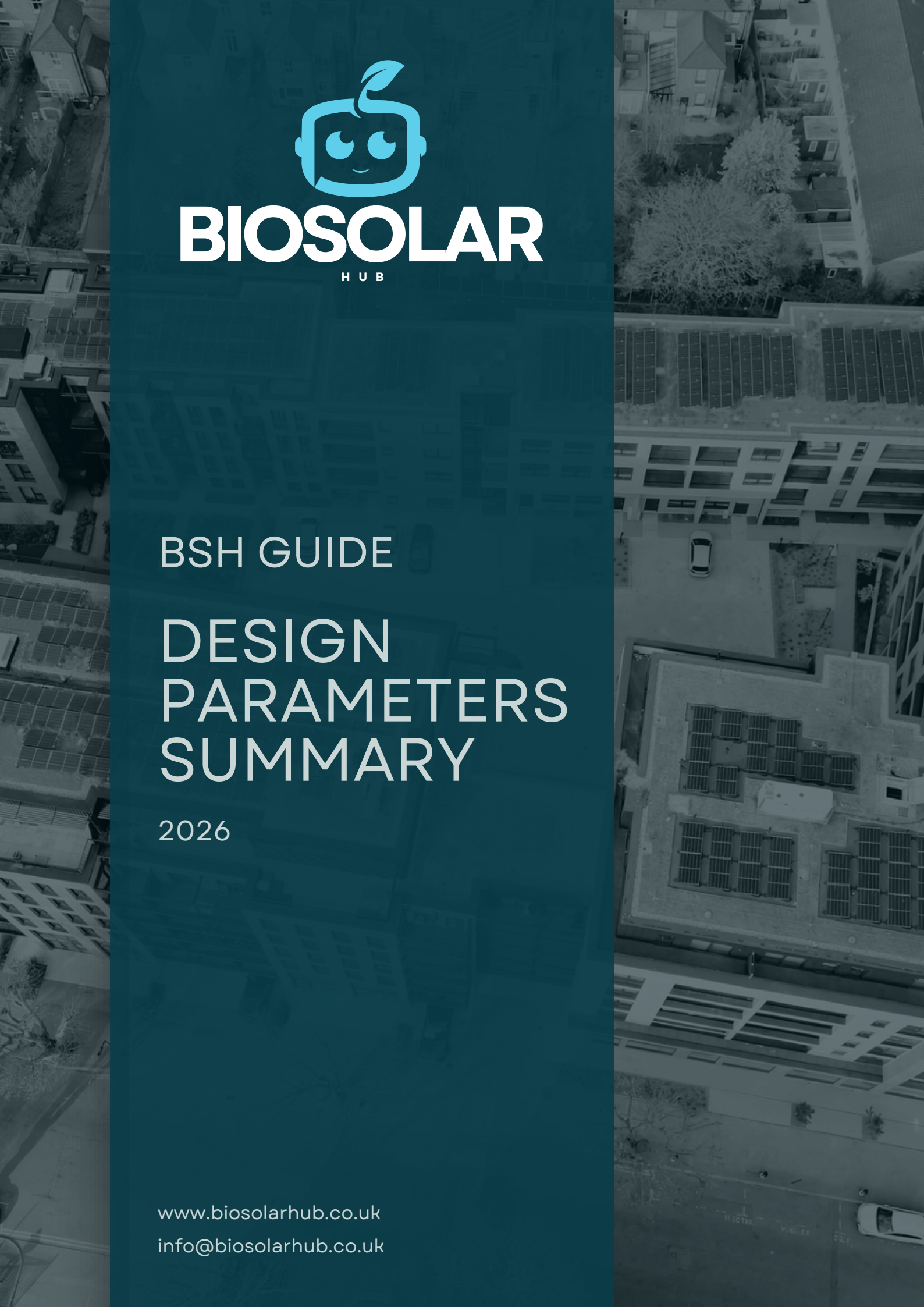

BIOSOLAR HUB

BSH GUIDE

DESIGN PARAMETERS SUMMARY

2026

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BIOSOLAR DESIGN PARAMETERS SUMMARY

The values in this guide are indicative and based on typical biosolar roof practice. All projects must be designed and verified by competent professionals to suit their specific conditions, including structure, wind uplift, drainage, fire strategy and electrical design. Final requirements must always be confirmed against the latest GRO guidance, RC62: Biosolar Roofs, British Standards and manufacturer specifications.

1. STRUCTURAL DESIGN PARAMETERS

1:1 Typical Biosolar System Loads

(Indicative ranges – actual weights depend on manufacturer and specification)

Component	Typical Load (kN/m²)
Extensive green roof (saturated)	0.8 – 1.5 kN/m²
Biosolar PV support system	0.10 – 0.25 kN/m²
Ballast (if required)	Typically 5–20 kg/m² in central zones and 20–80 kg/m² in edge and corner zones, but always calculated from project-specific wind uplift analysis.
Total indicative biosolar build-up	0.9 – 1.8 kN/m²

Notes:

- Values must be confirmed by a structural engineer.
- Snow load calculations must follow BS EN 1991-1-3.
- Biosolar systems often reduce ballast loads due to integrated trays and lower ballast requirements, but this varies by manufacturer.

1:2 Roof Build-Up Depth Requirements

Typical extensive build-up (vegetation + substrate + drainage)	80–150 mm
Deeper biodiverse substrates	100-200mm
PV mounting zone height must allow for	Vegetation height (typically 80–150 mm) Required PV clearance (see Section 3.1)

1:3 Point Loads & Concentrated Loads

Most biosolar systems distribute loads over a wide base.

Check: point load capacity, deflection limits, and local reinforcement near upstands, outlets, and penetrations.

BIOSOLAR DESIGN PARAMETERS SUMMARY

Always cross-check values against GRO Guidance, RC62: Biosolar Guidance, manufacturer specifications, and project-specific engineering advice.

2. GREEN ROOF PARAMETERS

2:1 Vegetation and Substrate Depths

Vegetation Type	Typical Substrate Depth
Sedum blanket / Mat	40-80mm
Sedum / Wildflower mix	80-120mm
Biodiverse / Brown roof	100-150mm +

2:2 Fire Safety: Fire Breaks (Vegetation-free zones)

Purpose : Reduce horizontal flame spread and separate vegetation from heat sources. Final fire strategy must be confirmed with the project fire engineer

Fire Element	Typical Range	Source
Perimeter gravel margin.	300-500mm (Width varies by wind zone and system design PV arrays are typically set back ≥ 1,000 mm from the roof edge for wind, access and manufacturer requirements (see Section 5.3).	GRO
Penetrations / Roof lights	500mm (Penetrations, vents, roof lights, pipework)	GRO
PV row seperation	500 - 1000 mm (Typically used for mixed vegetation, taller planting, or tight module spacing)	RC62
Long PV Runs	Where continuous PV rows exceed ~40 m in length, a transverse fire break / access break should be introduced (typically ≥ 1000 mm)	In line with RC62 principles and GRO guidelines
High Risk Zones	≥ 1000 mm (plant rooms, escape doors, major heat sources)	RC62 & Fire Engineer

2:2 Fire Safety: Vegetation Management

Vegetation maintenance height	70-100mm (sedum). Under and around modules keep vegetation short and maintained.	GRO

2:2 Fire Safety: Fire Breaks (Vegetation-free zones)

Minimum roof fire classification	BROOF(t4)	ADB

3. PV SYSTEM DESIGN PARAMETERS

3:1 PV Panel Clearance Above Vegetation

(Indicative ranges – actual weights depend on manufacturer and specification)

Component	Recomendation	Notes
Minimum clearance GRO Baseline	200mm minimum from top of vegetation to underside of module	Valid only for low sedum systems with controlled vegetation height
Recommended clearance Biosolar best practise	300-450mm	For most biosolar roofs this provides • Better airflow and panel cooling • Improved fire safety (per RC62) • Space for natural vegetation growth • Enhanced biodiversity • Reduced long-term maintenance

Why recommended heights exceed GRO minimum:

GRO 200mm recommendation assumes controlled low-height sedum.
Most biosolar roofs use biodiversity-rich substrates with 80–150 mm vegetation height.
Fire engineers increasingly recommend 350 mm+ to reduce radiative heat transfer.
Lower heights increase shading, heat accumulation, and vegetation scorch risk.

Design Requirement:
Clearance must be confirmed with PV manufacturer, green roof supplier & fire engineer.

3:2 PV Panel Pitch

Typical Bio Solar Pitch	10-15 degrees	Higher pitches require increased row spacing and may increase ballast

3:3 Orientation

Optimal	South-facing arrays are optimal for peak annual energy generation, as they align with the sun's strongest midday irradiance and therefore maximise kWh output per kWp. This orientation typically provides the highest overall system efficiency and is preferred where the goal is maximum annual yield.	East–West layouts are fully viable and can be beneficial for buildings with daytime energy demand, as they provide a flatter generation profile with useful morning and late-afternoon output. They also typically require lower ballast than south-facing systems due to reduced wind uplift and more aerodynamic, interlocking mounting geometries.

3:3 Row Spacing

Guideline: Ensure the bottom edge of the upper row does not shade the top edge of the lower row between 10:00 and 14:00 solar time.This equates to roughly 1.0 × module height as a safe spacing rule of thumb

Pitch	Required Spacing	Example
10	700-900mm	Example 1 – Low-pitch (10°) • Works for most sedum and low meadow systems • Minimises ballast while preserving access for maintenance
12	800-100mm	Example 2 – Medium-pitch (12–15°) • Needed to avoid shading between rows • Common on roofs with parapet or plant-unit shadows
15	1000-1200mm	Example 3 – High-clearance ecological biosolar system • Used for enhanced biodiversity performance • Allows airflow and tall meadow plants without panel shading

4. ACCESS AND MAINTENANCE

4:1 Access Requirements

Minimum Access route	≥ 600 mm	Preferred for maintenance: ≥ 1000 mm. Ensure access to outlets, safety lines, isolators & inverters
Fall Protection Systems	Typical 1500mm set back from edge of rood	Subject to fall protection design

4:2 Parapet Heights

Safe working height	1100mm	If lower fall protection must be provided

4:3 Inverter Positioning & Access

Pitch	Required Spacing	Example
Location	Indoors preferred	Inverters are generally preferred indoors (e.g., plant rooms) due to improved thermal stability, reduced weather exposure, and longer operational life. Outdoor rooftop mounting is possible but may lead to thermal derating and accelerated wear.
Inverter Clearance	Check Manufacturer guidelines	Manufacturers typically require ventilation clearances of 150–300 mm on the sides, 300–500 mm above, and a 600–1000 mm front working zone.

5. WIND, BALLAST & UPLIFT PARAMETERS

5:1 Wind Uplift Checks

Use Eurocode EN 1991-1-4 or manufacturer wind maps	Corner and edge zones require higher uplift resistance	Green roof substrate helps reduce uplift risk

5:2 Ballast Requirements (must be calculated by:)

PV mount manufacturer	Structural engineer	Wind uplift specialist

5:3 Edge Zones

Typical Perimeter margin	300-1000mm	Depending on wind zone and fire strategy
PV Layout	1500mm	Typical PV setback from roof perimeter 1500mm (BSH preferred standard). Final setback subject to manufacturer design, wind uplift analysis, and fire strategy.

COMPLIANCE AND REFERENCE STANDARDS

Designers must refer to full documents, including:

- ☐ GRO Green Roof Code
- ☐ GRO Fire & Solar Guidance
- ☐ RC62: Biosolar Roofs
- ☐ Approved Doc B (Fire Safety)
- ☐ Approved Doc O (Overheating)
- ☐ BS EN1991-1-3 (Snow)
- ☐ BS EN1991-1-4 (Wind)
- ☐ BS 8616 (Green Roof)
- ☐ BS7671 (Electrical)

Manufacturer Documentation Specific to Project

- ☐ Load Data
- ☐ Minimum clearance
- ☐ Ballast requirements
- ☐ Fire Classification
- ☐ Roof system compatibility
- ☐ Warranty limits

QUICK REFERENCE TABLE

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Category	Parameter	Typical Range / Value	Notes / Source
Substrate depth	Exstensive green roof	80-150mm	GRO / BS8616
	Biodiverse substrate	100-200mm	GRO
Vegetation height	Sedum / low growing	70-100mm (maintained)	GRO
	Mixed meadow / Biodiverse	80-150mm	System - dependant
PV clearance	Min clearance above vegetation	200mm	GRO baseline (sedum only)
	Recommended clearance	300-450mm	RC62 & manufactures guidelines
	High biodiversity systems	350-500mm	Fire & airflow benefits
Panel Pitch	Typical biosolar pitch	10-15 degrees	Manufacturer norms
Orientation	South Facing	Opitmal annual yeild	Peak midday irradiance
	East-West	Flatter profile & lower ballast	Morning & afternoon generation
Row spacing	10 degree pitch	700-900mm	Shading & airflow
	12-15 degree pitch	900-1200mm	Avoid inter-row shading
	High cleanace eco systems	1000-1200mm	Vegetation & airflow
PV Layout	PV setback from roof permieter	≥ 1.5 m	GRO Recommendation
Loads	Extensive roof (saturated)	0.8–1.5 kN/m²	BS 8616 typical
	Biosolar mounting system	0.10–0.25 kN/m²	Manufacturer ranges
	Total indicative biosolar build-up	0.9–1.8 kN/m²	Dependent on system
Parapet height	Safe working height	1100 mm	Fall protection

QUICK REFERENCE TABLE

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Category	Parameter	Typical Range / Value	Notes / Source
Fire breaks	Avoid penetrations	500mm	GRO
	Green roof perimeter fire break	300-500mm	GRO
	Long runs	Introduce a transverse fire break (typically ≥1000mm)	RC62 & GRO
	Around PV arrays	500-1000mm	RC62
	High risk zones	≥ 1000 mm	RC62
Access routes	Min walkway width	≥ 600 mm	Maintenance access
	Preferred width	≥ 1000 mm	PV servicing
Inverters	Side clearance	150–300 mm	Manufacturer ventilation requirements
	Top clearance	300–500 mm	Typical airflow zone
	Bottom clearance	200–300 mm	Keep free for cooling
	Front working clearance	600–1000 mm	Access & safety
	Operating temperature	–25°C to +60°C	Most inverters; verify datasheet
	Derating threshold	> 40–45°C	Heat reduces output
Wind uplift	Perimeter spacing	300–1000 mm	EN 1991-1-4, fire strategy
Ballast (biosolar)	Central zones	5–20 kg/m²	Typical range only - must be calculated
	Edge/corner zones	20–80 kg/m²	Typical range only - must be calculated

Note:
These values represent typical industry ranges only. Every biosolar roof must be designed and verified to project-specific conditions, including structural loading, wind uplift, fire safety, and electrical design. Always check the full requirements of GRO, RC62, Approved Documents, EN standards, and manufacturer instructions.

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We’re here to accelerate the transition to buildings that give back more than they take – powering cities and restoring nature, one rooftop at a time.

Powering a sustainable future.