

Metal-Asia

Commercial Proposal for Supply

Steel Structures, Metal Frames, Hangars, and Airlock Door Systems for Air-Supported Structures

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Executive Summary

Steel structures for Air-Supported Structures (ASS) encompass anchor contours and foundation systems, airlock door system frames (revolving doors, emergency exits, cargo airlocks), support frames for lighting and instrumentation, insulated equipment enclosure frames, and auxiliary structures (stairs, maintenance platforms, guardrails). Improper material selection, anchor contour geometry deviations, or inadequate airlock sealing result in pressure loss, corrosion acceleration, safety code violations, and reduced service life. Metal-Asia.pw delivers complete structural packages with EN/ASTM-certified materials, third-party weld inspection, and geometry verification ensuring compliance with international building codes and insurance underwriting requirements.



Anchor contour, airlock systems, and metal frameworks for industrial ASS deployment

Market Challenges in Unassisted Structural Procurement

International EPC contractors and facility operators sourcing ASS structural components independently encounter critical quality and compliance failures:

- Substandard steel grade selection: Structural carbon steel (St3) specified for low-temperature regions instead of low-alloy steel (09G2S / S355J2), resulting in brittle fracture at temperatures below -20 °C
- Anchor contour geometry deviations exceeding ± 2 mm tolerance: Uneven membrane tension distribution, localized stress concentrations, premature material fatigue, and progressive seam delamination
- Missing hot-dip galvanization: Uncoated steel structures in aggressive environments (coal dust, salt air, chemical atmospheres) experiencing 3–5x service life reduction versus galvanized equivalents
- Weld quality below EN ISO 5817 Category B: Incomplete penetration, porosity, and lack of fusion in critical load-bearing joints creating catastrophic failure risk under snow and wind loads
- Insufficient emergency exit quantity per occupancy: Code violations (IBC, NFPA 101, local regulations), insurance coverage denial, and regulatory shutdown risk

- Conventional single-leaf doors substituted for airlock systems: Direct pressure loss, continuous compressor cycling, 40–60% energy cost inflation, inability to maintain structural overpressure
- Inadequate hinge and locking hardware on equipment enclosures: Air infiltration, thermal bridging, equipment freeze damage in sub-zero climates
- Incorrect hangar span selection: Arch-type structures deployed for spans exceeding 25 meters resulting in excessive deflection, snow accumulation, and progressive collapse

Our Solution: Certified Structural Packages with International Code Compliance

Metal-Asia.pw provides integrated procurement and engineering services for industrial steel structures from China, including structural calculation per Eurocode 3 / AISC 360, third-party weld inspection (UT, RT), hot-dip galvanization coordination, and full documentation packages for international building permit applications and insurance underwriting. Our supply chain compliance program ensures EN/ASTM-certified materials, ISO 9001 manufacturing audits, and CE-marked components where applicable.

Steel Structures — Manufacturing and Quality Assurance

Materials and Specifications

Parameter	Specification
Structural steel grades	St3sp, St3ps, 09G2S, S255, S355 per GOST 27772-2015 / EN 10025
Profile steel	Channel sections, I-beams, angle sections, square/rectangular/round hollow sections
Sheet steel	Hot-rolled, cold-rolled, galvanized per EN 10346 / ASTM A653
Fasteners	High-strength bolts M12–M24, property class 8.8–10.9 per EN ISO 898-1
Surface treatment	Primer + enamel (polyurethane, epoxy); hot-dip galvanization per EN ISO 1461 (on request)
Welding	MIG/MAG semi-automatic, SV08G2S wire per EN ISO 14341; EN ISO 5817 Category B quality

Manufacturing Process and Quality Control

Stage	Description	Quality Control
Engineering (KM / KMD)	Structural design documentation development	Client review, third-party engineering audit
Cutting	Plasma cutting, guillotine shearing, band sawing	Dimensional accuracy ± 1 mm
Bending	CNC press brake forming	Angle accuracy $\pm 0.5^\circ$
Welding	MIG/MAG CO2 welding	UT inspection, RT per client request
Assembly	Node assembly on jig/fixture	Geometric verification

Stage	Description	Quality Control
Surface preparation	Shot blasting to Sa 2.5 per EN ISO 8501-1	Surface profile verification
Coating	Primer + enamel application	Coating thickness 80–120 μm , adhesion test per EN ISO 4624
Packaging	Palletizing, stretch film, steel strapping	Marking, packing list, material certificate

Dimensional Tolerances

Parameter	Tolerance
Linear dimensions	± 2 mm
Angles	$\pm 0.5^\circ$
Perpendicularity	± 1 mm per 1 m
Parallelism	± 2 mm per 1 m
Flatness	± 3 mm per 1 m
Weld quality	EN ISO 5817 Category B

Metal Frames

Anchor Contour (Foundation System)

Parameter	Specification
Function	Anchor preventing ASS uplift under internal overpressure action
Type	Reinforced concrete strip foundation with embedded anchor plates
Embedment depth	Not less than frost penetration depth + 0.3 m
Strip width	300–500 mm
Strip height	400–800 mm
Concrete grade	C25/30 (B25) to C30/37 (B30) per EN 206
Reinforcement	B500B (A500C equivalent), diameter 12–20 mm, mesh reinforcement
Embedded elements	Anchor plates with studs M16–M24, 500 mm spacing
Steel equal-leg angle section	50×5, 63×6, 80×6 mm, 1 m length, 500 mm fastening spacing
Anchor line uplift force	200–500 kg/m

Alternative Anchorage Systems

Type	Application	Description
Screw piles	Mobile ASS, temporary facilities	Piles Ø108–Ø133 mm, 2–4 m length, screwed into soil
Ballasted foundation	Temporary facilities, exhibitions	Water/sand-filled cylinders along perimeter; retains structure and prevents leakage
Anchor rods/screws	Light soils	Screwed into soil along perimeter; surface must be perfectly level
Combined system	Complex soils	Strip foundation + screw piles

Insulated Equipment Enclosure Frame

Parameter	Specification
Function	Housing for climate control equipment (fans, heating generators, automation)
Frame material	Hollow section 60×40×2 mm, 40×40×2 mm
Cladding	Sandwich panels (PUR / mineral wool), 80–100 mm thickness
Thermal conductivity	≤0.04 W/(m·K)
Doors	Insulated, steel, reinforced hinges, locking device
Lighting	Automatic (motion sensor)
Heating	Electric convection heater, 1–3 kW
Ventilation	Forced supply-exhaust
Dimensions	3×2×2.5 m (standard) / custom
Weight	500–1,500 kg

Support Frames for Lighting and Instrumentation

Parameter	Specification
Function	Mounting LED floodlights (indirect/reflected lighting), instrumentation and sensors
Material	Hollow section 40×40×2 mm, angle section 40×4 mm
Height	3–6 m
Surface treatment	Hot-dip galvanization or primer + enamel
Foundation	Flange on anchor bolts or cast-in foundation
Load capacity	Calculated for LED floodlights (5–15 kg/unit)

Hangars (Auxiliary Structures)

Hangar Types

Type	Structure	Advantages	Limitations
Arch hangar	Arched profile from bent channel or corrugated sheet	Rapid erection, no internal frame	Limited span (up to 25 m)
Frame hangar	Columns + trusses + purlins	Any dimensions, overhead cranes	Higher steel consumption, higher cost
Tent hangar	Metal frame + PVC tent	Mobility, low cost	Reduced service life
Sandwich panel hangar	Frame + sandwich panels	Maximum thermal insulation	Highest cost

Standard Hangar Dimensions

Width m	Length m	Height m	Area m ²	Type
10	15–30	4–6	150–300	Arch
15	20–40	5–7	300–600	Arch / Frame
20	30–60	6–8	600–1,200	Frame
25	40–80	7–10	1,000–2,000	Frame
30	50–100	8–12	1,500–3,000	Frame

Airlock Door Systems

General Requirements

Air-Supported Structures are hermetic constructions with continuous internal overpressure of 150–500 Pa. Conventional single-leaf doors are not applicable — they compromise hermeticity. Only airlock systems ensuring minimal pressure loss are deployed.

Pedestrian Revolving Door (Airlock)

Parameter	Specification
Type	Three-wing revolving door (revolver)
Frame material	Aluminum alloy / Stainless steel (on request)
Panel material	Transparent PVC / Polycarbonate / Tempered safety glass (on request)
Internal diameter	1,800 / 2,100 / 2,400 / 2,700 / 3,000 / 3,600 mm
External diameter	1,880 / 2,180 / 2,480 / 2,780 / 3,080 / 3,680 mm

Parameter	Specification
Opening height	2,300 mm
Canopy height	300 mm
Overall height	2,600–2,640 mm
Rotation speed (high)	1–4 rpm
Rotation speed (low)	0.5–1.5 rpm
Power supply	220 V AC \pm 10%, 50 Hz
Rated power	600–1,200 W
Ceiling light	LED, 400 W
Noise level	\leq 60 dB(A)
Total weight	Below 1,000 kg
Operating temperature	-30 to +45 °C
Maximum humidity	90% RH
Protection class	IP54

Safety Functions

Function	Description
Special load-bearing structure	Reinforced frame withstanding ASS internal pressure
Vertical/horizontal safety sensor	Stop on obstacle detection
Anti-pinch	Pressure sensors on wings, automatic stop
Anti-collision	Infrared sensors, collision prevention
Force-sensitive control	Automatic drive force adjustment
Torque control	Motor torque monitoring
Panic breakout	Manual wing release for emergency evacuation
Handicap function	Reduced speed, extended opening time
Night lock	Automatic door locking during non-operational hours

Operating Modes

Mode	Description
Continuous	Door rotates continuously with minimal dwell time
Start/Stop	Door activates on personnel approach, stops after passage

Mode	Description
Remote control	Operation from security desk or BMS

Key Components

Item	Component	Specification
1	Control unit	PLC, programmable
2	Control software	Specialized, ASS-adapted
3	Variable frequency drive	Rotation speed regulation
4	Rotation drive	Electric motor with gearbox
5	Gearbox	Planetary / Worm
6	Drive belt	Toothed / V-belt
7	Ceiling floodlight	LED, 400 W
8	Detection radar	Infrared
9	Speed/position radar	High-precision encoder
10	Emergency stop button	Mushroom-type, self-resetting
11	Handicap button	Press = reduced speed
12	Curved glass	Tempered, laminated, safety
13	Flat glass	Tempered, laminated, safety
14	Aluminum profile	Anodized / Powder-coated

Pedestrian Tunnel (Alternative to Revolving Door)

Parameter	Specification
Function	Alternative entry for high traffic or oversized equipment passage
Structure	Two opening doors with airlock chamber between
Frame material	Aluminum alloy / Galvanized steel
Panel material	Transparent PVC / Polycarbonate
Opening size	1.2×2.3 m (standard) / custom
Operating principle	First door opens, person enters, door closes, second door opens
Pressure loss	Higher than revolving door; acceptable with compressor operation
Application	High-traffic facilities (>500 persons/hour), equipment movement

Emergency Exit Door

Parameter	Single Exit	Double Exit
Opening size	1.35 × 2.0 m	2.6 × 2.0 m
Clear width	1.07 m (42")	2.13 m (84")
Opening height	2.0 m	2.0 m
Frame material	Aluminum alloy / Galvanized steel	Aluminum alloy / Galvanized steel
Door material	Steel sheet / Aluminum sheet with transparent insert	Steel sheet / Aluminum sheet with transparent insert
Opening direction	Outward (push bar)	Outward (push bar)
Panic hardware	Yes (panic bar)	Yes (panic bar)
Emergency lighting	Yes, autonomous power (battery, 90 minutes)	Yes, autonomous power
EXIT sign	Illuminated, autonomous	Illuminated, autonomous
Marking	Per fire code requirements	Per fire code requirements
Quantity	Per occupancy calculation (1 per 200 persons)	Per occupancy ≥200 persons
Pressure loss	Brief, compensated by compressors	Brief, compensated by compressors

Emergency Exit Quantity Calculation

Occupancy (persons)	Required clear width mm	Single exits qty	Double exits qty
Up to 100	510	1	—
100–200	1,020	1	—
200–400	2,040	2	1
400–600	3,060	3	1–2
600–800	4,080	4	2
800+	Per calculation	Per calculation	Per calculation

Width calculation formula: $\text{Width (mm)} = \text{Occupancy} \times 5.1 \text{ mm}$ (per IBC 2021, 1005.3.2). Single exit = 1,070 mm, double exit = 2,130 mm.

Cargo Airlock (Vehicle Door)

Parameter	Specification
Door type	Sectional / Sliding / Overhead sectional
Frame material	Steel profile 80×40×3 mm, galvanized

Parameter	Specification
Door leaf material	PUR sandwich panels, 40 mm thickness / Profiled sheet with insulation
Standard opening	4.0 × 4.5 m (width × height)
Dump truck opening	5.0 × 5.5 m
Excavator opening	6.0 × 6.5 m
Maximum opening	Custom
Drive type	Electric (chain / belt / direct)
Drive power	0.75–2.2 kW
Opening speed	0.15–0.25 m/s
Sealing	Double rubber seal contour
Safety	Photocells, edge sensors, emergency stop
Fastening	Anchor bolts M16–M20 to concrete foundation
Protection class	IP54
Temperature range	-40 to +50 °C

Cargo Airlock Operating Sequence

Step	Action
1	Vehicle approaches airlock
2	External doors open, vehicle enters airlock chamber
3	External doors close
4	Compressors equalize chamber pressure to ASS internal level
5	Internal doors open, vehicle exits into ASS
6	Internal doors close
7	Reverse sequence for vehicle exit

Note: For high-traffic facilities (>50 cycles/hour), dual cargo airlocks or double-chamber configuration recommended.

Technical Access Doors

Parameter	Specification
Function	Oversized equipment movement, conveyor line installation, construction machinery access
Type	Removable panel / Folding structure / Lift-up

Parameter	Specification
Opening size	Custom (up to 10×10 m)
Material	Steel frame + PVC fabric / Sandwich panels
Fastening	Flange, bolted
Hermeticity	Gasket seal, clamping system
Erection/dismantling time	2–4 hours

Airlock System Comparison Matrix

Parameter	Pedestrian Revolver	Pedestrian Tunnel	Emergency Exit	Cargo Airlock	Technical Door
Function	Primary personnel entry	Alternative entry, equipment	Evacuation	Vehicle access	Equipment access
Pressure loss	Minimal	Moderate	Brief	Chamber-compensated	Chamber-compensated
Throughput	200–400 persons/hour	100–200 persons/hour	—	10–30 cycles/hour	—
Opening size	Ø 1.8–3.6 m	1.2×2.3 m	1.35×2.0 / 2.6×2.0 m	4×4.5 ... 6×6.5 m	Custom
Material	Aluminum + PVC/glass	Aluminum/steel + PVC	Aluminum/steel	Steel + sandwich panels	Steel + PVC/panels
Drive	Electric 220 V, 600–1,200 W	Manual / Electric	Manual (panic bar)	Electric 0.75–2.2 kW	Manual / Electric
Automation	Yes	On request	No	Yes	On request
Safety	Anti-pinch, anti-collision, panic breakout	—	Panic hardware, emergency light	Photocells, edge sensors	—
Weight	Below 1,000 kg	200–500 kg	150–400 kg	1,000–3,000 kg	500–2,000 kg
Temperature range	-30 to +45 °C	-40 to +50 °C	-40 to +50 °C	-40 to +50 °C	-40 to +50 °C
Service life	15–20 years	10–15 years	15–20 years	15–20 years	10–15 years

Parameter	Pedestrian Revolver	Pedestrian Tunnel	Emergency Exit	Cargo Airlock	Technical Door
HS Code	7308.30	7308.30	7308.30	7308.30	7308.30

Airlock System Configuration by Facility Type

Small Facility (span up to 30 m, area up to 1,000 m²)

Element	Quantity	Specification
Pedestrian revolving door	1 pc	Ø 1.8–2.1 m
Emergency exit (single)	1–2 pcs	1.35×2.0 m
Cargo airlock (standard)	1 pc	4.0×4.5 m

Medium Facility (span 30–60 m, area 1,000–5,000 m²)

Element	Quantity	Specification
Pedestrian revolving door	1–2 pcs	Ø 2.1–2.7 m
Pedestrian tunnel	1 pc	Alternative/supplement
Emergency exit (single)	2–3 pcs	1.35×2.0 m
Emergency exit (double)	Per calculation	Per occupancy ≥200
Cargo airlock (standard)	1–2 pcs	4.0×4.5 m
Cargo airlock (dump truck)	On request	5.0×5.5 m

Large Facility (span 60–100 m, area 5,000–15,000 m²)

Element	Quantity	Specification
Pedestrian revolving door	2–4 pcs	Ø 2.4–3.0 m
Pedestrian tunnel	1–2 pcs	High throughput
Emergency exit (single)	3–5 pcs	1.35×2.0 m
Emergency exit (double)	1–2 pcs	Per occupancy ≥200
Cargo airlock (standard)	2–3 pcs	4.0×4.5 m
Cargo airlock (dump truck)	1–2 pcs	5.0×5.5 m
Cargo airlock (excavator)	On request	6.0×6.5 m
Technical access door	1–2 pcs	Equipment access

Mega Facility (span 100+ m, area above 15,000 m²)

Element	Quantity	Specification
Pedestrian revolving door	4–8 pcs	Ø 3.0–3.6 m
Pedestrian tunnel	2–4 pcs	High throughput
Emergency exit (single)	5–10 pcs	1.35×2.0 m
Emergency exit (double)	2–4 pcs	Per occupancy ≥200
Cargo airlock (standard)	3–5 pcs	4.0×4.5 m
Cargo airlock (dump truck)	2–3 pcs	5.0×5.5 m
Cargo airlock (excavator)	1–2 pcs	6.0×6.5 m
Technical access door	2–4 pcs	Equipment access

Structural and Airlock Maintenance Schedule

Frequency	Activity
Monthly	Visual anchor contour inspection for corrosion, cracks, fastener loosening
Quarterly	Anchor bolt tightening check, hinge and lock lubrication on airlock systems
Annually	Structural steel recoating (as required), door seal replacement
Annually	Pedestrian revolving door service: drive inspection, sensor verification, emergency exit function test
Annually	Cargo airlock service: drive inspection, photocell alignment, seal inspection
As required	Repair/replacement of damaged elements

Why Metal-Asia.pw — Direct Access, Transparency, Compliance

- Direct manufacturer contracts for steel structures without intermediary markups
- Dedicated quality control division: UT, RT weld inspection, chemical composition verification against EN/ASTM standards
- Structural engineering per Eurocode 3 / AISC 360 with regional climate adaptation
- Hot-dip galvanization coordination for aggressive environments (coal dust, salt air, chemicals)
- Complete permit documentation package for international building code compliance
- Installation supervision and commissioning with operator certification
- Warranty and post-warranty service with spare parts inventory
- Tender documentation support for public and private procurement frameworks

Contact Information

For detailed service specifications and portfolio references, visit Metal-Asia.pw.

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Request structural package quotation — email zakaz@metal-asia.pw with facility dimensions and regional wind/snow loads