The following specification has been developed following a programme of static load tests and a series of arena blast tests.

The guidance contained in this document should be used when designing or specifying a point-fixed glazing system where a degree of blast enhancement is required.

The following must be considered as guidance and defines the **minimum requirements**.

The fittings must be considered in conjunction with a correctly designed façade system which must be checked by façade designers competent in the field of blast design. Suitable engineers should be members of the Register of Security Engineers and Specialists (RSES) ([www.rses.org.uk](http://www.rses.org.uk)) or be able to demonstrate that they meet the appropriate RSES competences.

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Requirements for an ‘enhanced’ point-fixed glazing system

Structural glass system

- Single glazed: toughened laminate wall
- Double glazed: toughened laminate (inner ply), toughened or toughened laminate (outer ply)

Assembly fixings

Single glazed - toughened laminate wall fixings – see Appendix A.

Fixing Type I: cylindrical head and adjustable clamp with counter sunk static bolt.

Fixing Type II: cylindrical head and adjustable dual clamp with integral clamping mechanism and articulated bolt.

Fixing Type III: cylindrical head and adjustable triple clamp with integral clamping mechanism and articulated bolt.

Fixing Type IV: planar type with adjustable dual clamp with integral clamping mechanism and planar articulated bolt.

Double glazed - toughened laminate wall fixings – see Appendix B.

Fixing Type V: cylindrical head and adjustable double clamp with integral clamping mechanism and articulated bolt applied to inner laminated plies.

Fixing type VI: cylindrical head and adjustable triple clamp with integral clamping mechanism and articulated bolt applied to inner laminated plies.

Fixing type VII: planar type with adjustable dual clamp with integral clamping mechanism and planar articulated bolt.

Stainless steel assembly fixings

All castings and machined fittings: to BS EN 10088-1, grade 1.4401 (BS 1449:Part 2, grade 316).
Assembly supports

The following means of supporting the fixings are considered acceptable:

- Composite vertical ribs
- Vertical beams (i.e. RHS)
- Vertical beams with cross bracing
- Vertical beams with cross beams
- Cable truss (with compression chord)
- Cable truss (without compression chord)
- Horizontal beam (i.e. RHS)
- Props (taken back to main building structure props capable of taking tension and compression)

Note: Glass fin and glazed supporting elements will not be permitted.

Maintenance

All threaded assembly fixings and assembly support fixings must be locked or pinned at the completion of structural glazing to prevent unplanned rotation due to building movement or unauthorized adjustment.

Glass (general)

Heat toughened glass:

- All toughened glass to have a minimum surface compressive stress of 120N/mm² after heat soak testing.
- All toughened glass must be subjected to a heat soaking test to EN 14179.

Laminated glass:

- Interlayers to glass leaves must be polyvinyl butyral (PVB). Ionoplastic interlayers may be considered as an alternative.
- Cast in place (CIP) or Ethylene-vinyl acetate (EVA) interlayers will not be considered.
Design

The following bolt types provide enhanced security against blast effects, these indicative bolt types were found to perform best when tested by CPNI - they are of generic detail and the following key provides detail of the essential components.

Key:

[01] Toughened and laminated glass.
[02] PVB or approved equivalent interlayer minimum 1.52mm thickness.
[03] Clearance holes cut in glass prior to thermal processing.
[04] Cylindrical clamping head and/or base member: minimum 80 mm Ø x 8mm torque to 35N/m.
[05] Gasket or contact washer manufactured from Polyacetal or polyethylene or acceptable alternative.
[06] Very High Bond (VHB) adhesive, 0.75 mm thick, manufactured from 5952F pressure sensitive adhesive - use a 3M recommended VHB cleaner and/or adhesion promoter.
[07] 3mm thick tubular nylon 80 bush dimensioned in length, to provide correct torque backstop.
[08] Spacer shim integral component to fixing.
[09] M12 Nut G8.8 or equivalent.
[11] Cylindrical clamping head with integral clamping mechanism and/or base member: minimum 80 mm Ø x 8mm, torque to 35N/m or 70N/m – see manufacturer’s specification.
[12] Cylindrical inner clamping head, torque to 35N/m or 70N/m – see manufacturer’s specification.
[14] Aluminum grommet dimensioned in length, to provide correct torque backstop.
[15] Structural cylindrical clamp torque to 35N/m or 70N/m – see manufacturer’s specification.
[16] High performance spacer bar as primary seal.
[17] Structural sealant as secondary seal.
[18] Toughened or toughened and laminated exterior glass ply.
Appendix A
Single-glazed toughened laminated wall fixings

*Fixing type I: cylindrical head and adjustable clamp with counter sunk static bolt*
Fixing type II: cylindrical head and adjustable dual clamp with integral clamping mechanism and articulated bolt
Fixing type III: cylindrical head and adjustable triple clamp with integral clamping mechanism and articulated bolt
Fixing type IV: planar type with adjustable dual clamp with integral clamping mechanism and planar articulated bolt
Appendix B

Double glazed toughened laminated wall fixings

*Fixing type V: cylindrical head and adjustable double clamp with integral clamping mechanism and articulated bolt applied to inner laminated plies*
Fixing type VI: cylindrical head and adjustable triple clamp with integral clamping mechanism and articulated bolt applied to inner laminated plies
Fixing type VII: planar type with adjustable dual clamp with integral clamping mechanism and planar articulated bolt