waagner biro
steel and glass

Security Rated Building Envelopes - Protecting People and Assets

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SOLUTIONS AND SERVICES

Waagner Biro steel and glass, your partner for:

building envelopes in steel and glass

free-form surfaces and complex geometries

cable supported structures

retractable roofs

Integration of modern architecture into historical buildings

bomb blast and security rated facade

special solutions for complex aluminium façades

integrated solutions incl. special materials such as textile envelopes

innovative use of materials like glass as a structural element

solutions for complex staircases and ramps

solar trees and moveable solar trackers

PCSA & feasibility studies → **Design & build** → **Service & maintenance**

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BLAST-RESISTANT STEEL & GLASS STRUCTURES

Waagner Biro steel and glass, your partner for:

- Safety and security of people and assets
- Building envelope protection for blast hazards
- Architectural transparency with robust performance
- Fit-for-purpose solutions for façades, roofs and openings
- Proven delivery on sensitive architectural projects
- Retrofit solutions
- Specialist service & maintenance solutions

WHY BLAST PROTECTION MATTERS

Key message:

- Building envelopes are often the first and most vulnerable line of defense
- Failure can cause serious safety risks and high asset damage
- Protection must be effective and proportionate
- Safety of people and assets
- Protection of infrastructure
- Operational security

WHAT WE PROTECT

Building envelope protection includes:

- External walls and façades
- Roofs and roof–wall interfaces
- Doors, windows and glazed openings
- Interfaces, fixings and connection
- Secure rooms, public spaces and assets

Building envelope protection includes:

- Debris
- Blast caused by explosion
- Drone attacks
- Bullet attack
- Heavy vehicle attack
- Fire

OUR APPROACH

Our approach:

- Understand your facility, asset, occupants and realistic risks
- Define protection objectives together
- Develop a tailored building envelope solution
- Design, supply and support implementation
- Mitigation design & testing
- Implementation process with stakeholders
- No “One size fits all” solution

COLLABORATION & NEXT STEPS

Collaboration is key:

- Early engagement encouraged
- Transparent discussion of risks and options
- Protection levels aligned with your priorities
- One partner from concept to delivery

PROTECTION DELIVERY PROCESS

Steel & glass protection scope:

- Blast-resistant façade zones and entrances
- Protected glazing + steel framing + anchors
- Interfaces and penetrations coordinated early
- Design, supply and installation support
- Turnkey Design & Build
- Civils & MEP

1. **Survey & assess**
   Confirm geometry, supports and interfaces
2. **Define design threat**
   Agree scenario, occupancy and target level
3. **Engineer the system**
   Design steel + glazing, anchors and penetrations
4. **Coordinate interfaces**
   Align with MEP and adjacent trades
5. **Fabricate & install**
   Detailing, QA/QC, installation and handover
6. **Service & maintenance**

Critical details to resolve

- Opening performance and anchorage
- Corner continuity

Expected deliverables

- Blast design calculations and acceptance criteria
- Structural + interface drawings incl. protected penetrations

Presentation close

- Clear retrofit / new-build concept for stakeholder review
- Defined target performance aligned with scenario

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QUEEN ANNE'S G
London, UK

- Explosion-resistant steel and glass roof & façade
- High transparency with controlled damage behavior
- Integrated architectural and safety performance
- Delivered for a sensitive inner-city government building

PADDINGTON STATION
London, UK

- Explosion-resistant steel and glass roof
- Columns designed for protection from progressive collapse due to heavy vehicle impact
- Cloud Index glass artwork
- Integrated architectural and safety performance
- Delivered for a sensitive inner-city infrastructure building

BATTERSEA STATION
London, UK

- Explosion-resistant steel and glass roof & façade
- Architectural Feature
- Integrated architectural and safety performance
- Delivered for a sensitive inner-city infrastructure building

TECHNICAL SUMMARY

Blast load characterization

- Short-duration dynamic blast actions govern façade and roof response
- Governing parameters: peak reflected pressure, impulse and load duration
- Incident vs reflected pressure dependent on stand-off and orientation

Design blast scenarios

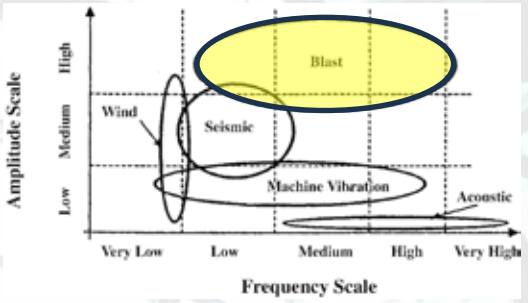
- Free-air, air-burst and surface-burst detonation scenarios
- Differentiation between incident and reflected pressures
- Directionality governs glazing and framing response

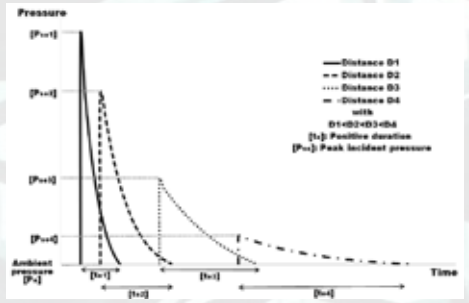
Hazard rating and performance criteria

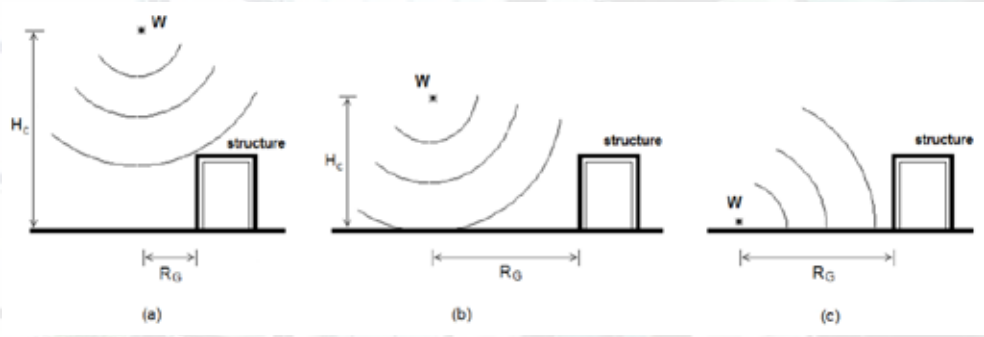
- Fragmentation-based hazard classification for glazing
- Assessment of fragment retention, size and throw distance
- Performance objective: controlled damage, no brittle failure

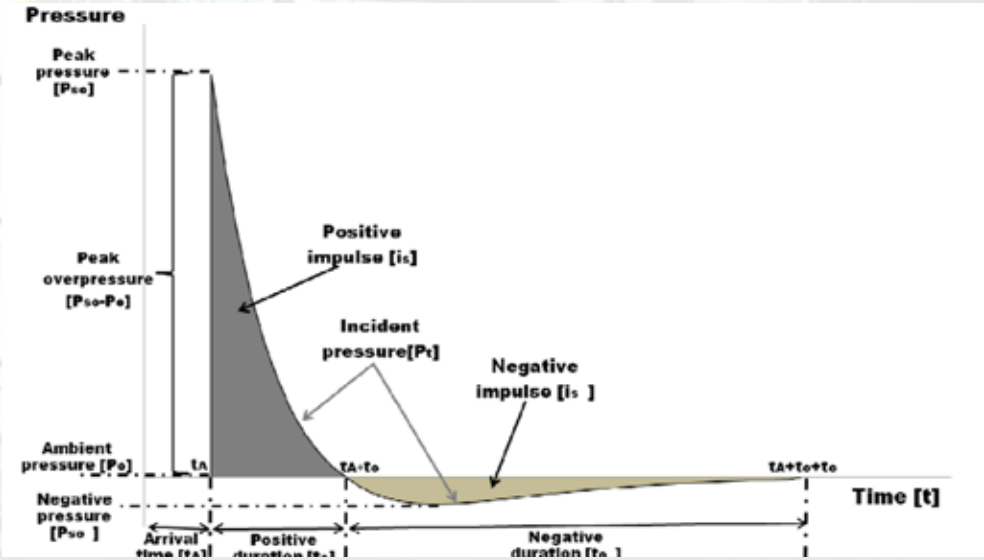
Structural response and verification

- Pressure–time functions derived from calibrated blast models
- Inertia effects, natural frequency and deformation limits evaluated
- Verification using analytical and numerical (FE) models
- Codes and technical guidelines such as ISO 16933, ISO 16934, EN 13541, WBDG, CWCT TNs, etc.









TECHNICAL SUMMARY

System interaction and detailing

- Glass, interlayers, framing, anchors and steel act as one system
- Clear load paths and ductile detailing are critical
- Interfaces, penetrations and connections explicitly designed

Testing and validation

- Desktop studies supported by laboratory and full-scale field testing
- Blast test rigs validate façade and roof assemblies
- Test results correlated with analytical and FE models

Structural Behavior and Design Philosophy

- Elastic vs plastic response of envelope elements
- Acceptance of controlled permanent deformation
- Load redistribution and membrane action

Analysis and Design Methods

- Simplified SDOF analysis for envelope components
- Dynamic time-history calculations
- failure analyses and progressive collapse studies

CONTACT & NEXT STEPS

Invitation for discussion

waagner biro
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"Let's define, design and build your protection needs together!"

tender@wb-sg.com

Waagner Biro steel and glass GmbH
(Group Head Office)
Saturn Tower (7th floor)
Leonard Bernstein Straße 10
1220 Vienna
AUSTRIA
+43 1 90 277 0
www.wb-sg.com

Waagner Biro steel and glass Contracting
Riyadh Office
2nd Floor, Building B
Anas Ibn Malik Road,
Al Malqa
Riyadh
SAUDI ARABIA

Waagner Biro steel and glass Emirates Contracting LLC
Gibca Building (8th floor)
Khalifa St, Abu Dhabi, UAE
+971 2 626 0416
Dubai Branch:
Tameem House (13th floor)
Barsha Heights, Dubai, UAE
+971 4 584 6765

Waagner Biro steel and glass Çatı Cephe Sistemleri İstanbul Tic.A.Ş.
Yenişehir Ankara Caddesi No:405/5
D:155 Office 360 Plaza
Kurtköy / Pendik
Istanbul
TÜRKİYE
T: +90 216 574 44 74

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