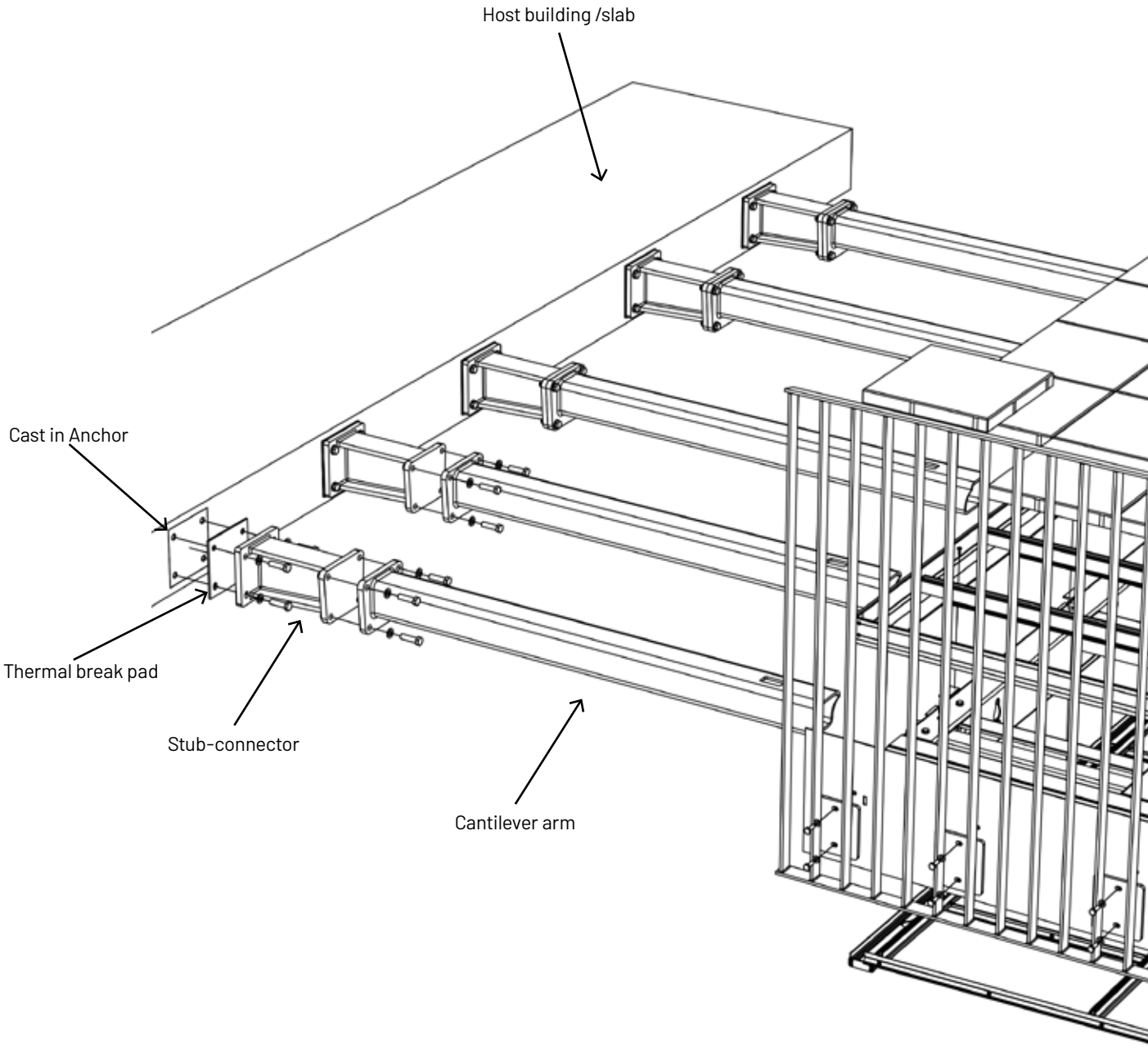
Levitate®

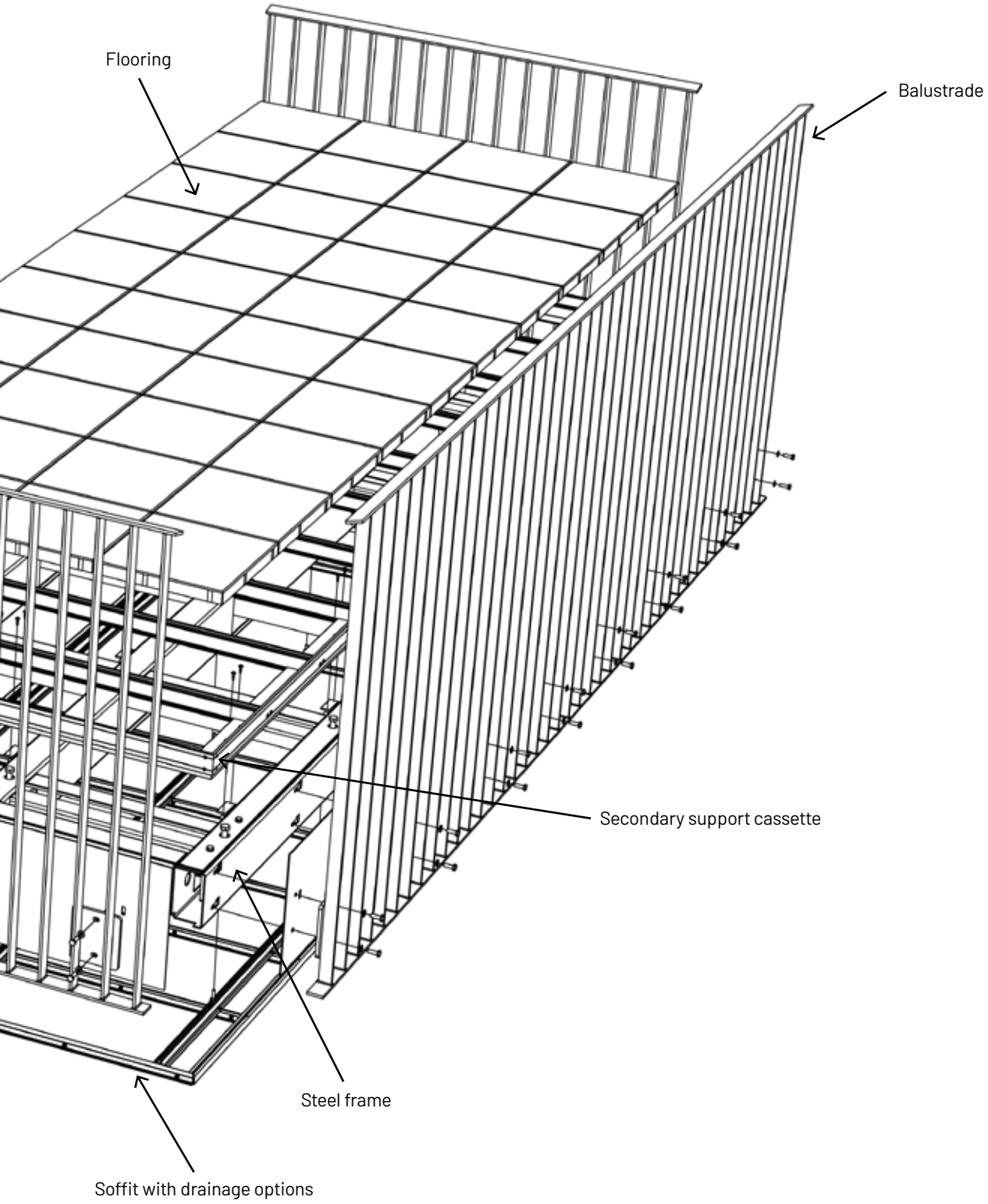
Technical specification

BALCO

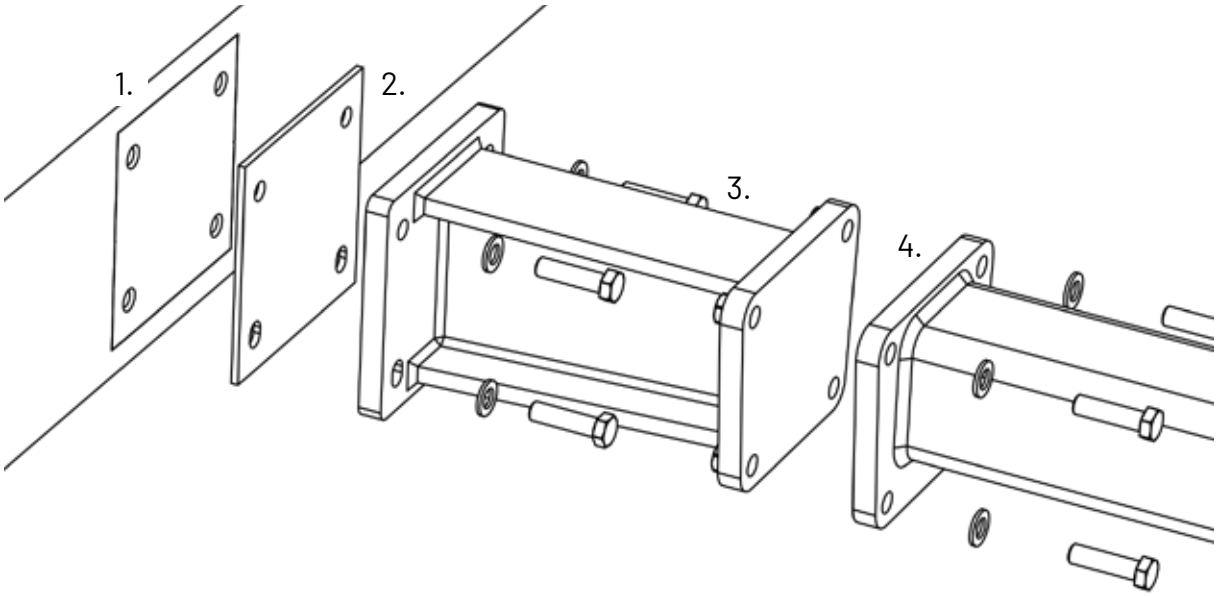
BALCONIES FOR GREATER LIVING

Version 1 - 2022


Host building /slab
Cast in Anchor
Thermal break pad
Stub-connector
Cantilever arm


Flooring
Balustrade
Secondary support cassette
Steel frame
Soffit with drainage options

Stub-connector



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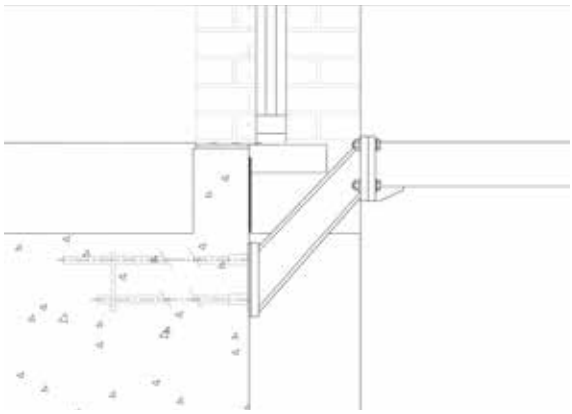
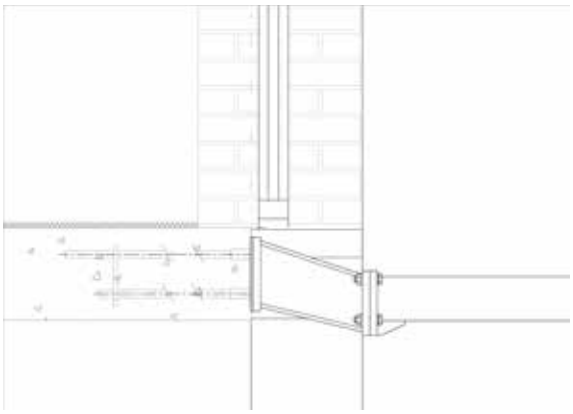
1. Cast In Anchor – subject to structural calculations
2. Thermal break pad
3. Stub-connector
4. Cantilever arm

Project specific Stub-connector
Levitate balcony positioning is dictated primarily by the angle and length of the Stub-connector.
Stub connector cross-section subject to structural calculations, and also angles nearing 45°.

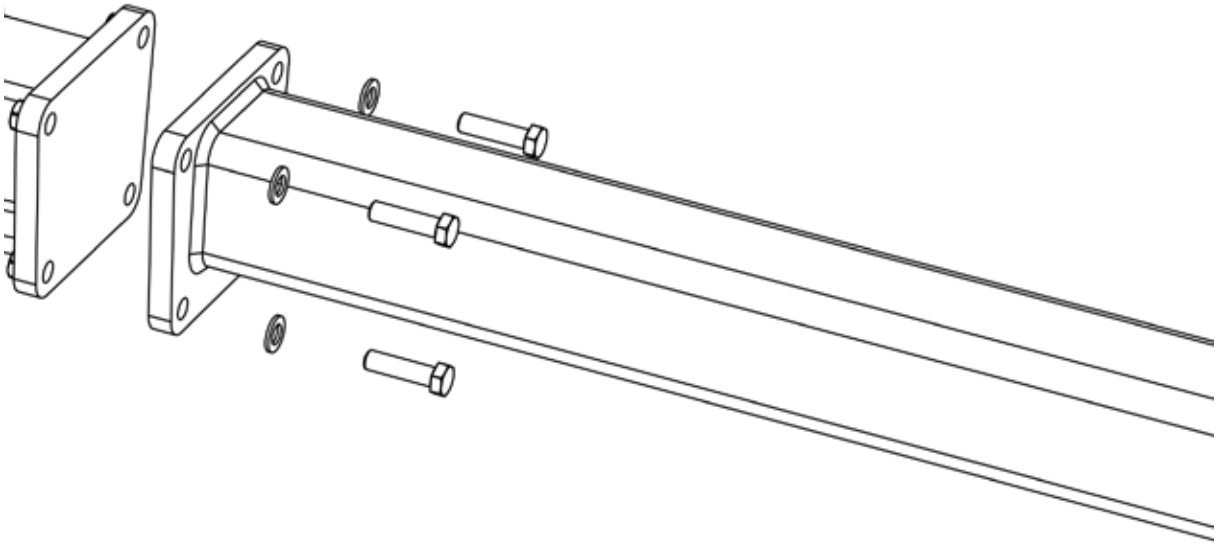


Stub-connector max inclination 45°



Stub-connector max declination 15°

Cantilever arm



Max 5mm deflection at 2kN point load incorporated in structural calculations.

*Eigenfrequency minimum 5Hz.

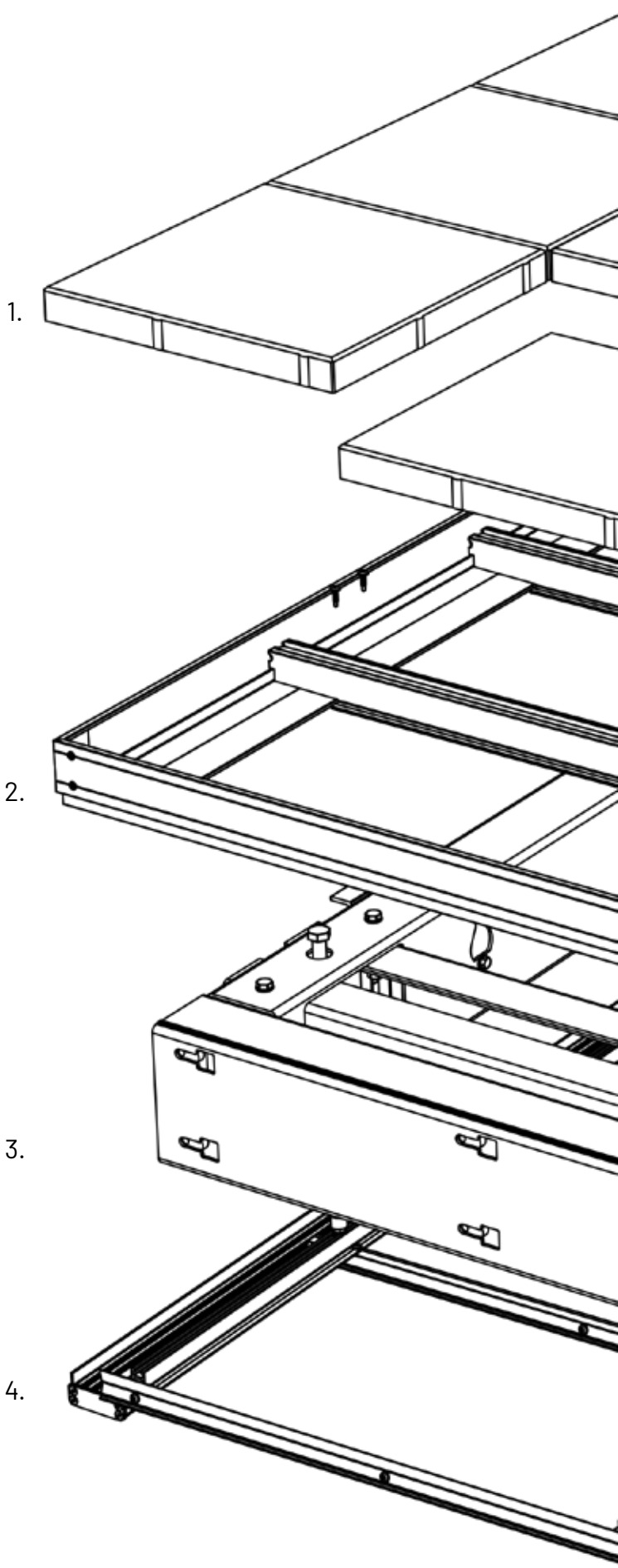
Patent pending: Anti-snag slide on technique.

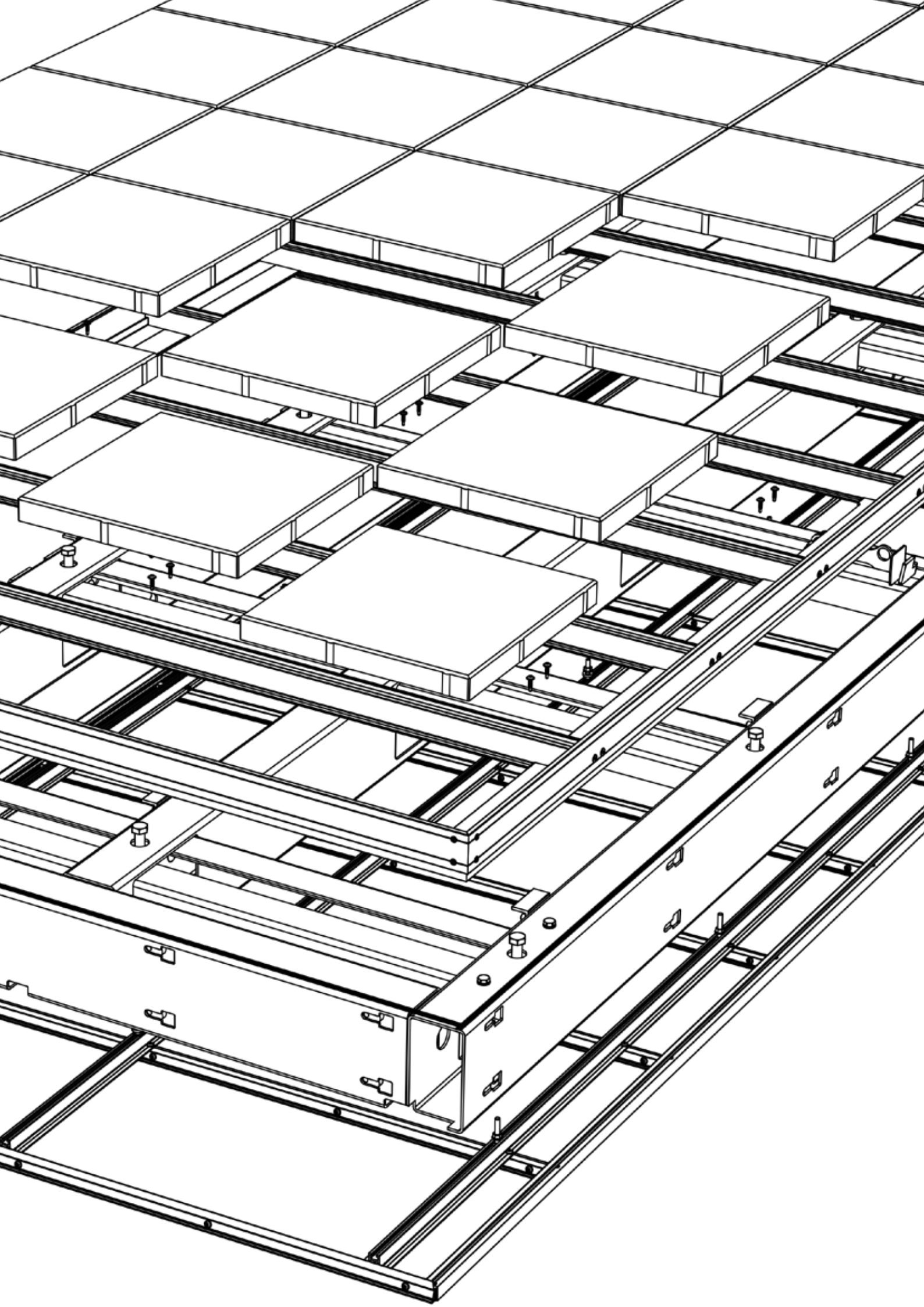
Cantiliver arm

Slab elements

1. BS8579 compliant concrete tile flooring or Aluminium decking according to BS7976-2+A1:2013
2. Secondary support cassette EN-AW 6063 T66
3. Steel frame S355
4. Soffit EN-AW 1050

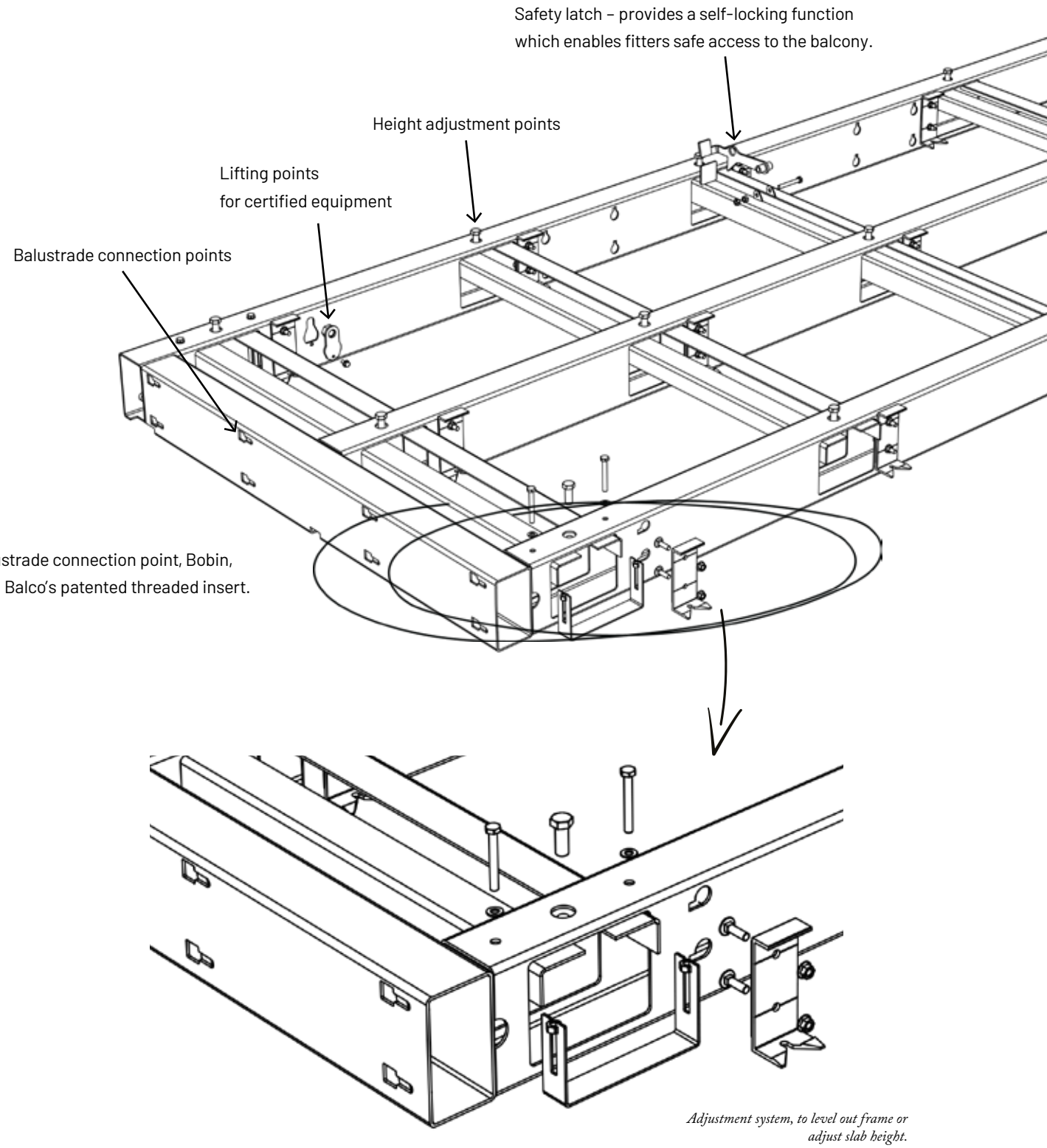
Levitate complies with material class A1 or A2-s1,d0 according BS EN 13501-1:2018.





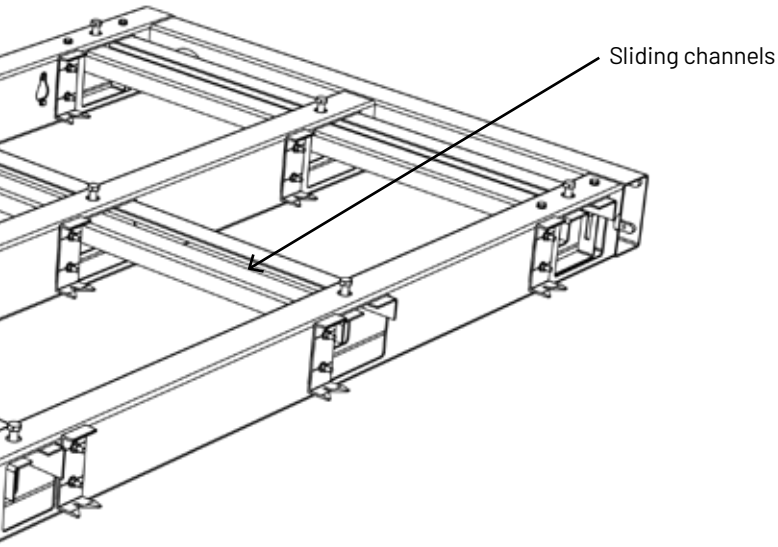
Frame structure with clamp system

Clamp system
Clamps verified by Balco test facility.
Apertures allow for 20 mm tolerance.

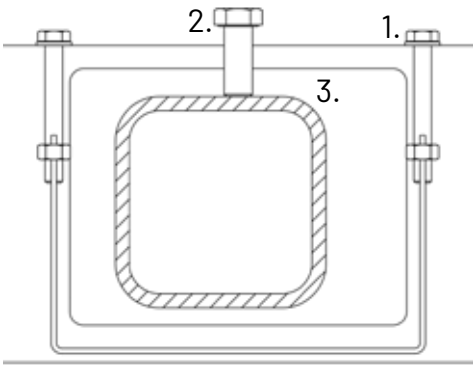


Balustrade connection point, Bobin,
with Balco's patented threaded insert.

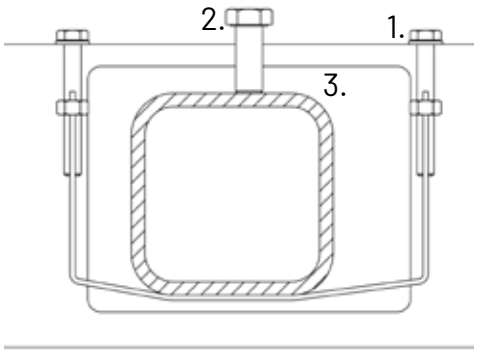
Adjustment system, to level out frame or adjust slab height.



Frame structure view of clamp mechanism



Pre lock example

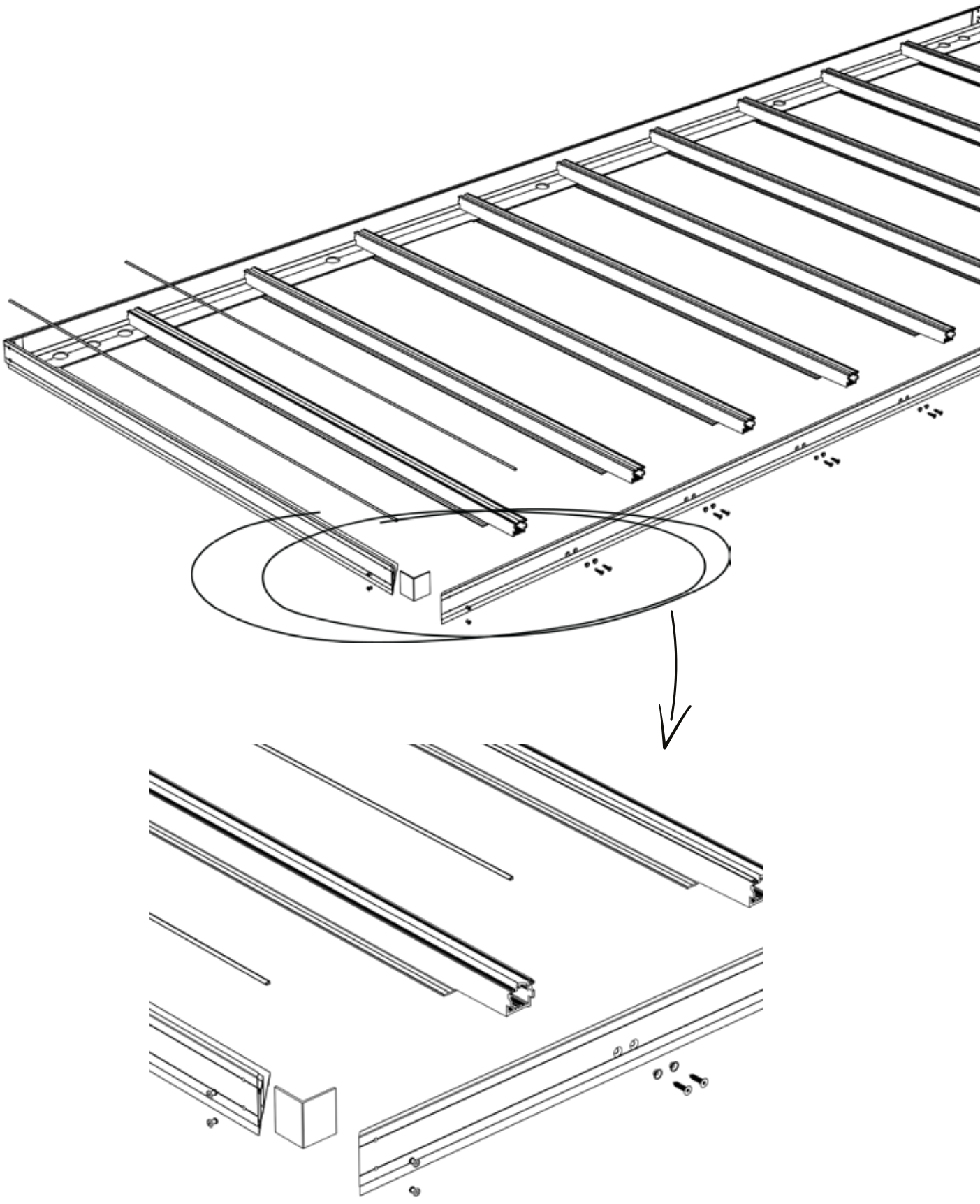


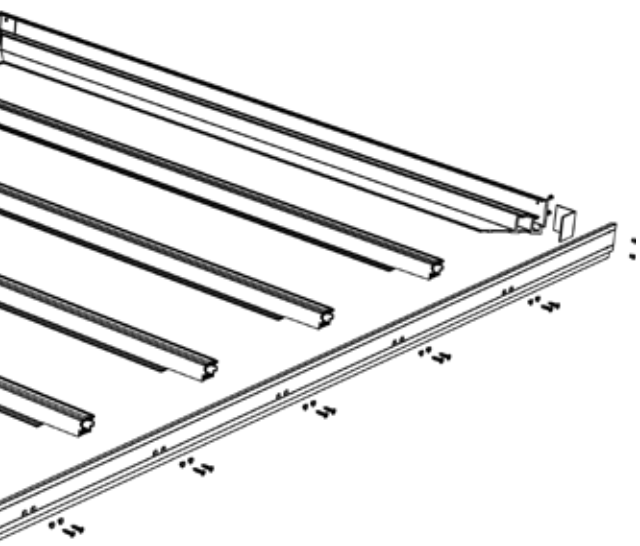
Post lock example

Clamp mechanism

Bolts in accordance with DIN933 and ISO4017.
Each clamp is able to resist pull forces of 3.43kN.
Patented, and tested at Balco's lab.

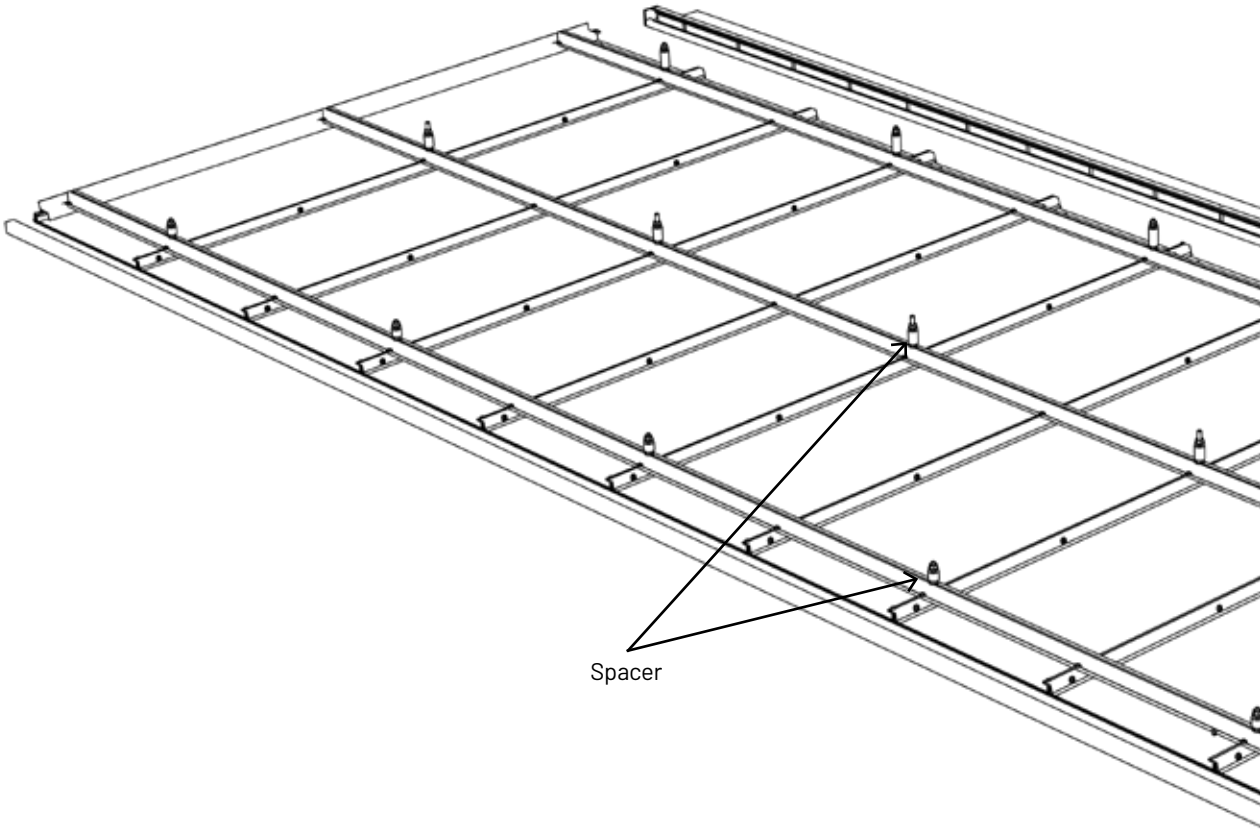
1. Clamp
2. Height adjustment points
3. Sliding channel





Secondary support cassette

Aluminium alloy: EN-AW 6063-T66 Material classification according EN13501-1:2018 as A1. Rubber gaskets in accordance with exemptions in Regulation 7(3) to adapt to all decking options.

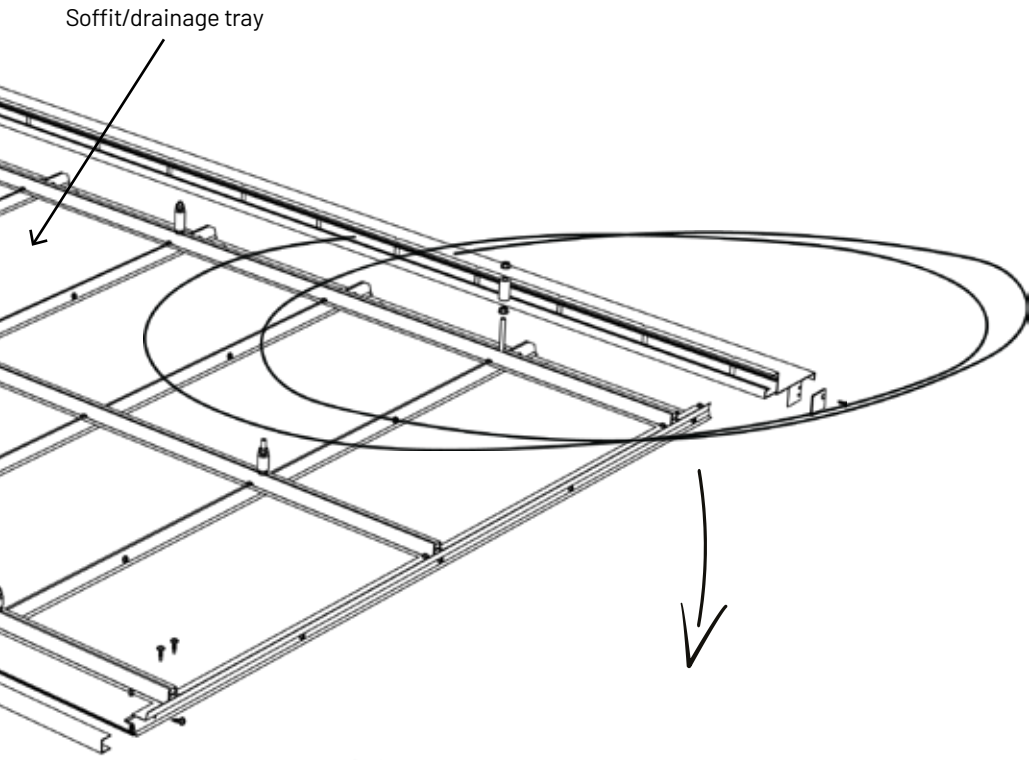


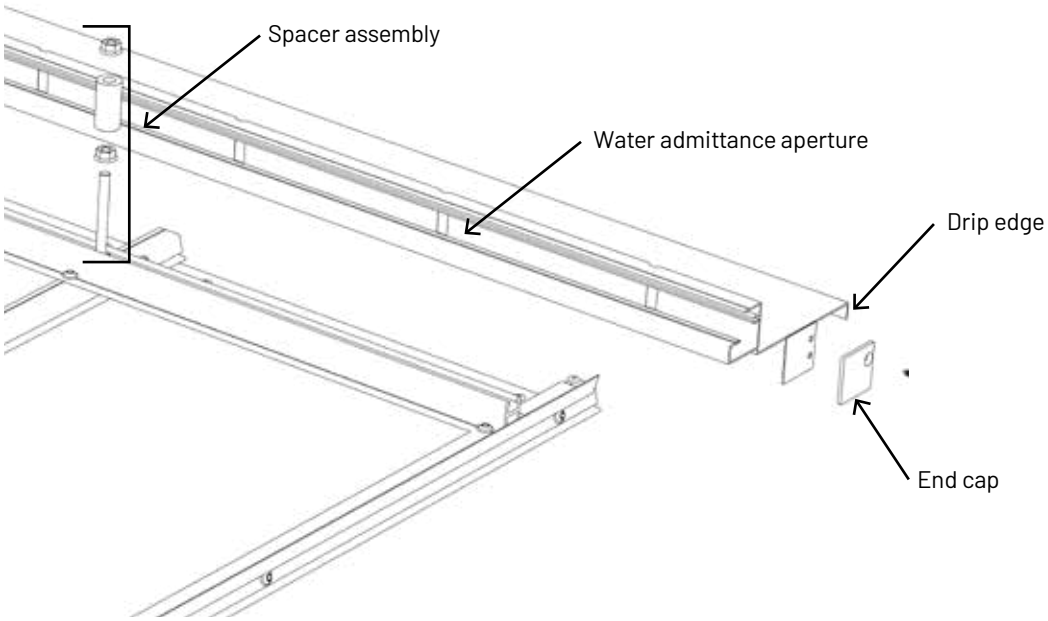
Soffit cassette with edge drainage

BS8579: Balconies should not have a perforated pedestrian surface draining directly onto balconies and public spaces below without a water collecting surface.

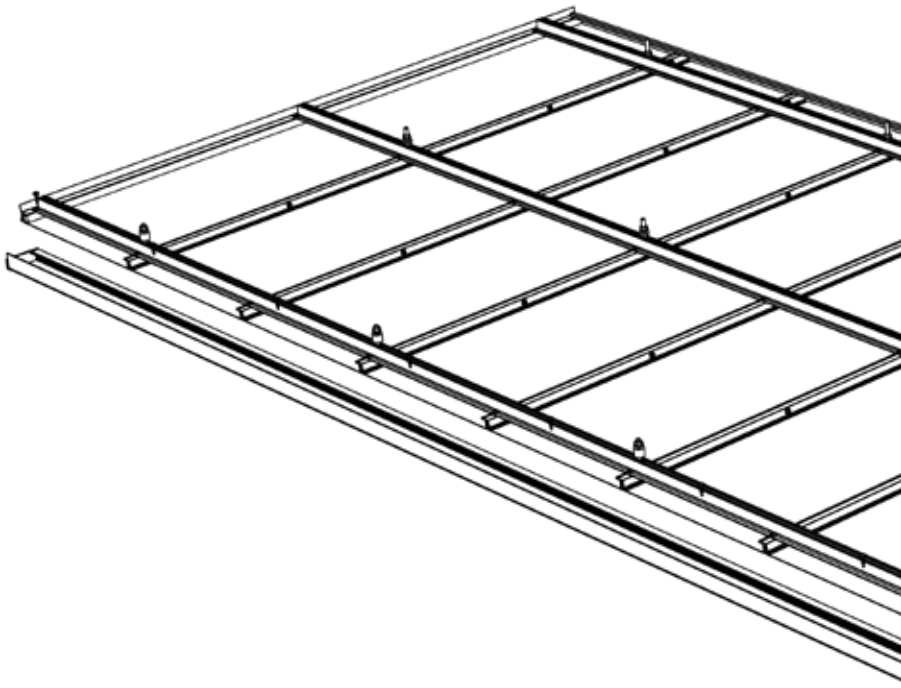
Levitate is fitted with a soffit which manages rainwater through either 'edge' or 'piped' drainage systems.

Levitate soffit is always set to a fall of at least 1:80





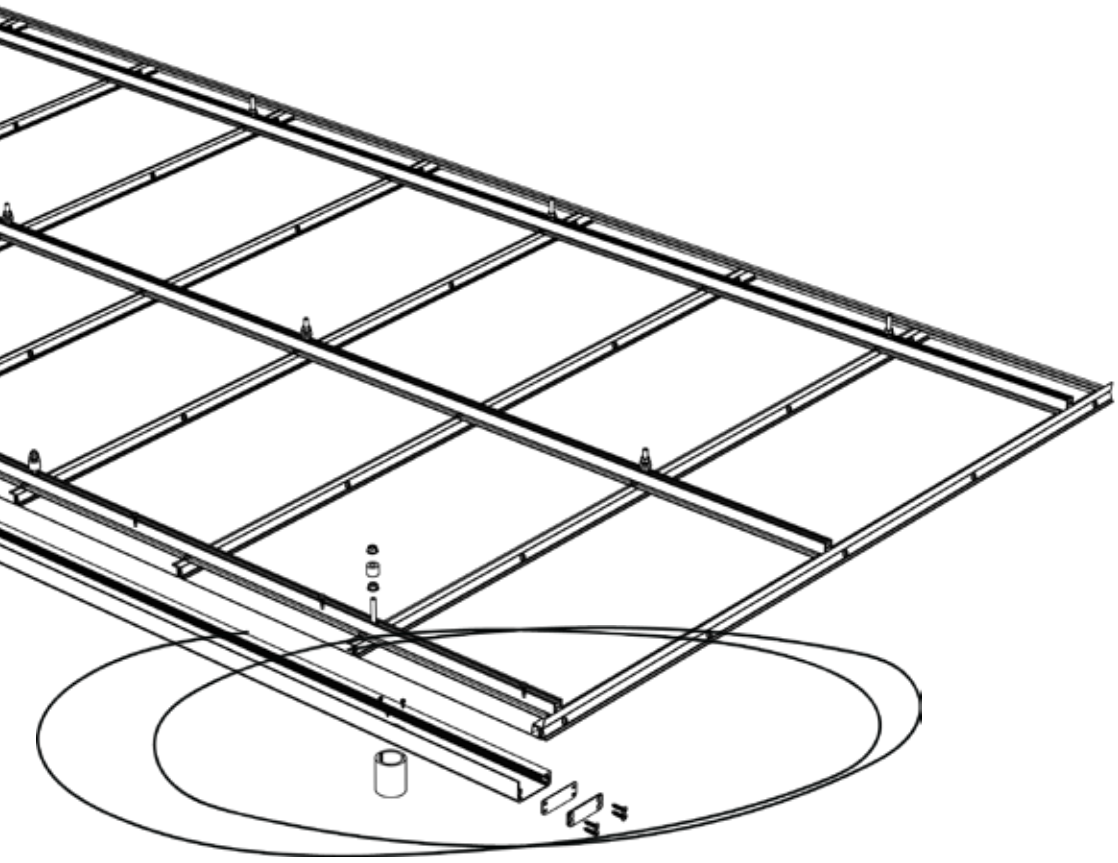
Adjustable drainage holes to allow for compliance with drainage when against adjacent walls

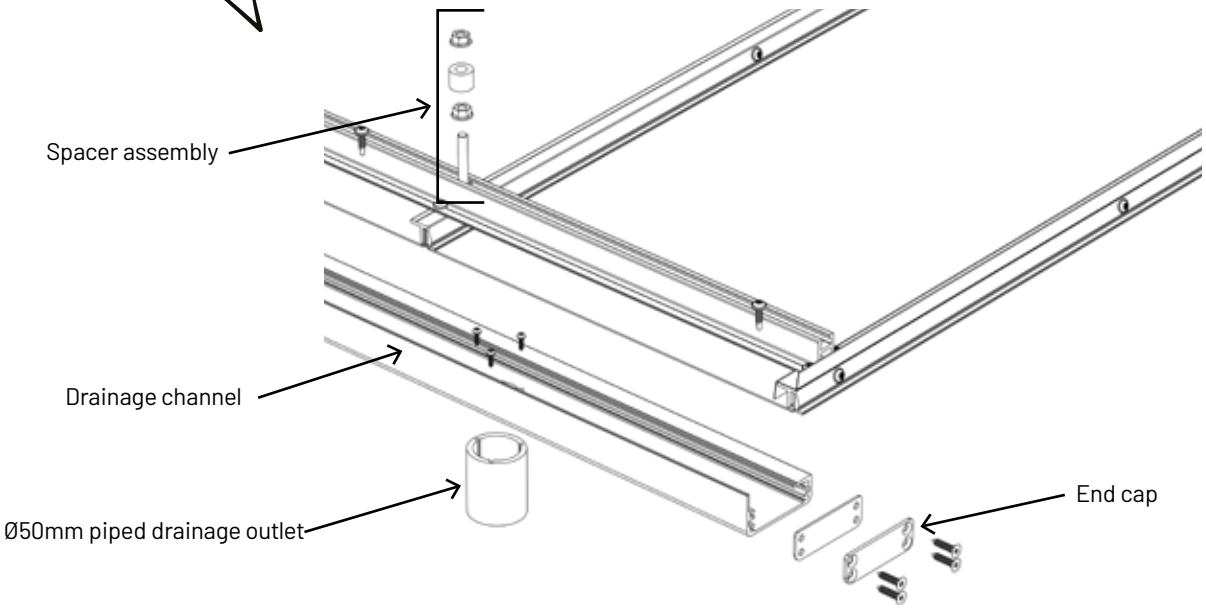


Soffit cassette with piped drainage

BS 8579: Where the soffit acts as the principle water collecting surface, it should be set to fall so that it is self-cleansing.

Levitate soffit is always set to a fall of at least 1:80




Spacer assembly
Drainage channel
Ø50mm piped drainage outlet
End cap

BS8579:2020 Compliance analysis

Chapter Scope	Requirement None	Solution or feature on Levitate®
Normative references	Referred standards:	X = Used in structural calculations
	BS 6180, Barriers in and about buildings – Code of practice.	X
	BS EN 1990, Eurocode – Basis of structural design.	X
	BS EN 1991 (all parts), Eurocode 1 – Actions on structures.	X
	BS EN 1992 (all parts), Eurocode 2 – Design of concrete structures.	X
	BS EN 1993 (all parts), Eurocode 3 – Design of steel structures.	X
	BS EN 1994 (all parts), Eurocode 4 – Design of composite steel and concrete structures.	X
	BS EN 1999 (all parts), Eurocode 9 – Design of aluminium structures.	X
	BS EN 1090 (all parts), Execution of steel and aluminium structures.	X
	NA to BS EN 1990, UK National Annex for Eurocode – Basis of structural design.	X
	NA to BS EN 1991 (all parts), UK National Annex to Eurocode 1.	X
	NA to BS EN 1992 (all parts), UK National Annex to Eurocode 2.	
	NA to BS EN 1993 (all parts), UK National Annex to Eurocode 3.	X
	NA to BS EN 1999 (all parts), UK National Annex to Eurocode 9.	X
	PD 6688-1-4, Background information to the National Annex to BS EN 1991-1-4 and additional guidance.	X
General principles	Balconies, terraces and access decks should be designed to provide amenity and sized for intended use.	Levitate is available in standard sizes with tile patterns of 3x6 up to 5x12. Aludecking is available in sizes in between as well.
	Design should aim for quality and functionality.	Levitate is CE and UKCA marked.
Wind effects	Design of balconies, guarding and weather screens should mitigate nuisance effects from wind Consideration should be given to tie-down points.	Different balustrade designs available, also including wind screens. Levitate is secured by steel clamps and safety latch.
Wind mitigation measures	Increased wind loading from any higher balustrade/screen	Object specific structural design in case of high screens.
	Net wind pressure factors.	Wind pressure coefficients according eurocode are incorporated in Levitate and balustrade structural calculations. Not according Figure 5.
Service life	Service life equal to buildings primary structure.	Design life of Levitate balcony main structural components 60 years.
	Pedestrian surface and balustrade infill 30 years.	For Levitate: Concrete tiles according EN1339:2003 or painted aluminium decking. Balustrade infills durability similar to balcony main structure.
	Components disproportionately difficult or impracticable to inspect or repair should have service life as designated primary components .	Design life of Levitate balcony main structural components 60 years.
	All other balcony components should be designated as secondary components and should be easy to inspect .	Secondary components are easily inspected, as it is possible to disassemble the product into modules.
	Safe method to replace secondary components should be demonstrated in the design.	Secondary components are easily replaced, as these belong to subassemblies of the final product.
	Assessment of water ingress to interlayer in laminated glass.	Considered in balustrade design.
	Capping should be made to susceptible interlayers.	Considered in balustrade design.
	Base channels should include drainage.	Considered in balustrade design.
Inclusive design Thresholds	Balconies should be designed to provide equal utility and enjoyments for all users.	Balcony levelled to 10mm below indoor FFL.
	Threshold should be designed to minimum restriction or trip hazard.	Threshold maximum 4mm above general balcony FFL.
	The threshold of this door should be level from indoor FFL to balcony FFL.	Bespoke stub connectors for levelling of the balcony pedestrian surface.
	Transition surfaces should fulfill: a) Internal transition max slope 15°, max length 150mm. b) Threshold upstand <15mm and trough minimized.	Bespoke stub connectors for levelling of the balcony pedestrian surface.
Balcony and terrace surfaces	If drain-type pedestrian surface, finishes should make sure risk for entrapment is removed.	See below.
	Slots max 8mm wide due risk of entrapment.	Nominal gap of 1mm between concrete tiles. Aludecking nominal gap 6mm.
	Circular holes ≤ 10mm.	No circular holes in any decking type.
Sight lines via balconies and terraces	Balcony should not screen off intended view.	Different balustrade designs are available.
	50% view through balustrade.	As above
Structural and mechanical stability and integrity	Thermal break to reduce heat loss and avoid condensation.	Thermal break pads or thermal break connectors are used.
	Suitability in terms of tolerances, camber etc.	Accounted for in Levitate balcony design phase.
	Accounting for low rotational spring in thermal break connectors.	Incorporated in Levitate structural calculations.
	Design should be according BS standards: • BS 6180, Barriers in and about buildings – Code of practice. • BS EN 1990, Eurocode – Basis of structural design. • BS EN 1991 (all parts), Eurocode 1 – Actions on structures. • BS EN 1992 (all parts), Eurocode 2 – Design of concrete structures. • BS EN 1993 (all parts), Eurocode 3 – Design of steel structures. • BS EN 1994 (all parts), Eurocode 4 – Design of composite steel and concrete structures. • BS EN 1995 (all parts), Eurocode 5 – Design of timber structures. • BS EN 1999 (all parts), Eurocode 9 – Design of aluminium structures. • BS EN 1090 (all parts), Execution of steel and aluminium structures. • BS EN 16612, Glass in building – Determination of the lateral load resistance of glass panes by calculation. • IStructE, Structural use of glass in buildings [N1].	All Levitate and balustrade structural calculations are performed according listed standards, including UK National annexes and NCCIs where available. Glass design in balustrade is confirmed by testing.
	Both Ultimate and Serviceability combinations need to be considered.	Incorporated in structural calculations.
	Movements and deflections restricted.	Incorporated in structural calculations.
	Deflection max 5mm at 2kN static load.	Incorporated in structural calculations.
	Vertical Eigen frequency minimum 5Hz.	Incorporated in structural calculations.
Safety Persons occupying the balcony or terrace	**Aspects for safety:** a) Loading of structure - Walking surface should not be dislodging by wind, flotation or humans b) Loading of envelope/guarding c) Prevention of falls. Prevent both people and objects. Non-climbable, also between balconies. Terraces, balconies and Juliet guardings 1100mm high above pedestrian surface or FFL. Toe hold <25mm. Risk assessment or design incorporating a toe hold should trigger height to 1100mm above step. Toe hold 300-600mm require increased guarding heights. Protection from wind. Mitigate risk for vertigo. d) Slip prevention. - Rz > 20µm - BS7976 - Max 3mm steps on pedestrian surface. e) Safety for persons below. - Prevention of falling objects. - Handrail top surface non-level. - Brittle materials prevented from falling down. - Prevent liquids	**These aspects are handled by:** a) Structural calculations - Heavy tiles, Aludecking screwed to frame b) Structural calculations c) Balustrade Balustrade according BS6180 Balustrade according BS6180. Screens at adjoining balconies. Safety height 1100mm in balustrade design. Steel balustrade have a thin side cover plate / flashing. Narrow aluminium profiles in balustrades. 1100mm is always safety height in balustrade design. - Increase height to 700mm above toe hold (at least 1100mm above pedestrian surface). - Architects responsibility (Different balustrade designs are available). - Higher balustrade available. Handrail provided on balustrade. Concrete tiles provide slip resistant surface. - Profiled aludecking. Concrete surface. - Aludecking paint with properties certified according BS7976-2+A1:2013. - Even thicknesses on tiles and decking profiles respectively. Following BS6180 for balustrades. - Toe board included in balcony side cover plates. - Either slanted 15degrees or rounded handrails available - Concrete tiles always on top of metal sheet soffit. - Drainage through soffit

Chapter Safety	Requirement Aspects for safety	Solution or feature on Levitate® These aspects are handled by:
	- Prevent dislodging	- Screwed connections to balcony frame.
	f) Safety for service.	
	- Avoid work under suspended load and work at height.	- Levitate features a locking device which enables secure work.
	- Cleaning of guarding inside.	- O&M
	- Access to inspect support structure, drainage and paint.	- Possible to lift tiles/unscrew profiles
	- Cleaning with rope access.	- Not allowed according current design.
	- Rope access connection points.	- Not featured in Levitate
	- Abseil connection points.	- Not featured in Levitate
Performance in fire – General	No additional risk to building or adjacent building.	Non-combustible materials
	Components exposed to fire should:	
	a) Not provide a medium for fire spread due to material or design.	Non-combustible materials
	b) Not propagate fire downwards through falling objects.	Non-combustible materials
	c) Be designed to remain in place (no risk for firefighters or the public)	Load-bearing structure designed for R30 according external fire curve. Locking mechanism featured.
	d) Designed to not affect buildings stability when large deformations occur	Levitate have no vertical connections, hence no destabilizing loads other than regular ULS and SLS. Large deflections do not cause any problem, since there are a lot of space below balconies.
	Open balconies not for access paths do not require fireproof design if size is small enough.	Levitate is for single dwelling units only.
	Access balconies and escape routes classed as floor which require fire resistance from underside.	Levitate is not intended as access balcony.
Materials and components for balconies in respect to fire.	Components of balconies with floor level 11m above ground should be of material class A1 or A2-s1,d0 according BS EN 13501-1:2018. This applies also to all stacked balconies.	Levitate act as Single units (not stacked). Steel and Aluminium classified as A1 materials.
	All other buildings should have risk assessed to prove adequate resistance. Minor components exempt from requirement according national regulations.	Levitate is non-combustible. If customer requires solution with other materials a risk assessment may be performed.
	Guardings to access balconies imperforate.	Different solutions available e.g. aluminium sheet.
	Open structures and open pedestrian surface should be fitted with imperforate tray to reduce risk of fire spread.	Drainage soffit serve as fire protection.
	Drainage pipe through soffit to be evaluated on risk for fire spreading.	Non-combustible materials used, except sealant but volume used is negligible.
Weathering and hydraulic design. General	Design should take the following into account:	
	- Rainwater outlet design	- Levitate options: Piped drainage or Edge drainage.
	- Overflow design	- Free edge overflow
Drainage of balconies and small terraces.	Controlled drainage should be used to prevent water ingress and staining of the building and/or nuisance to people or landscaping below.	Levitate have two options: Piped drainage and Edge drainage.
	Pedestrian surface should not have free standing water or give rise to water ingress of the building via accessible threshold.	Levitate have decking options with concrete tiles and aluminium flooring, both with porosities for drainage. Thresholds (balcony extensions against facade) can have the same flooring as slab, with drainage connected to slab drainage.
	As-built gaps between planks/slabs should be between 6-8mm to achieve effective drainage and minimize discomfort to wheelchair users.	Nominal distance between tiles: 3mm (as casted).
	Gaps of 10-12mm around perimeter.	Nominal distance at perimeter: 2mm.
	Balconies should not drain through perforations directly on balconies or public spaces below without a water collecting surface.	Levitate is fitted with a soffit which handle the drained water.
	For balconies with upstands on all sides, water collecting surface can be designed falls or flat with no back falls or ponding.	Levitate is designed with porous pedestrian surface with a sloping soffit (1:60) that directs the water.
	The design of support structure for water collecting surface should include tolerances and deflections to ensure falls.	Fixed slope of the soffit ensures the fall and eliminate ponding.
	If collecting surface is flat, then screed, layer, filler should be used to ensure no ponding occurs. Structural analysis should be used to estimate movements in order to verify drainage.	Soffit is always sloping. Deflections are included in structural calculation pack.
	Balconies and terraces guide for tiles in BS5385-3.	BS5385-3 is for tiles in grouting, not applicable to Levitate.

Chapter Safety	Requirement Aspects for safety	Solution or feature on Levitate® These aspects are handled by:
Large terraces	Require piped drainage and BS6229 should be followed.	Not applicable to single Levitate. Large, coupled balconies can be equipped with piped drainage.
Prevention of water ingress into the building.	a) Water collecting surface 75mm below ingress level.	Levitate's soffit is placed at the underside.
	b) Spillover at least 25mm below ingress level.	Spillover (free edge drain) close to soffit level.
	c) Water collecting surface nominal 25±10mm below spillover level.	Spillover 20mm above soffit's water collecting surface.
Managing water drainage.	Blocked outlet require an overflow to prevent water from entering the building.	Overflow at edge drainage of soffit.
	Warning pipe should be provided where flow from overflow is hidden.	Overflow is visible.
	When water collecting surface does not coincide with deck level, design should enable inspection and maintenance.	Both tiles and aludecking is possible to dismantle.
	Soffits should be ventilated.	Levitate soffit is ventilated.
	Soffit should be set to falls when used as water collecting surface.	Levitate soffit is always set to falls (1:60).
Edge drainage of balconies and small terraces.	a) Falls at least 1:80, for on-site built balconies, 1:60 to 1:40 is recommended.	1:60 is used on the soffit.
	b) Water collecting surface projection 30mm beyond vertical surface.	Drainage of soffit through and edge drain profile, extending more than 30mm from balustrade front plane.
	c) Drain via edge furthest from the wall. At adjacent walls, no discharge within 400mm from wall.	Exit slots in edge drain profile are avoided within 400mm from the wall.
	d) Flow concentrations should be avoided.	Exit slots evenly distributed over the length of the edge profile.
	e) Edge drain allowed if plan depth collecting surface never more than 2500mm.	Max depth is 5 tiles (ca 2000mm)
	g) Collecting surface allows drainage from window sills but not roofs or other balconies.	Window sills are allowed to drain on Levitate.
	NOTE 1: balconies below 6m2 may omit gutter and rainwater pipes. e) gives a limit for drain length /area for an even outflow.	Levitate always fulfill limit in e), but also have the possibility to divide large balconies into more slabs.
	NOTE 2: Gutters and rainwater pipes may be omitted from tall structures. Such runoff should be directed.	It is possible to direct the runoff by soffit and edge profile configurations.
Pipe and outlet design	Vertically stacked pipes should fully extend down to the receiving outlet.	Possible to accomplish with Levitate.
	Outlets accessible and incorporate removable grating.	Tiles and aludecking removable.
	Outlets should be slightly recessed to avoid ponding.	Outlet is fitted to a drainage profile.

Technical summary

- CE/UKCA marked according EN1090, EXC2.
- 60 year design life.
- Structural calculations for ultimate resistance as well as deflections at serviceability limit state.
- Max 5mm defection at 2kN point load incorporated in structural calculations.
- Eigenfrequency minimum 5Hz.
- BS8579 compliant.
- Compliant with Approved Document B: Regulation 7.

Levitate and balustrade structural calculations are performed according relevant BS standards, including national annexes and NCCI's, such as:

- BS 8579:2020, Guide to the design of balconies and terraces.
- BS 6180, Barriers in and about buildings – Code of practice.
- BS EN 1990, Eurocode – Basis of structural design.
- BS EN 1991 (all parts), Eurocode 1 – Actions on structures.
- BS EN 1992 (all parts), Eurocode 2 – Design of concrete structures.
- BS EN 1993 (all parts), Eurocode 3 – Design of steel structures.
- BS EN 1999 (all parts), Eurocode 9 – Design of aluminium structures.
- BS EN 1090 (all parts), Execution of steel and aluminium structures.

Balco ownes over 40 patents which make our products unique within our industry.

Every year the global agency Dun & Bradstreet performs a credit assessment of multiple companies. Over the last ten years we have achieved the highest credit rating – AAA.

Our ISO 9001 certification gives our customers assurance that Balco's products are produced in accordance with high quality standards and in an environmentally responsible manner.

SMAS Worksafe is one of the UK's leading providers of health and safety assessments and a national leader in providing full form SSIP (Safety Schemes in Procurement).

CHAS is the UK's leading provider of compliance and risk management solutions.A co-founder of Safety Schemes in Procurement (SSIP) and the Common Assessment Standard

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