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REXSTEEL

WONDERARCH HAS SYSTEM

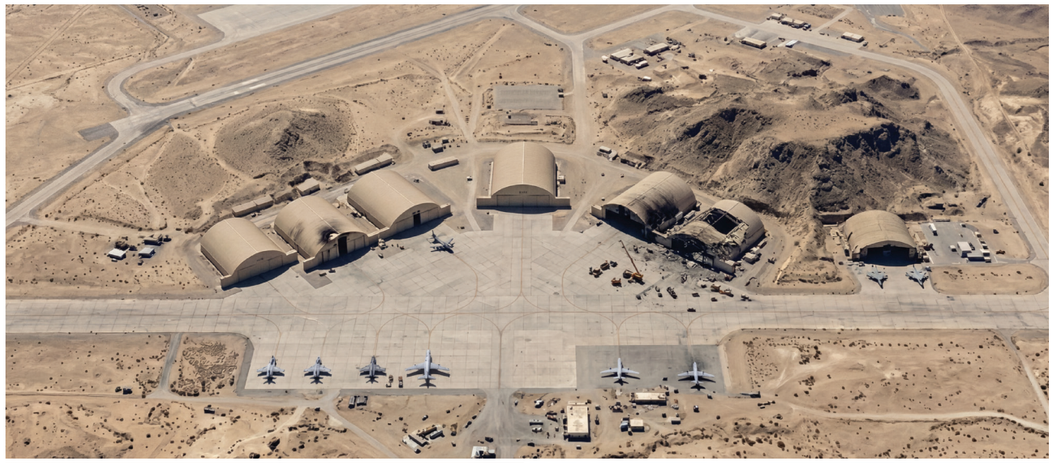
HAS - Hardened Aircraft Shelter

UFC 3-340-01 Compliant

NET
(New Excellent Technology)
Certified - No. 1560

Total HAS Integrator









Threat Environment

The Paradigm of Modern Warfare Has Fundamentally Shifted

» The Russia-Ukraine War and ongoing conflicts in the Middle East clearly demonstrate that asymmetric attacks utilizing low-cost drones and high-precision missiles have emerged as core threats. This rising asymmetric threat is starkly evident in frequent incidents where state-of-the-art fighter jets worth hundreds of millions of dollars are repeatedly disabled or destroyed by precise strikes from drones costing merely a few hundred dollars.

The Indispensable Role of Hardened Aircraft Shelters

» Without robust physical protection facilities to safeguard high-value air assets, an entire air force built on massive budget investments can be instantly neutralized. In this critical reality, Hardened Aircraft Shelters (HAS) are no longer an optional upgrade but have become an indispensable element of national security.

Critical Protection Infrastructure Gaps

» Due to a global shortage of defense infrastructure, even the United States Military, the world's most powerful force, often lacks permanent Hardened Aircraft Shelters and relies on fabric shelters with significantly lower protection capabilities. Amidst these global shortfalls, domestic demand for military facilities including Hardened Aircraft Shelters and ammunition depots is also rising rapidly due to the growing need for shelters and military facility expansion projects.

Lessons from Recent Conflicts in the Middle East

» Ballistic missile and drone attacks are causing repeated damage to aircraft at airbases across the Middle East. With fighter jets parked out in the open on runways being repeatedly destroyed by precision strikes, even conventional concrete hangars are failing to respond effectively against modern precision-guided weapons.

Hardened Aircraft Shelters (HAS) are no longer an optional upgrade but are a vital strategic infrastructure for national security.







Introducing the WonderArch System

WonderArch

» WonderArch represents a structural turning point in the construction of Hardened Aircraft Shelters.

Self-Supporting Arch Structure

» An arched structure that eliminates the need for structural steel trusses. WonderPanels are interconnected using high-specification bolts to form a robust structural arch.

» By maximizing structural efficiency without trusses or frames, this system reduces labor costs and construction time by up to 50 percent.

Double Corrugation Design

» Self-Supporting Arch Structure → No Trusses or Frames Required - **Up to 50% Reduction in Construction Time and Labor Costs**

» Double Corrugation → Securing Multi-Axial Structural Rigidity - **Efficient Dispersion of Blast Impact Energy**

» Coro-Crimped Method → Uniform Structural Performance - **Minimizing On-Site Quality Variations**



Technical Specifications and Compliance



Regulatory Compliance

WonderArch perfectly complies with the UFC 3-340-01 structural and protective requirements and fully meets the US Military Base Design Standard Section 05 30 00 for Steel Arch Liners.

» **Applicable Standards** : UFC 3-340-01, DDESB, ASTM A653/A792, KS D 3506 (Supporting documentation available upon request)

Production Specifications by Thickness in Alignment with UFC 3-340-01 Anti-Shatter Regulations

» The panel thickness is determined by the span of the hangar and the spall liner performance requirements specified in the Unified Facilities Criteria (UFC 3-340-01). Wider spans require higher sectional stiffness to satisfy blast overpressure and fragmentation resistance standards.

Thickness	Profile	Applicable Span	Typical Application (Per UFC 3-340-01)
3.2mm ★Flagship	610 × 355	Up to 22m	Standard Hardened Aircraft Shelter (Span ≤ 22m / Min. Spec Thickness)
4.0mm	610 × 355	Up to 50m	SLarge Aircraft and Tactical Transport Aircraft Shelter (Span up to 50m)
4.5mm	610 × 355	50m and Above	Strategic Asset and Large Transport Aircraft Shelter (Span over 50m)

※ A minimum thickness of 3.2mm is applied as specified in the U.S. Military Base Design Standard Section 05 30 00, Clause 2.1.1, and this thickness has been verified to meet the blast load and spall liner performance criteria of UFC 3-340-01.

※ Minimum 3.2mm as specified in U.S. Military HAS Design Standard Section 05 30 00, Clause 2.1.1.

Coating Technology (PosMACR + NET-Certified Electrodeposition (E-Coating))

What is PosMAC®?

» PosMAC® represents POSCO Magnesium Aluminum Alloy Coating product. It is a highly corrosion-resistant alloy-coated steel developed with POSCO's proprietary technology, delivering 5 to 10 times greater corrosion resistance compared to conventional hot-dip galvanized steel (GI).

» PosMAC® is a registered trademark of POSCO.

Product Configuration

Schematic



Key Features

» PosMAC® delivers 5 to 10 times greater corrosion resistance than conventional hot-dip galvanized steel (GI, GI(H)) with the same coating weight. In particular, its exceptional cut-edge corrosion resistance makes it a highly viable alternative to post-galvanized (heavy-gauge coated) products.

» It can be processed, assembled, and painted using the exact same methods as conventional GI steel, ensuring seamless integration into existing production lines.

Assembly follows advanced E-coating, rather than coating after assembly. This process fundamentally eliminates cracking and peeling at its source, delivering semi-permanent durability.

Product Feature Comparison

» Demonstrates superior corrosion resistance on flat, processed, and cut-edge surfaces compared to GI, and delivers significantly better cut-edge corrosion resistance than Galvalume.

Quality Metrics		PosMAC®	GI	Galvalume
Coating Layer Hardness (Hv)		110~130	60~80	80~100
Frictional Properties		○	×	△
Corrosion Resistance	Flat Surface	○	△	○
	Bending	○	△	△
	Cup	○	△	○
	Cut Edge	○	△	×
Chemical Resistance		○	△	△
Weldability		○	○	○

NET(New Excellent Technology) The Innovation of Certified E-Coating Technology

» NET (New Excellent Technology) Certification - Certified by the Ministry of Trade, Industry and Energy, Republic of Korea (No. 1560)

No. 1560



Conventional Method (Coating after Assembly)

» Manual application of epoxy or urethane coatings after structural assembly results in uneven film thickness on complex geometries like weldments and cut edges. This triggers cracking and peeling within a few years, leading to frequent and costly maintenance.

WonderArch Method (Assembly after E-Coating)

» Individual panels are precision-coated using the NET-certified E-coating method prior to assembly, forming a uniform and robust film across all surfaces and intricate gaps. This fundamentally eliminates cracking and peeling, ensuring semi-permanent durability.

Proven Protective Performance

01 7-Bar
Blast Test



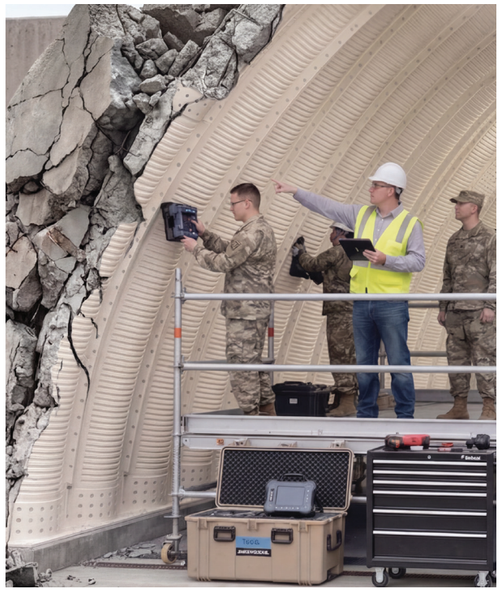
Indirect Blast

» Applicable Standards: UFC 3-340-01 & DDESB TP 15
» Threat Conditions: Indirect Explosion (2,000 lbs at a 10m standoff distance) producing a blast pressure of 7-Bar (approx. 101.5 psi)
» Verification Result: Structural Resistance Fully Verified
» Reference Documents: US Army Official Test Reports (ADP001768, AD0886769)
» Spall Liner Functionality:
- As the blast pressure transfers to the main RC (Reinforced Concrete) structure (800mm), spalling occurs on the interior surface.
- The bottom-most WonderArch liner completely contains and blocks all concrete spall fragments.
- Absorbs impact energy through ductile deformation without panel penetration or tearing ➔ Ensuring full protection for internal equipment and personnel

Direct Hit

» Threat Conditions: Direct HE (High-Explosive) Impact and Combined Blast Loading
※ Details regarding ammunition types, specific metrics, and layer configurations are not disclosed.
» Spall Liner Functionality:
- Direct impact and blast energy are sequentially attenuated as they pass through the multi-layered structure.
- The bottom-most WonderArch liner acts as the final line of defense, completely blocking any remaining spall fragments.
- Maintains the structural integrity of the internal space even after a direct hit ➔ Ensuring the survivability of internal equipment and personnel

02 Spall
Liner Effect



Integrated Spall Liner Mechanism

» Universal Protection Principle: The WonderArch liner operates on the exact same protective principle in both hazard scenarios (Close-Proximity Blast and Direct HE Impact).
» Structural Failure Defiance: Even if the RC (Reinforced Concrete) structure sustains severe damage from the impact, the bottom-most liner absolutely resists penetration and fracturing.
» Energy Absorption Mechanics: By undergoing ductile (plastic) deformation, the liner successfully absorbs the blast energy, ensuring the absolute safety of internal assets and personnel.
» Compliance Standards: Fully meets the rigorous Spall Liner performance requirements of UFC 3-340-01.

Full blast resistance test results and simulation reports are available upon request.

Key Competitive Advantages

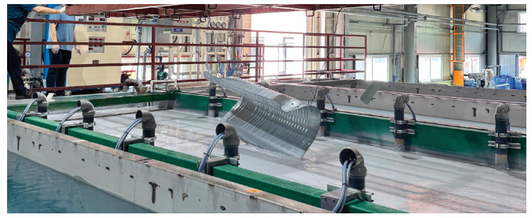
01 NET(New Excellent Technology) Certified E-Coating Process
» NET Certificate No. 1560 by the Ministry of Trade, Industry and Energy of Korea / Semi-Permanent Corrosion Resistance

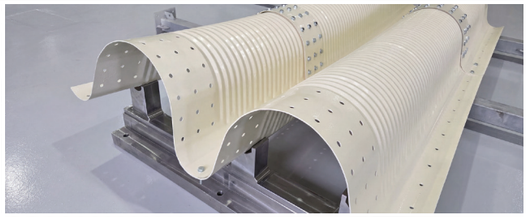
02 Double Corrugation Structural Design
» Reduces material requirements by up to 50% while maintaining equivalent structural stiffness

03 7-Bar Verified Blast Resistance
» Fully meets UFC 3-340-01 and DDESB TP 15 performance requirements

Cost Efficiency / Schedule Reduction / Minimal Maintenance / Future-Proof Protection















Three Flexible Supply Options

We provide the optimal supply option tailored to each stage of your project.

Option A - Spall Liner Panel Supply



Spall Liner Panel Supply

- Buyer Situation: Projects where the design is already completed. Only WonderArch panels are required.
- Supply according to WonderArch panel design specifications
- UFC 3-340-01 thickness standards applied (3.2 / 4.0 / 4.5mm)
- All material certification documents provided

Option B - Panel Supply + Blast Simulation



Panel Supply + Blast Simulation

- Buyer Situation : Projects where the design is completed, but the spall reduction performance when applying WonderArch panels must be verified with official numerical values.
- Blast Simulation : LS-DYNA numerical analysis performed based on UFC 3-340-01 and DDESB TP 15 standards.
- WonderArch Spall Liner Panel Supply
- Simulation Result Report Provided (Numerical verification of spall debris blockage performance)

Option C - Full Package (Total HAS Integration)



Full Package (Total HAS Integration)

- Buyer Situation : Consortiums or Main Contractors preparing bids for HAS projects.
- Specialized hangar design (Based on UFC 3-340-01)
- Blast simulation (LS-DYNA numerical analysis, spall reduction performance verification)
- WonderArch spall liner panel supply
- Blast door supply
- One Contact Point

Rexsteel responds effectively to any stage of your project. Contact us today, and we will guide you to the optimal option.

Advanced Engineering Capabilities

From advanced blast simulation to comprehensive material supply, Rexsteel delivers flawless engineering support for HAS projects of all scales.



Expert Engineering Team

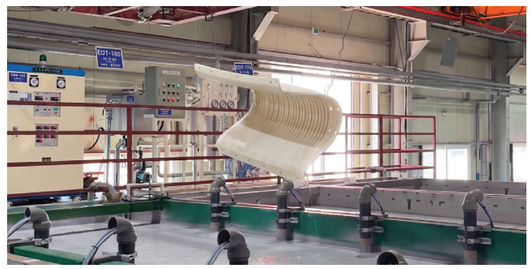
- Execution of structural and blast load analysis based on UFC 3-340-01
- Advanced Numerical Analysis Using LS-DYNA
- Performance Validation in Full Compliance with DDESB TP 15 Standards

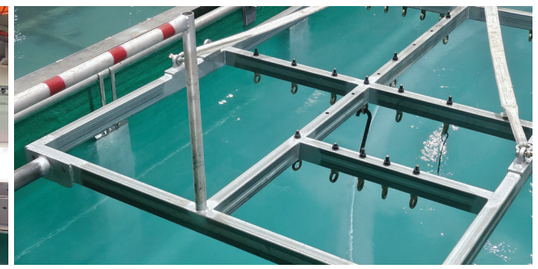
Proven Collaborative Network

- Strategic Partnerships with Specialized HAS Engineering Firms (Partner identities disclosed upon mutual agreement or separate consultation)
- Partnerships with NATO and DDESB Standard-Certified Blast Door Suppliers
- Technical Collaboration with Nationally Authorized Research Institutes Specializing in Military Facility Structures

In-House Manufacturing Capabilities

- Dedicated Manufacturing Facility in Haman, Gyeongnam
- Material Production in Full Compliance with KS D 3506 Standards
- Immediate Supply Available for 3.2mm, 4.0mm, and 4.5mm Thicknesses









Rexsteel Protective Structures Portfolio

WonderArch (Steel Arch Panel System)



WonderArch
Steel Arch Panel System

›› Spall Liners for Hardened Aircraft Shelters (HAS) - **Fighter Jet Protection**

REX PLATE (Corrugated Steel Plate Protective Structure System)





REX PLATE
Corrugated Steel Plate Protective Structure System

›› Spall Liners for Corrugated Steel Protective Structures -
Ammunition Depots, Emergency Shelters, and Buried Protective Structures

From Hardened Aircraft Shelters (HAS) to specialized protective structures, Rexsteel serves as a Total Protection Integrator across the entire spectrum of military defense.

REXSTEEL

WONDERARCH HAS SYSTEM

HAS - Hardened Aircraft Shelter

Rexsteel delivers the definitive, all-in-one solution for shelter construction.

From blast simulation to panel supply Total HAS Integration.

rexsteel.kr

Detailed technical specifications, engineering packages, blast simulation reports, and project proposals are available upon request for immediate delivery.