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# STRUCTURAL VENTILATED STEEL FLOOR SYSTEM FOR LARGE-SPAN AVIATION HANGARS

Engineering-based passive subfloor airflow integration
for corrosion risk mitigation and load distribution

TECHNICAL OVERVIEW PREPARED FOR ENGINEERING EVALUATION

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# CONDENSATION BEHAVIOR IN FABRIC & LARGE-SPAN HANGARS

In aviation hangars, rapid temperature fluctuations combined with large internal air volumes often lead to condensation formation at floor level.
Key engineering challenges:

- Moisture accumulation beneath slab interface
- Accelerated corrosion risk
- Increased mechanical ventilation load
- Long-term structural degradation potential

This issue is particularly relevant in semi-permanent and fabric structures.

# INTEGRATED STRUCTURAL & VENTILATION CONCEPT

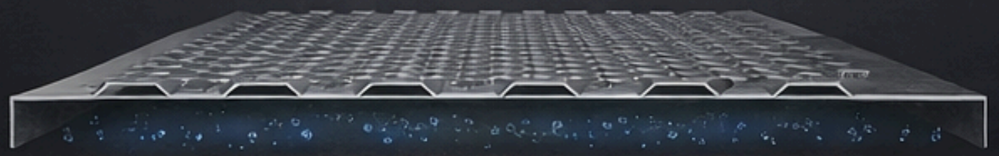
THE SYSTEM CONSISTS OF AN EMBOSSED AND PERFORATED 5 MM STRUCTURAL STEEL PANEL DESIGNED TO FUNCTION AS:

- LOAD-DISTRIBUTING STRUCTURAL SURFACE
- PASSIVE AIRFLOW CHANNEL LAYER
- MOISTURE MITIGATION INTERFACE

RATHER THAN REPLACING MECHANICAL VENTILATION, THE SYSTEM REDUCES DEPENDENCY BY INTRODUCING CONTROLLED SUBFLOOR AIRFLOW.

# STRUCTURAL VENTILATED STEEL FLOOR SYSTEM

## For Large-Span Aviation Hangars



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Technical overview prepared for engineering evaluation

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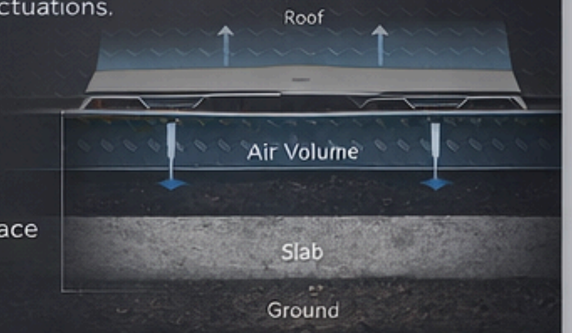


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## INTEGRATED STRUCTURAL & VENTILATION CONCEPT

*Engineering values calculated conservativly based on minimum yield strength of 235 MPa.*

**Structural comert includes:**

- Moisture accumulation beneath slab interface
- Accelerated corrosion risk
- Increased mechanical ventlation load
- Long-term structural degradation potential

| Structural Grid Spacing | Safe Distributed Load Capacity |
|---|---|
| 1.00 m | ~ 40 kN/m² |
| 1.25 m | ~ 25 kN/m² |
| 1.50 m | ~ 20 kN/m² |

Embossed geometry provides approximately 2.5x stiffness increase compared to flat plate.

This issue is particulary relevant in **semi-permanent and fabric** structures.

## WHEEL LOAD CONSIDERATION

*Typical avation values celculated convertinaly* ***based on minimum yield strength of 235 MPa.***

- Forklift weight: 8 tons
- Approximate wheel load: 20 kN
- Suitable for 1.0 m grid spacing
- Local reinforcement recommended beyond 1.5 m spacing

The concept is intended as a complementary structural enhancement layer for large-span hangar environments.

Prepared for engineering discussion purposes.

# Comparative Evaluation of Flooring Solutions for Large-Span Hangars

| Feature / Solution | Conventional Concrete Flooring | Mechanical Ventilation Only | Ventilated Structural Steel Flooring System |
|---|---|---|---|
| **Moisture & Condensation Control** | Limited – moisture accumulates at slab interface | Provides airflow but no passive floor-level mitigation | Passive subfloor airflow reduces condensation and corrosion risk |
| **Structural Performance** | High compressive strength, but heavy and rigid | No contribution to floor structure | 235 MPa steel panels with embossed geometry → ~2.5× stiffness increase |
| **Heavy Load Resistance (Forklifts, Equipment)** | Suitable, but prone to cracking under concentrated loads | Not applicable | Safe distributed load up to 40 kN/m² (1.0 m grid), local reinforcement possible |
| **Energy Efficiency** | High ventilation demand → increased energy use | High operational energy consumption | Reduced dependency on mechanical ventilation, improved efficiency |
| **Installation & Flexibility** | Long construction time, permanent solution | Add-on system, limited adaptability | Modular panels (1250×2500 mm / 1000×2000 mm), short production lead times |
| **Long-Term Maintenance** | Crack repair, corrosion risk | High maintenance cost due to continuous operation | Lower maintenance demand, minimized corrosion risk |

**Concrete flooring: structurally strong but heavy, moisture control is poor, and maintenance costs are high.**
**Mechanical ventilation only: addresses air circulation but does not solve floor-level condensation; energy costs remain high.**
**Ventilated steel flooring system: combines structural reinforcement with passive airflow, offering balanced performance, energy efficiency, and reduced long-term maintenance.**


STRUCTURAL VENTFLOW PANELS
FOR AGRICULTURAL HANGARS
Airflow
Moisture Control
Corrosion Resistant
Load Bearing
VENTILATED FLOOR
LIVESTOCK PROTECTION
GRAIN STORAGE

# Integration & Deployment Advantages

- Compatible with existing steel structural grids
- Suitable for aviation, logistics and maintenance hangars
- Supports corrosion risk mitigation strategies
- Flexible panel sizing (1250×2500 mm / 1000×2000 mm)
- Short production lead times
- Customized solutions

The concept is intended as a complementary structural enhancement layer for large-span hangar environments.

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