Electrochromic Dynamic IGUs

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Executive Summary

- Primary use cases and constraints for electrochromic dynamic igus.
- Design drivers: performance, programme, visual intent; evidence path for approvals.
- Specification essentials: correct glass/IGU build-up, interface continuity, workmanship/QA.

Scope & Applications

Defines where this system excels, its practical limits (size/weight/support), alternatives and coordination needs with structure, envelope, M&E and fire strategy. Consider planning sensitivities (glare/reflection), acoustic exposure (road/rail), and maintenance access from the outset.

Key Standards & References

- Glass: EN 12150 (toughened), EN 1863 (heat-strengthened), EN 14179 (heat soak), EN 14449 (laminated), EN 1279 (IGUs)
- Impact safety: EN 12600
- Barriers: BS 6180
- Façade/Roof: CWCT standards & sequence testing where applicable
- Thermal/Solar: EN 673 (U), EN 410 (LT/g), ISO 10077 (Uw/Ucw)
- Wind: EN 1991-1-4 (UK NA)
- Fire: EN 13501 classification; EN 1364/1634 test evidence (E/EI systems)
- Security: EN 1627 (RC), EN 356 (P), EN 1063 (BR) as applicable

Design Inputs (to request/agree)

Design Input	Notes
Wind pressures & zones	EN 1991-1-4 (UK NA); field/edge/corner; internal pressure; psi factors.
Deflection limits	Agree span/ratio early (e.g., span/200 serviceability). Check sealant bite/hardware in SLS.
Loads (floors/barriers)	EN 1991-1-1 floor categories; BS 6180 line & point loads for barriers.

Thermal/solar targets	Ug/Ucw; g/LT; shading & Part O coordination; condensation risk.
Acoustics	RW/CTR targets; flanking at perimeters; vents & purge strategy.
Fire/Security	E/EI classification; RC/BR classes; use tested systems only.
Access/Maintenance	Cleaning, replacement strategy, walkways for overhead glazing.

Engineering Notes

- **Glass sizing:** use validated plate theory methods/software; account for laminate shear (temperature/time). Ionoplast interlayers (SGP) retain stiffness better than PVB at elevated temperatures.
- **Deflection:** serviceability limits must protect sealant bite, gasket compression and hardware function. Declare the limit (e.g., span/200) and check both SLS and ULS as appropriate.
- **Connections:** detail isolation, tolerances, rotation capacity (point-fixings), and SSG bite/cure evidence where applicable.
- **Thermal & solar:** declare method (EN 673/EN 410). Balance U, g and LT with Part O/daylight targets. Consider thermal shock for external plies.

Performance-Based Spec Template (copy/paste)

- **System outcomes (measurable):** Ug/Ucw [W/m^{2}K]; g-value [%]; LT [%]; RW/CTR [dB]; Air [Class]; Water [Class]; Wind [Pa]; *Deflection limit* [e.g., span/200]; Safety EN 12600 [class]; Fire [E/EI, mins] (if applicable); Security [RC/BR] (if applicable).
- **Glass/IGU stack:** Outer ply [thk, treatment, coating]; Cavity [gas, spacer type]; Inner ply [thk, lamination]; Interlayer [PVB/SGP/Acoustic]; Heat-soak [Yes/No]; Edgework [polished/arrissed]; Edge cover [mm].
- **Interfaces & continuity:** Membranes/tapes/primers with *compatibility letters*; airtightness & vapour control continuity; thermal breaks at frames; sill/threshold *falls*, upstands, and unblocked *weep* paths.
- **Workmanship & QA:** Tolerances [frame plumb/level]; setting blocks/packers (hardness, spacing, positions); sealant type & substrate prep; SSG QA (if used: bite, cure evidence); temporary protection/cleaning.
- **Evidence & submittals:** Calcs pack (loads/deflection/fixings); wind zone map; glass/IGU schedule; drawings/details; DoP/UKCA/CE; CWCT sequence (façade/roof); heat-soak certificates (if specified); warranties.
- **Samples & mock-ups:** Coatings/interlayers/frits with photographic acceptance; on-site mock-up (reflection/time-lapse; drainage/threshold check; operation under wind).

- **Maintenance & replacement:** Cleaning regime per coating; inspection intervals (gaskets/sealants); spare pane strategy; safe access routes.

Interfaces & Detailing

- Membranes/tapes/primers: compatibility letters; airtightness & vapour continuity.
- Drainage/weep strategy: sill/threshold falls, upstands, unblocked paths; avoid ponding.
- Setting blocks/packers: hardness, spacing and positions; guarantee edge cover.

QA & Acceptance

- **Visual acceptance:** inspect at ≥3 m (internal) / ≥5 m (external) in diffuse daylight; exclude edge zones per guidance.
- **Water management:** verify continuous drainage; unblocked weeps; hose test by agreement.
- **Movement & tolerances:** check joint capability; setting block positions; edge cover & frame plumb.
- **Documentation:** as-built glass schedule; heat soak certificates (if specified); hardware torque logs.

Risks & Mitigations

- Overheating vs daylight → selective coatings + shading + purge/ventilation alignment.
- Acoustic flanking → robust perimeter sealing; asym IGUs; attenuated vents where required.
- Condensation & cold bridges → warm-edge spacers; thermal breaks; vapour control continuity.
- Reflections & glare → assess receptors; frit/AR; geometry/orientation adjustments.
- Handling & access → cranage routes; temporary works; pane size & weight limits.

Mock-ups & Testing

- Samples: coatings/interlayers/frits; set photographic standards for viewing.
- On-site mock-up: reflection/time-lapse; threshold drainage check; door operation/deflection under wind.
- Evidence pack: test reports, method statements, insurer/warranty acceptance letters, CWCT sequence (if façade/roof).

Maintenance & Replacement

- Cleaning regime tailored to coatings (AR/solar/hydrophobic) — approved agents & tools only.
- Sealant & gasket life-cycle — inspection intervals and replacement strategy.

- Replacement: identify lifting routes, glazing stools/packers, safety controls for public realm.

Submittals (include with tender/approval)

- Calcs pack (loads, sizing, deflection, fixings), wind zone map, deflection limit statement.
- IGU/glass schedule; coating specifications; heat soak certificates (if specified).
- CWCT sequence results (if façade/roof); DoP/UKCA/CE; warranties; cleaning/care guides.

Project-specific verification is required. This document is guidance only and not a substitute for structural design or fire engineering.