. For FOPS and ROPS machines that are lacking cab bosses, Equipment Armor has developed a universal bracket that can be welded directly to the excavator chassis that allows for easy installation of the sub-frame to the cab. Additional support for the top of the cab is achieved through the use of tie rod arms that adjust to the curvature of the individual machine.

"We tried welding brackets to the cab but it was a total disaster. The welder was blowing holes through the shell of the cab. And, inherently, we were violating the ROPS configuration of the cab..."

"To reduce engineering costs, we tried to develop a universal bracket system. It was a failure. However, it highlighted the design and manufacturing weaknesses of the shield frame and sub-frame..."



THE SUB-FRAME – The Sub-Frame is gusseted on all four corners with oversized welds in each of the interior corners for added strength. In addition to the reinforcement gussets, the bottom of the sub-frame is reinforced with a welded doubler-plate that is designed to withstand the stress and eliminate the fatigue being transferred to the bottom of the frame.

THE SHIELD FRAME - As with the Sub-Frame all four corners of the Shield Frame have welded gussets for additional strength. The top of the frame is enclosed by a hinged door allowing for simple shield installation/replacement. The shield frame is mounted to the sub-frame by way of 3-barrel hinges that allow for easy removal of the shield frame. The shield frame, once mounted on the barrel hinges, locks into place against the sub-frame utilizing a locking pin and T-handles. The shield frame opens and closes like a door allowing for easy access to the front of the cab.



The Equipment Armor Shield Package Options

Currently, Equipment Armor offers two options that can be added to the Equipment Armor Shield Package. These options include a Sub-Frame Wrap and a Sacrificial Layer that can be placed in front of the Equipment Armor Shield to prolong shield life in high volume/impact environments.



"Because the Equipment Armor shield frame sits at 90 degrees to open and close like a door, the windshield was exposed to greater potential damage. The sub-frame wrap eliminated windshield breakage. One of our customers estimated the sub-frame wrap alone saved him from \$1,200 to \$1,800 a year in broken windshields, not to mention down time..."

THE SUB-FRAME WRAP – The sub-frame wrap consists of three pieces of ½" clear polycarbonate that mount on the top, bottom, and boom sides of the Equipment Armor Sub-Frame. The sub-frame wrap bolts directly to the sub-frame through pre-drill holes. The sub-frame wrap provides additional protection to the cab so that airborne projectiles do not enter the area between the cab and the frame and impact the glass windshield saving the operator thousands of dollars annually in windshield replacement costs

"High volume quarries were going through shields way too fast. I expected shield life to be at least one year. A trap rock quarry went through a shield in three months. I tried NASCAR windshield film but it failed miserably. All four layers pulled away from the shield upon impact, then they would bubble and blister. The sacrificial layer solved the problem. The layer is replaced on average every six months. With the sacrificial layer, a two-year shield life in high volume quarries is achievable..."

THE SACRIFICIAL LAYER - The Equipment Armor Shield sacrificial layer is a 1/8" high optic sheet of polycarbonate with an abrasion resistant hard coating. The sacrificial layer slides into the shield frame and sits in front of the shield. The sacrificial layer is capable of doubling the life of a shield in high volume/high impact environments. However, the use of the Sacrificial Layer can lead to accelerated deterioration of the Shield if dirt or moisture is introduced between the shield and the sacrificial layer and is not addressed. The sacrificial layer should only be used where the environment requires additional life of the shield (experiencing shield life less than one year) and there is a dedicated operator on the machine who can recognize when contamination is present.

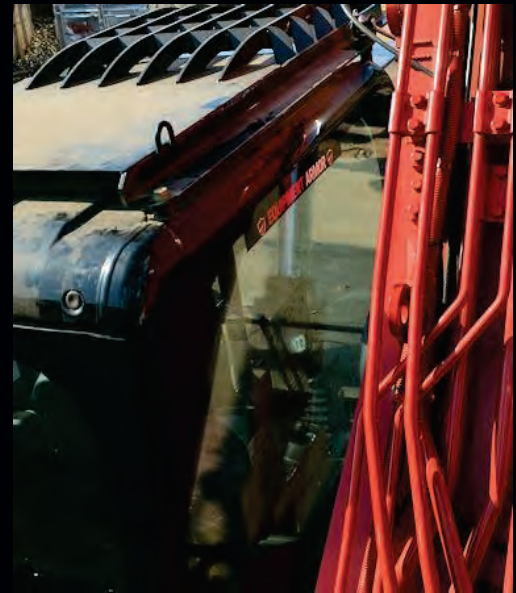


Why Install the Equipment Armor Shield Package?

1. **Great visibility** – Manufactured from High Optic Polycarbonate - unmatched by other guarding.
2. **Superior Stopping power** – Capable of Stopping a ½ pound piece of hammer steel at 300 mph. The Equipment Armor shield is field tested to meet UL752 Level 1 (9MM) and Level 2 (.357) performance criteria.
3. **Easy to replace shield / No down time on machine** - takes less than 15 minutes.
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.
8. **Average shield life** span of one year plus.



Custom Boom Side Glass Overlay and Replacements



Equipment Armor responded to the injury of a hydraulic hammer operator in Tennessee by developing a line of custom boom side glass overlays and replacements.

MSHA-SURFACE SANDSTONE - On 01/18/2018, a miner was operating an excavator equipped with a rock breaker attachment to break up large boulders. A rock penetrated the right side window of the cab and struck the excavator operator in the head. A nearby front end loader operator noticed that the excavator operator was slumped over the controls and called for help. The victim was unresponsive for approximately twenty minutes before medical help arrived. The victim was transported and diagnosed with a severe concussion.

★ Best Practices.

1. Establish and discuss safe work procedures before beginning work. Identify and control all hazards associated with the work to be performed and the methods to properly protect persons. Task train all persons in safe work procedures.
2. When breaking oversized material, it is always better to break the ends or at a crack.
3. To avoid injury from flying chips of stone, be sure other stay well away from the breaker when it is operating.
4. **ENSURE THAT THE MACHINE IS EQUIPPED WITH THE NECESSARY GLASS PROTECTION FROM FLYING MATERIAL.**

★ How Equipment Armor responded by creating boom side glass overlays and replacements in order to protect operators from needless injuries.

Equipment Armor manufactures custom polycarbonate boom side glass overlays and replacement windows for excavators from every major manufacturer.

We use the same high optics and hard coated polycarbonate used in the Equipment Armor shields. The use of high quality materials helps to reduce glare, extend life, and allow for easing cleaning.

We are currently formulating a frit system with Five Star Coatings and an adhesive system with DuPont to allow for easy adhesion to the existing cab glass without the tradition adhesion issues originally present in a glass to polycarbonate assembly.

Our custom overlays are 1/4" thick while our replacements are 3/8" thick.

Boom side glass overlays can be ordered with or without adhesive and can readily be installed by inhouse mechanics or your local

Hydraulic Cylinder Guard System



In response to our customer's requests, Equipment Armor, Inc. developed a Hydraulic Cylinder Guarding System designed to protect both hydraulic hoses and fittings from fly rock. In addition to preventing machine damage, the Hydraulic Cylinder Guard also aids in protecting operators from flying hydraulic hoses cut loose under pressure and the unsafe situations that can be created by leaking hydraulic lines.

The Equipment Armor Hydraulic Cylinder Guard is a simple bolt on bracket system which allows for:

1. Either center or top mount cylinder brackets depending on hose and fitting configuration.
2. Easily movable from machine to machine.
3. Provides for both vertical and horizontal adjustment.
4. Is frameless, with the use of 1/2" polycarbonate, is lighter and stronger than a 1/4" sheet of polycarbonate in a framed system.
5. Allows for simple attachment of various media including polycarbonate, rubber, and steel mesh or plate.
6. Allows full visibility of hydraulic lines and fittings for pre-shift inspection.
7. Provides easy access to hydraulic lines and fittings - just pull four 12mm bolts.

The complete Equipment Armor Protection Package includes:

The Equipment Armor
Shield Package
with Subframe Wrap



The Equipment Armor
Boom Side Glass Cover



The Equipment Armor
Hydraulic Guard



Bull Dozer Doors



- ★ Equipment Armor offers both 3/8" and 1/2" custom bull dozer doors for all makes and models.
- ★ The custom bull dozer doors are fabricated from coated polycarbonate and edge primed for easy installation

Equipment Armor, Inc. stocking locations:

Raleigh Office:
3331 Heritage Trade Drive
Suite 108
Wake Forest, NC 27587
Phone: 919-554-6571

Charlotte Office:
10806 Reames Road
Suite V
Charlotte, NC 28269

Richmond Office:
9830 Atlee Commons Drive
Suite 222
Ashland, VA 23005

For additional ordering information please visit our Web Site: www.equipmentarmor.com, or
Contact: tim@equipmentarmor.com

Patent Information: US Patent Pending #62/260,708, International Patent Pending #PCT/US2016/064077